National Park Service
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Natural Resource Stewardship and Science

National Park Service
Vegetation Mapping Inventory Program

Appalachian National Scenic Trail Vegetation Mapping Project

Natural Resource Report NPS/NETN/NRR—2017/1437





ON THIS PAGE
All photographs collected along the Appalachian National Scenic Trail. Background: Whitetop Mountain, Virginia. Foreground from lower left clockwise: Acidic hardwood cove forest along Chester Creek, Georgia; pinesap (*Monotropa hypopitys*); oak scree forest on Brusy Mountain, Virginia; pincushion plant (*Diapensia lapponica*) blooming on Mount Monroe, New Hampshire; goldenrod crab spider (*Misumena vatia*) and aphid on pale touch-me-not (*Impatiens pallida*); and seal salamander (*Desmognathus monticola*) in Big Creek, North Carolina.
Photographs by Andrew Strassman (U.S. Geological Survey).

ON THE COVER
A team of ecologists and mappers trekking toward the Appalachian Trail footpath from Mount Washington in New Hampshire for field reconnaisance to support vegetation mapping of the Appalachian National Scenic Trail.
Photograph by Kevin Hop (U.S. Geological Survey).

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Natural Resource Report NPS/NETN/NRR—2017/1437

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The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

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Executive Summary

The National Park Service (NPS) Vegetation Mapping Inventory (VMI) Program classifies, describes, and maps existing vegetation of national park units for the NPS Natural Resource Inventory and Monitoring (I&M) Program. The NPS VMI Program is managed by the NPS I&M Division and provides baseline vegetation information to the NPS Natural Resource I&M Program. The U.S. Geological Survey Upper Midwest Environmental Sciences Center, NatureServe, NPS Northeast Temperate Network, and NPS Appalachian National Scenic Trail (APPA) have completed vegetation classification and mapping of APPA for the NPS VMI Program.

Mappers, ecologists, and botanists collaborated to affirm vegetation types within the U.S. National Vegetation Classification (USNVC) of APPA and to determine how best to map the vegetation types by using aerial imagery. Analyses of data from 1,618 vegetation plots were used to describe USNVC associations of APPA. Data from 289 verification sites were collected to test the field key to vegetation associations and the application of vegetation associations to a sample set of map polygons. Data from 269 validation sites were collected to assess vegetation mapping prior to submitting the vegetation map for accuracy assessment (AA). Data from 3,265 AA sites were collected, of which 3,204 were used to test accuracy of the vegetation map layer. The collective of these datasets affirmed 280 USNVC associations for the APPA vegetation mapping project.

To map the vegetation and land cover of APPA, 169 map classes were developed. The 169 map classes consist of 150 that represent natural (including ruderal) vegetation types in the USNVC, 11 that represent cultural (agricultural and developed) vegetation types in the USNVC, 5 that represent natural landscapes with catastrophic disturbance or some other modification to natural vegetation preventing accurate classification in the USNVC, and 3 that represent nonvegetated water (non-USNVC). Features were interpreted from viewing 4-band digital aerial imagery using digital onscreen three-dimensional stereoscopic workflow systems in geographic information systems (GIS). (Digital aerial imagery was collected each fall during 2009–11 to capture leaf-phenology change of hardwood trees across the latitudinal range of APPA.) The interpreted data were digitally and spatially referenced, thus making the spatial-database layers usable in GIS. Polygon units were mapped to either a 0.5-hectare (ha) or 0.25-ha minimum mapping unit, depending on vegetation type or scenario; however, polygon units were mapped to 0.1 ha for alpine vegetation.

A geodatabase containing various feature-class layers and tables provide locations and support data to USNVC vegetation types (vegetation map layer), vegetation plots, verification sites, validation sites, AA sites, project boundary extent and zones, and aerial image centers and flight lines. The feature-class layer and related tables of the vegetation map layer provide 30,395 polygons of detailed attribute data covering 110,919.7 ha, with an average polygon size of 3.6 ha; the vegetation map coincides closely with the administrative boundary for APPA.

Summary reports generated from the vegetation map layer of the map classes representing USNVC natural (including ruderal) vegetation types apply to 28,242 polygons (92.9% of polygons) and cover 106,413.0 ha (95.9%) of the map extent for APPA. The map layer indicates APPA to be 92.4% forest and woodland (102,480.8 ha), 1.7% shrubland (1866.3 ha), and 1.8% herbaceous cover (2,065.9 ha).

Map classes representing park-special vegetation (undefined in the USNVC) apply to 58 polygons (0.2% of polygons) and cover 404.3 ha (0.4%) of the map extent. Map classes representing USNVC cultural types apply to 1,777 polygons (5.8% of polygons) and cover 2,516.3 ha (2.3%) of the map extent. Map classes representing nonvegetated water (non-USNVC) apply to 332 polygons (1.1% of polygons) and cover 1,586.2 ha (1.4%) of the map extent.

A thematic AA study was completed of map classes representing USNVC natural (including ruderal) vegetation types. Initial AA results were discussed with NPS staff. Following input from NPS staff on how to handle map classes that fell below accuracy standards, adjustments were made to the vegetation map layer. Final results indicate an overall accuracy of 80.18% (kappa index of 79.94% for chance agreements) based on data from 3,204 of the 3,265 AA sites. Most individual map-class themes exceed the NPS VMI Program standard of 80% with a 90% confidence interval with 95% of map classes for users' accuracy and 93% of map classes for producers' accuracy meeting or exceeding the standard.

The APPA vegetation mapping project delivers many geospatial and vegetation data products, including an indepth project report discussing methods and results, which include descriptions to vegetation associations, field keys to vegetation associations, map classification, and map-class descriptions. The suite of products also includes a database of vegetation plots, verification sites, validation sites, and AA sites; digital images of field sites; field data sheets; digital aerial imagery; hardcopy and digital maps; a contingency table listing AA results; and a geodatabase of vegetation and land cover (map layer), field sites (vegetation plots, verification sites, validation sites, and AA sites), aerial imagery index, project boundary, and metadata. Geospatial data are projected in Universal Transverse Mercator, Zone 18 North, by using North American Datum of 1983. Information on the NPS VMI Program and completed mapping projects are on the Internet at http://science.nature.nps.gov/im/inventory/veg.

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Photograph images in this report are either by authors of or by contributors to this report unless otherwise specified.

Introduction and Project Overview

This report describes the Appalachian National Scenic Trail (APPA) vegetation mapping project for the National Park Service (NPS) Vegetation Mapping Inventory (VMI) Program. This "Introduction and Project Overview" section provides a general description of the vegetation mapping project without an indepth review of the methods and results. The report then continues with an indepth description of the methods and results for each main project component to provide the necessary detail to replicate this project. Appendixes are included and referenced in the report to provide further detail. Because of the length of this report, acronyms and abbreviations are reestablished for each main section and appendix.

Throughout this report, APPA also is referred to as the "AT corridor" for the Appalachian Trail corridor and sometimes as the "corridor" after the AT corridor context is established. For clarity purposes, the footpath of APPA always is referred to as the "Appalachian Trail footpath."

Appalachian National Scenic Trail[1]

The APPA is an approximately 3,525-kilometer long footpath between Springer Mountain in northern Georgia and Mount Katahdin in central Maine (Figure 1) and includes a corridor of variable widths averaging 300-meters wide. The APPA is approximately 111,000 hectares (ha) that passes through 14 states and 88 counties. The AT corridor, with its expansive latitudinal and elevation ranges, traverses through a variety of wild, scenic, wooded, pastoral, and culturally significant lands.

More than 99% of lands within APPA are protected under ownership and jurisdiction by various public entities, including APPA, 6 other national park units of the NPS, 8 national forests of the U.S. Forest Service, 2 national wildlife refuges of the U.S. Fish and Wildlife Service, and 60 state-managed lands. With this diversity of land ownership throughout the AT corridor, natural and cultural resource management is administered by APPA through a cooperative partnership with the Appalachian Trail Conservancy, which is a nation-wide nonprofit organization established in 1925 that cooperates with 31 local volunteer clubs. Also known as "The People's Trail," the APPA is a testament of volunteerism in the United States and is supported by volunteers who donate their time and resources to monitor, maintain, and manage the AT corridor. Local club volunteers develop management and landscape protection plans, monitor and manage rare plants and invasive species, build and maintain shelters and bridges, and maintain the Appalachian Trail footpath (Figure 2).

The idea for the Appalachian Trail footpath gained popularity in 1921 when Benton MacKaye published an article detailing his vision of a trail to provide people a retreat from an increasingly industrialized modern life. The design and construction of the Appalachian Trail footpath began with volunteers from various hiking clubs throughout the 1920s and 1930s. In 1925, the Appalachian Trail Conference, now known as the Appalachian Trail Conservancy, formed to organize the localized hiking clubs for the purpose of constructing and managing the Appalachian Trail footpath. The Civilian Conservation Corp in the 1930s helped complete the continuous stretch of the Appalachian

[1]Information within this section was largely compiled from the website for APPA at http://www.nps.gov/appa.

Trail footpath from Mount Oglethorpe in Georgia to Mount Katahdin in Maine, which was opened in 1937. In 1958, because of development in the area, the southern terminus of the footpath was relocated from Mount Oglethorpe to its current location on Springer Mountain in Georgia. In 1968, the U.S. Congress passed the National Trails System Act, establishing the Appalachian Trail footpath as the first National Scenic Trail. The National Trails System Act of 1968 was amended in 1978 to acquire additional lands to protect and preserve the Appalachian Trail footpath. The National Trails System Act highlights the importance of continued volunteers in their roles of planning, development, maintenance, and managing APPA; the Appalachian Trail Conservancy and their volunteer-based club organizations continues in a cooperative role with the NPS in these roles.



Figure 1. The Appalachian National Scenic Trail (shown by the red line in the figure) follows an approximate 3,525-kilometer long footpath between Springer Mountain in northern Georgia and Mount Katahdin in central Maine.[2]

[2]The map display in Figure 1 was made using the Appalachian Trail Interactive Map; the Interactive Map was built cooperatively by the Appalachian Trail Conservancy and National Park Service. The Interactive Map can be accessed on the Internet at https://www.appalachiantrail.org/home/explore-the-trail.



Figure 2. In addition to developing resource plans, managing vegetation, and maintaining structures, local volunteer clubs with the Appalachian Trail Conservancy help maintain the Appalachian Trail footpath.

One of the management priorities of APPA is to protect the natural resources of the AT corridor by "Managing, preserving, and interpreting natural resources in the AT corridor, and increasing awareness of the AT's value as a natural resource, reserve of biodiversity, and barometer of regional environmental health.[3]" The AT corridor supports a diverse natural resource community as it traverses through forests and meadows, over high mountain ridges, and through low valleys between Georgia and Maine. Vegetation is a significant component of the natural resources in APPA (Figure 3). Classification and mapping of vegetation are necessary to facilitate management of the AT corridor by informing resource managers and researchers involved in decision making and monitoring.

National Park Service Vegetation Mapping Inventory Program

The NPS VMI Program classifies, describes, and maps existing vegetation of national park units with a significant natural resource. Managed by the NPS Natural Resource Inventory and Monitoring (I&M) Program Division, the NPS VMI Program provides to the NPS I&M Program baseline vegetation information needed to manage ecosystem integrity for NPS units. Vegetation layers and associated information support a wide variety of resource assessment, park management, and planning needs. The layers and information also provide structure for framing and answering critical scientific questions about vegetation communities and their relation to environmental processes across the landscape.

[3]Quoted from the NPS 2015 Business Plan for APPA.



Figure 3. Vegetation is a significant natural resource of the Appalachian National Scenic Trail; a view of vegetation on Round Bald near Carvers Gap along the North Carolina-Tennessee State line, with the Roan Mountains in the distance.

Program Procedures and Standards

Program scientists developed procedures for classifying and mapping vegetation, and for completing a mapping accuracy assessment (AA) (The Nature Conservancy and Environmental Systems Research Institute 1994a, 1994b; The Nature Conservancy et al. 1994; NatureServe 2004; Lea and Curtis 2010). Ecology and mapping teams collaborated to share knowledge and data and to resolve issues regarding classification and mapping procedures.

Products of the NPS VMI Program meet Federal Geographic Data Committee (FGDC) standards for vegetation classification and metadata, and national standards for spatial accuracy and data transfer. These standards include the following:

- National Vegetation Classification Standard (NVCS; Federal Geographic Data Committee 2008),
- Content Standard for Digital Geospatial Metadata (Federal Geographic Data Committee 1998a),
- United States National Map Accuracy Standards (U.S. Geological Survey 1999), and
- Spatial Data Transfer Standard (Federal Geographic Data Committee 1998b).

Mapping standards include a minimum mapping unit (MMU) of 0.5 ha and a classification accuracy meeting or exceeding 80% (with a 90% confidence level) for map classes representing natural (including ruderal[4]) vegetation types in the U.S. National Vegetation Classification (USNVC).

[4]Ruderal vegetation is defined as "vegetation found on human-disturbed sites, with no apparent recent historical natural analogs and whose current composition and structure is not a function of continuous cultivation by humans and includes a broadly distinctive characteristic species combination, whether tree, shrub, or herb dominated. The vegetation is often composed of invasive species, whether exotic or native, that have expanded in extent and abundance due to the human disturbances" (Faber-Langendoen et al. 2004).

Geospatial products are projected in Universal Transverse Mercator (UTM) by using North American Datum of 1983 (NAD83). The NPS VMI Program provides an array of mapping and vegetation data products. Mapping products include aerial imagery, spatial map layers of vegetation, metadata, a map-classification description or key, and an AA of the vegetation map. Vegetation products include vegetation classification, field key to vegetation types, formal descriptions of vegetation types, and field data in database format. More information on the NPS VMI Program, including completed vegetation mapping projects, is on the Internet at http://science.nature.nps.gov/im/inventory/veg. Information on the NPS Natural Resource I&M Program is available on the Internet at http://science.nature.nps.gov/im/index.cfm.

Classification Standard

The NVCS (Federal Geographic Data Committee 2008) is a methodology to classify existing vegetation and is a framework to organize a vegetation classification within a hierarchical structure. The USNVC is a vegetation classification that follows the NVCS as a standard to define and organize existing vegetation in the United States. The NVCS is static in its methods and hierarchical structure, whereas the USNVC is flexible with its vegetation classification concepts and assignments, yet remains within the static structural hierarchy of the NVCS. The NPS VMI Program uses the USNVC to classify and describe vegetation of national park units to provide a uniform approach in vegetation classification. The use of a national standard aids effective resource stewardship by augmenting compatibility and widespread use of the information throughout the NPS and other federal and state agencies.

The NVCS separates vegetation into two overriding categories: natural vegetation (including ruderal vegetation) and cultural vegetation. Each category is further divided into three main sections: (1) Upper (where physiognomy plays a predominant role), (2) Middle (where floristics and physiognomy play a significant role), and (3) Lower (where floristics plays a predominant role). The hierarchical structures for natural and cultural vegetation types with examples of vegetation types from the USNVC are listed in Tables 1 and 2. Definitions of these various levels are detailed within Section 2 of the NVCS (Federal Geographic Data Committee 2008); however, because of the emphasis given by the NPS VMI Program to vegetation types of the floristic levels (alliance and association) and the group level of the NVCS, the following brief definitions are provided.

- An association-level type is the finest level of the NVCS and is “defined on the basis of a characteristic range of species composition, diagnostic species occurrence, habitat conditions and physiognomy” (Jennings et al. 2006, as quoted in FGDC 2008:14). “Associations reflect topo-edaphic climate, substrates, hydrology, and disturbance regimes” (FGDC 2008:14).
- An alliance-level type is hierarchically one level above the association level and is “defined by a characteristic range of species composition, habitat conditions, physiognomy, and diagnostic species, typically at least one of which is found in the uppermost or dominant stratum of the vegetation” (Jennings et al. 2006, as quoted in FGDC 2008:14). “Alliances reflect regional to subregional climate, substrates, hydrology, moisture/nutrient factors, and disturbance regimes” (FGDC 2008:14).

- A group-level type is hierarchically one level above the alliance level (two levels above association level) yet is also the lowest level of the middle section of the NVCS hierarchy. The group level is defined in Table 2.4 of the NVCS as "combinations of relatively narrow sets of diagnostic plant species (including dominants and codominants), broadly similar composition, and diagnostic growth forms that reflect biogeographic differences in composition and sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes" (FGDC 2008:17).

Table 1. Hierarchy structure of the National Vegetation Classification Standard, Version 2 (Federal Geographic Data Committee 2008) for natural vegetation with example assignments from the U.S. National Vegetation Classification (USNVC Database 2016).*

Level	Example (classification code assignment)
Upper: Physiognomy plays a predominant role	
Formation Class	Forest & Woodland (1; C01)
Formation Subclass	Temperate & Boreal Forest & Woodland (1.B; S15)
Formation	Cool Temperate Forest & Woodland (1.B.2; F008)
Middle: Both floristics and physiognomy play a significant role	
Division	Eastern North American Forest & Woodland (1.B.2.Na; D008)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (1.B.2.Na.2; M502)
Group	Appalachian Oak / Chestnut Forest (1.B.2.Na.2.1; G015)
Lower: Floristics plays a predominant role	
Alliance	*Quercus rubra* - *Quercus prinus* Woodland (A0624)
Association	*Quercus rubra* - *Betula lenta* / *Polypodium virginianum* Woodland (CEGL006585)

*The Oak - Birch Talus Slope Woodland Association—a vegetation type recognized by the Appalachian National Scenic Trail vegetation mapping project—is presented in its full hierarchical classification assignments by the U.S. National Vegetation Classification.

Table 2. Hierarchy structure of the National Vegetation Classification Standard, Version 2 (Federal Geographic Data Committee 2008) for cultural vegetation with example assignments from the U.S. National Vegetation Classification (USNVC Database 2016).*

Level	Example (classification code assignment)
Upper: Physiognomy plays a predominant role	
Cultural Class	Agricultural & Developed Vegetation (7; CL01)
Formation Subclass	Woody Agricultural Vegetation (7.A; CSC01)
Cultural Formation	Forest Plantation & Agroforestry (7.A.2; CFO02)
Cultural Subformation	Forest Plantation (7.A.2.1; CSF05)
Middle: Both floristics and physiognomy play a significant role	
Cultural Group [optional]	Temperate & Boreal Plantation (7.A.2.1.2; CGR007)
Cultural Subgroup	Eastern North American Temperate Forest Plantation (7.A.2.1.2.a; CSG005)
Lower: Floristics plays a predominant role	
Cultural Type	Native Northern Pine Plantation (7.A.2.1.2.a.1; CTY009)
Cultural Subtype [optional]	*Pinus strobus* Planted Forest (CST007178)

*The White Pine Plantation Cultural Subtype—a vegetation type recognized by the Appalachian National Scenic Trail vegetation mapping project—is presented in its full hierarchical classification assignments by the U.S. National Vegetation Classification.

Appalachian National Scenic Trail Vegetation Mapping Project

The APPA vegetation mapping project was initiated by the NPS VMI Program to classify and map vegetation types throughout the AT corridor, thereby providing NPS Natural Resource I&M Program, resource managers, and biological researchers with useful baseline vegetation information.

The objective for the APPA vegetation mapping project was to accurately identify and map existing vegetation types within the AT corridor. To accomplish this objective, three main components were necessary: (1) vegetation classification, (2) vegetation mapping, and (3) AA. Each of these main components is discussed in greater detail in this report; however, as with any vegetation mapping project, several intermediate steps are inherent to the process. The remainder of this section provides an overview of events to complete the APPA vegetation mapping project, including the three main components and some of the more prevalent intermediate steps. This overview is presented somewhat in order of sequence; however, some overlap of events intrinsically exists. A timeline outlining the sequence of task events for the APPA vegetation mapping project is listed in Figure 4.

Project Boundary

The project boundary extent for the APPA vegetation mapping project coincides closely with the APPA administrative boundary and covers an area of 110,918 ha. A feature-class layer showing the extent of the project boundary was developed and incorporated into the geodatabase for the APPA vegetation mapping project.

Ecoregions and Project Areas

The AT corridor spans over 11 degrees of latitude and over 15 degrees of longitude as it traverses nearly 1,525 kilometers across the Appalachian Mountain range between northern Georgia and central Maine. The composition of vegetation changes dramatically throughout this range, which necessitates that the vegetation classification, vegetation mapping, and AA be developed by segments of the AT corridor.

The initial vegetation classification effort approached APPA in four segments that closely follow the ecoregion boundaries defined by The Nature Conservancy (2007). Likewise, vegetation mapping and AA efforts approached the AT corridor in four segments; however, these segments were partitioned differently than The Nature Conservancy (TNC) ecoregion boundaries, and are thereby project defined and termed “APPA project areas.” Although the boundary extents of the APPA project areas and TNC ecoregions resemble each other from afar, they do have distinct differences, particularly where the two northern project areas and ecoregions meet. Locations of the four APPA project areas, in reference to TNC ecoregions, are shown in Figure 5. Although the APPA vegetation mapping project proceeded by segments of the AT corridor, the end product is contiguous in presentation across the entire AT corridor.

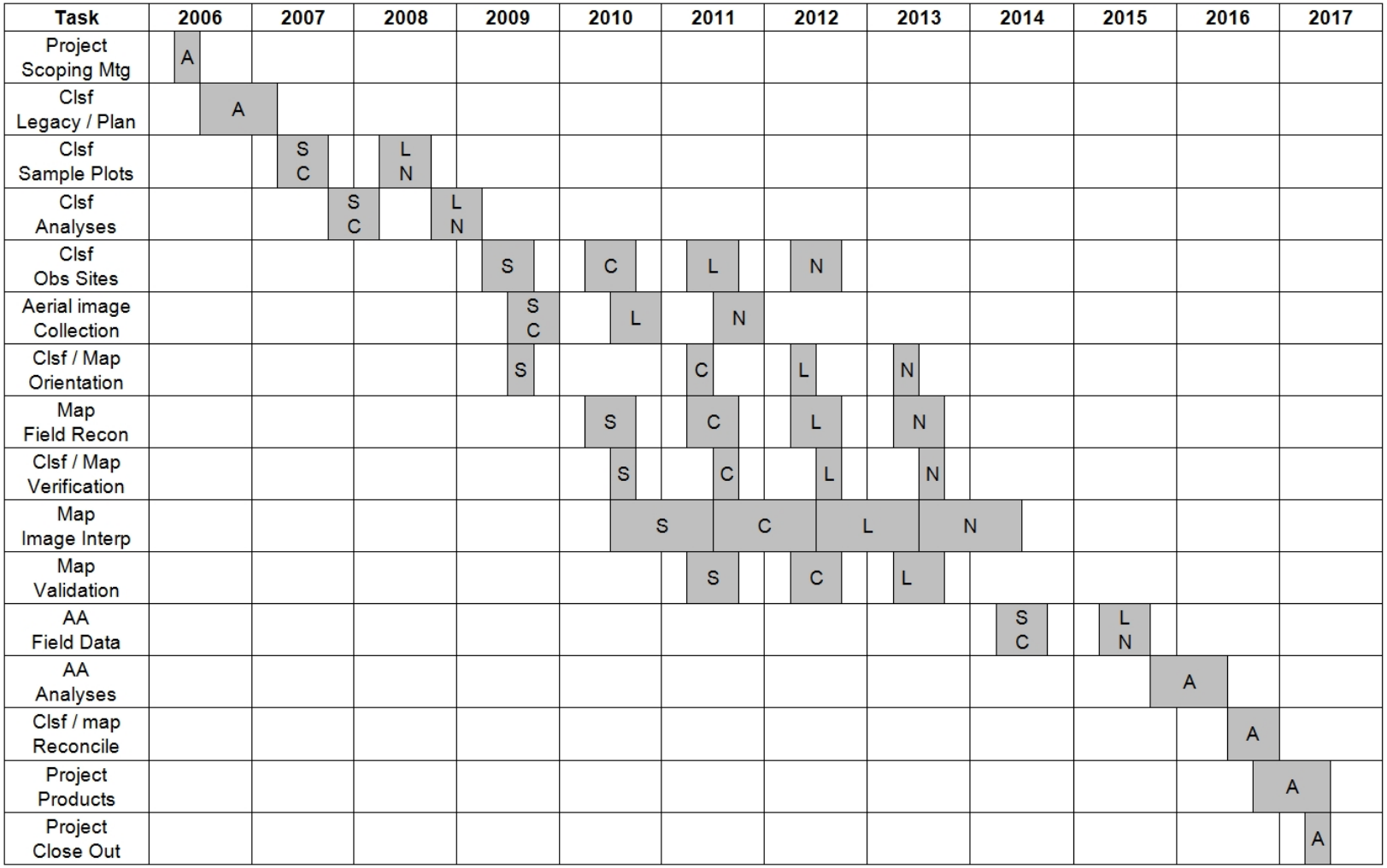


Figure 4. Timeline by year and task event for the Appalachian National Scenic Trail vegetation mapping project. Each cell that represents a year is split into four blocks. From left to right in a cell year, blocks represent January–March, April–June, July–September, and October–December. Shaded blocks are when tasks were completed, coded with the Project Area the task was completed (A, APPA; S, Southern Blue Ridge; C, Central Appalachian; L, Lower New England, and N, Northern Appalachian). Mtg, meeting; Clsf, classification; Obs, observation; Recon, reconnaissance; Interp, interpretation; AA, accuracy assessment.

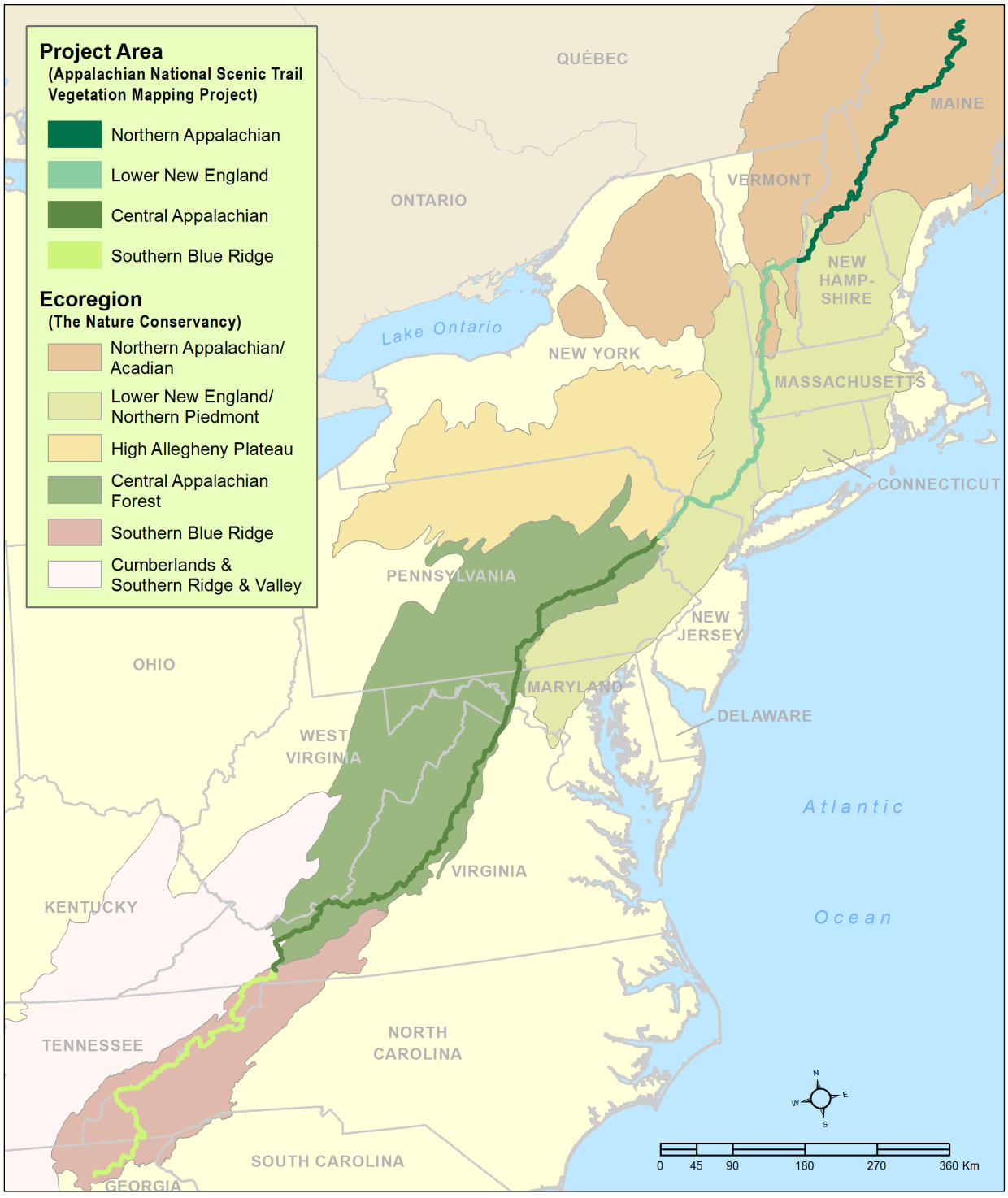


Figure 5. Locations of the four focus project areas defined for the Appalachian National Scenic Trail, in reference to ecoregions defined by The Nature Conservancy (2007).

Ecoregions

To develop the initial vegetation classification, particularly the collection of vegetation plots and subsequent analyses, the AT corridor was partitioned into four focal areas that closely follow four ecoregion boundaries defined by The Nature Conservancy (2007). The AT corridor technically passes through six ecoregions, but two of the ecoregions are minor in the area through which the AT corridor passes. Accordingly, the two "minor" ecoregions are incorporated into the four more "involved" ecoregions. The four ecoregions of TNC are as follows:

- Southern Blue Ridge,
- Central Appalachian Forest,
- Lower New England / Northern Piedmont, and
- Northern Appalachian / Acadian.

The two ecoregions of TNC that have minor amounts of land within the AT corridor are the Cumberlands And Southern Ridge And Valley and the High Allegheny Plateau, which both were assumed into the Central Appalachian Forest ecoregion.

Project Areas

For the mapping and AA efforts, TNC ecoregions were modified into four project defined areas for two reasons. The first reason is that a consensus could not be reached on the division between the Southern Blue Ridge and Central Appalachian Forest ecoregions, and the NPS VMI Program made a final determination. The second reason is that the interlaced transition between the Lower New England / Northern Piedmont and Northern Appalachian / Acadian ecoregions made it difficult for mappers to consistently apply mapping conventions. (See the interlacing between the Lower New England / Northern Piedmont and Northern Appalachian / Acadian ecoregions across Vermont and New Hampshire in Figure 5.)

The four APPA project areas are (1) Southern Blue Ridge (SBR), (2) Central Appalachian (CAP), (3) Lower New England (LNE), and (4) Northern Appalachian (NAP). The four APPA project areas are shown by their locations in Figures 6–9 and are described as follows:

- the SBR project area includes APPA lands between the southern terminus of the AT corridor on Springer Mountain in Georgia and Dickey Gap in Virginia (Corners Creek Road near State Highway 16);
- the CAP project area includes APPA lands between Dickey Gap in Virginia (Corners Creek Road near State Highway 16) and the Delaware River (Pennsylvania-New Jersey State line along Interstate 80);
- the LNE project area includes APPA lands between the Delaware River (Pennsylvania-New Jersey State line along Interstate 80) and the Connecticut River (Vermont-New Hampshire State line between Norwich, Vermont, and Hanover, New Hampshire); and
- the NAP project area includes APPA lands between the Connecticut River (Vermont-New Hampshire State line between Norwich, Vermont, and Hanover, New Hampshire) and the northern terminus of the AT corridor on Baxter Peak of Mount Katahdin in Maine.

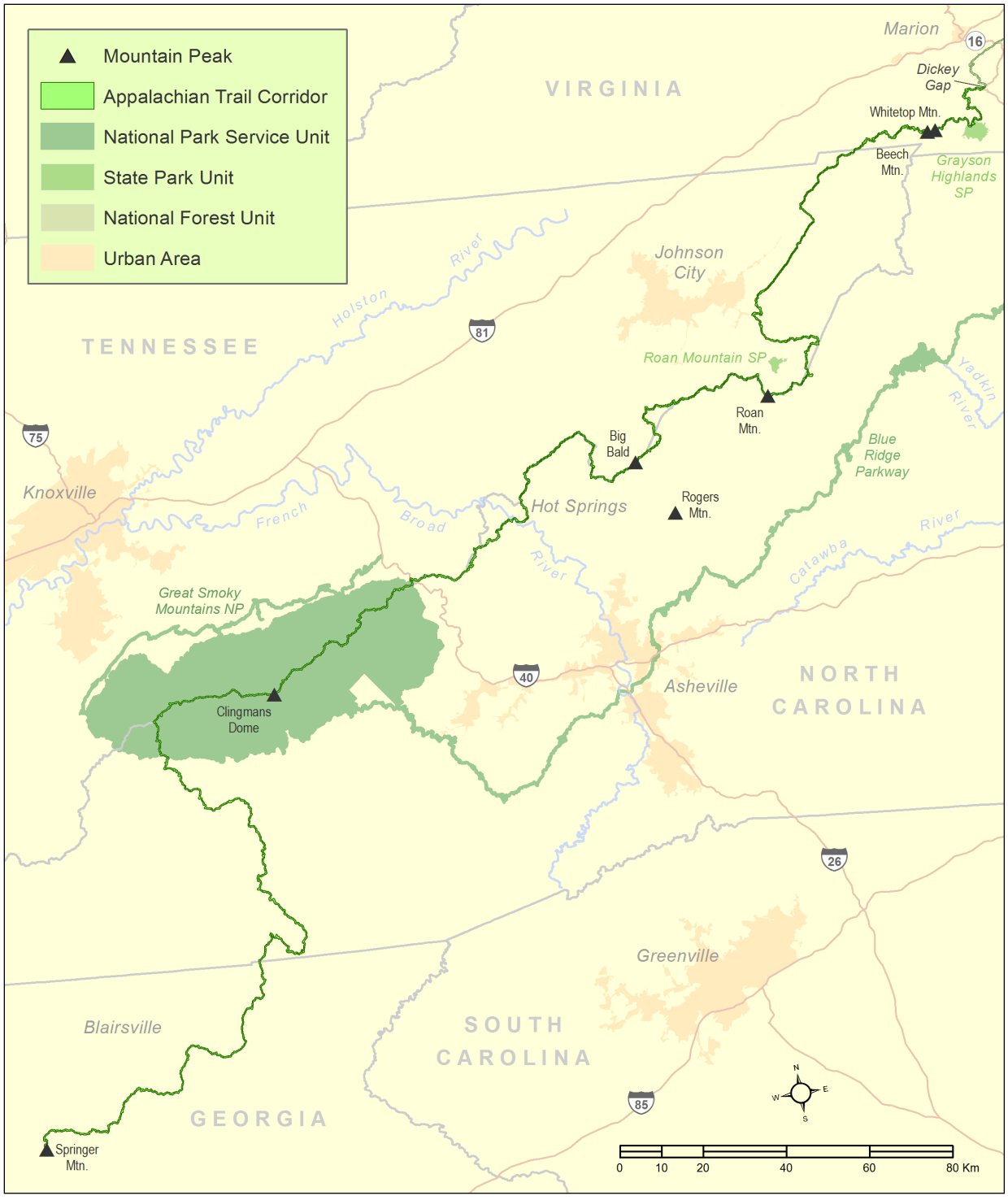


Figure 6. The Southern Blue Ridge project area for the Appalachian National Scenic Trail vegetation mapping project.



Figure 7. The Central Appalachian project area for the Appalachian National Scenic Trail vegetation mapping project.



Figure 8. The Lower New England project area for the Appalachian National Scenic Trail vegetation mapping project.



Figure 9. The Northern Appalachian project area for the Appalachian National Scenic Trail vegetation mapping project.

Because vegetation mapping was completed south to north in sequence by the four APPA project areas, the AA processes to test the vegetation map followed the same sequence. Similarly, the field keys to vegetation associations, which were used extensively for classifying vegetation associations during the AA field efforts and analyses, also followed the APPA project area sequence.

Project Continuity

Although four distinct areas had been set up (whether by TNC ecoregions or APPA project areas) to approach the classification, mapping, and AA components of the APPA vegetation mapping project, the deliverable is a set of products that is contiguous across the AT corridor. Granted, TNC ecoregions and APPA project areas are integrated into this report and the product suite, they are included merely to help readers and users better understand concepts and locations.

Project Scoping Meeting

A scoping meeting to initiate the APPA vegetation mapping project was held at the National Conservation Training Center (U.S. Fish and Wildlife Service) in Shepherdstown, West Virginia, during May 2006. Meeting participants consisted of ecologists, botanists, mapping experts, project coordinators, and resource managers from the NPS, ATC, NatureServe, and 11 state Natural Heritage Programs, which include Georgia, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Pennsylvania, Vermont, Virginia, and West Virginia.

The scoping meeting included addressing the following: (1) identifying supplemental data sources including Natural Heritage Program reports, classifications, existing vegetation maps, and plot and observation site data that had already been gathered; (2) reviewing vegetation mapping standards; (3) reviewing each vegetation association in the preliminary vegetation classification by regional experts to assess the potential existence of associations within the AT corridor; (4) discussing specific challenges associated with mapping APPA; (5) discussing the roles of nongovernment organizations and federal and state agencies; (6) identifying active participants in vegetation field sampling, classification, and mapping; (7) identifying issues with adjacent land owners and access; (8) discussing the mapping boundary; and (9) exploring aerial imagery and options for acquisition of new aerial imagery.

Classification of Vegetation

Classifying the vegetation within APPA began by generating a preliminary classification list, followed by acquiring vegetation data from legacy data, collecting vegetation-plot data, performing analyses of vegetation data, and assigning USNVC associations to analyses results.

The preliminary classification list was prepared as a primer for the project scoping meeting to determine the need for additional vegetation plots. Legacy vegetation data were assessed and used when applicable as a first source of vegetation plots to support classification. Data from additional vegetation-sampling plots were collected during 2007–08 to support vegetation types not supported by the legacy vegetation plots. Additional observation sites were collected (Figure 10) during 2009–12 to support common or ruderal vegetation types that were undersampled. (An observation site is a type of vegetation plot that examines the major vegetative components without completing a botanical inventory.) The collective of legacy plots, sampling plots, and observation sites provided

1,618 vegetation plots for the analyses to classify the vegetation of the entire AT corridor. The plot data were originally entered into the NPS PLOTS Database Version 2.0 (NatureServe 2005) and were eventually converted to the NPS PLOTS version 4.0 (National Park Service 2015) database. The vegetation-plot data were subjected to a series of analyses to classify associations in the USNVC and document those associations with local descriptors. A series of meetings to review the initial classifications by TNC ecoregion were held at various dates and locations. The purpose of these meetings was for NatureServe and local ecologists to comprehensively review the analyses and classification of vegetation plots. Adjustments to the vegetation classification were made following each ecoregion meeting. Field keys to vegetation associations were developed for each APPA project area. The vegetation classification and field keys were then continually refined throughout the remainder of the APPA vegetation mapping project with additional data from map reconnaissance, verification, validation, and AA.



Figure 10. A field ecologist recording vegetation data on an observation-site form in support of vegetation classification for the Appalachian National Scenic Trail vegetation mapping project.

The APPA vegetation mapping project identified 280 natural (including ruderal) associations in the USNVC. Of these 280 associations, 224 were a direct result from the analyses and classification of the vegetation plots. Another 29 of the 280 associations were anticipated to exist within the AT corridor and were confirmed during field reconnaissance for vegetation mapping, and another 24 associations—that were not anticipated—also were recognized during the field reconnaissance efforts. Three additional associations were recognized from the AA field data. Methods and results of vegetation classification are provided in the “Vegetation Classification” section of this report.

Classification Organization

Throughout this project report and the final products related to the APPA vegetation mapping project, the vegetation classification provided is from a 2016 version of the USNVC (USNVC Database 2016), which follows the methodology and organizational hierarchy of the NVCS, version 2 (Federal Geographic Data Committee 2008). The NVCS makes a distinction between natural (including ruderal) and cultural vegetation. Areas with at least 1% vegetation cover are classified and described with the USNVC with one exception—aquatic areas are only included when at least 10% vegetation cover (emergent or submergent) is present. Aquatic areas with less than 10% vegetation cover are categorized as open water; these areas are not described in the USNVC.

The term "vegetation type" is used throughout this report to reference vegetation classification units in general, at any level of the classification hierarchy. For example, the *Pinus strobus* - *Quercus alba* - (*Carya alba*) / *Gaylussacia ursina* Forest Association, the *Pinus strobus* - *Quercus prinus* Appalachian Forest Alliance, and the Appalachian Oak / Chestnut Forest Group are each treated as a vegetation type.

Vegetation Classification Orientation Meetings

A series of classification orientation meetings were held to allow for the classifiers to present the vegetation classification to the mappers. The meetings for each APPA project area were held prior to field reconnaissance efforts to map each area.

The first orientation meeting focused on the SBR project area and was held July 28–30, 2009, at the Blue Ridge Parkway Headquarters in Asheville, North Carolina. This meeting provided an orientation of vegetation classification for the SBR project area and provided a venue for collaborator discussion of the entire APPA vegetation mapping project, which included a review of the vegetation-plot collection and analyses, discussions of the mapping and AA processes and support needs, and an overview of end products. A result from this orientation meeting was the directive from the NPS VMI Program to collect additional observation-site data across all four APPA project areas for 4 years; one project area for each year. The main goal for additional observation sites was to collect vegetation data to support undersampled and ruderal associations in the USNVC. Participants at this meeting were from various entities from within the NPS, U.S. Geological Survey (USGS), and NatureServe organizations. This orientation meeting concluded with a field tour near Hot Springs, North Carolina, where participants visited some representative vegetation types within the SBR project area (Figure 11).

The orientation meetings to discuss the vegetation classifications for the remaining three APPA project areas (CAP, LNE, and NAP) were held at the USGS Upper Midwest Environmental Sciences Center (UMESC) in La Crosse, Wisconsin, with participants from NatureServe, USGS, and occasionally Natural Heritage Programs. For the CAP, LNE, and NAP project-area meetings, classifiers and mappers met on April 21–22, 2011, April 4–5, 2012, and April 1–3, 2013, respectively.



Figure 11. A field visit near Hot Springs, North Carolina, of forest vegetation during the orientation meeting for the Appalachian National Scenic Trail vegetation mapping project.

Mapping of Vegetation

The series of vegetation classification orientation meetings prepared the mappers for field reconnaissance. The purpose for field reconnaissance was to visit the vegetation types in the field, discern the vegetation type appearances in the aerial images, and establish mapping protocols. Field reconnaissance proceeded in the SBR project area during 2010, the CAP project area during 2011, the LNE project area during 2012, and the NAP project area during 2013. The mappers completed three field trips each year and were assisted intermittently by a vegetation ecologist for classification guidance (Figure 12). The first and second trips each year focused on collecting information on each individual association or map class. The third trip focused on the verification process, which tested a draft version of the vegetation field keys and a sampling of preliminary map polygons. The mapping protocols and vegetation field keys were then adjusted based on the verification results.

The mapping proceeded from fall 2010 to spring 2014; one APPA project area was mapped per mapping season following the field reconnaissance effort for a project area. Mappers interpreted vegetation and land cover types by viewing the digital aerial imagery collected for this project. The mappers viewed the aerial imagery stereoscopically by using computer workstations equipped with both three-dimension (3D) and geographic information system (GIS) software (Figure 13). Map conventions based on fieldwork and the vegetation classification helped maintain consistency in mapping. Draft versions of the vegetation map (a spatial database layer) were completed in spring 2014 for the SBR and CAP project areas, and spring 2015 for the LNE and NAP project areas. Each map layer was prepared for AA, some receiving map validation prior to entering AA.



Figure 12. A vegetation ecologist providing classification guidance to mappers during field reconnaissance for the Appalachian National Scenic Trail vegetation mapping project.



Figure 13. Image interpretation of vegetation using computer workstations equipped with three-dimension and geographic information system software.

The vegetation map layer has 169 map classes representing APPA. Of these 169 map classes, 150 represent 261 of the 280 USNVC associations recognized by this vegetation mapping project; 19 associations were determined always less than a MMU. Another 11 map classes represent cultural vegetation types (agricultural and developed) in the USNVC, 3 map classes represent nonvegetation open water (non-USNVC), and 5 map classes represent natural landscapes that have undergone catastrophic disturbance or some other form of modification to natural vegetation preventing accurate vegetation classification and placement in the USNVC. The vegetation map layer provides 30,395 polygons of detailed attribute data covering 110,919.7 ha. Methods and results of vegetation mapping are provided in greater detail in the "Vegetation Mapping" section of this report.

Minimum Mapping Units

The standard MMU of 0.5 ha set by the NPS VMI Program was applied to mapping forest, cultural, and park-special vegetation map classes. For woodland, shrubland, herbaceous, sparse vegetation, and nonvegetated open-water map classes, a MMU of 0.25 ha was applied with the exception of nine map classes representing alpine shrub, herbaceous, and sparse vegetation types; these alpine map classes were mapped to a MMU of 0.125 ha. Other allowances for reduced MMUs were applied to map polygons along the AT corridor boundary. More details on MMU conventions are provided in the "Vegetation Mapping" section of this report.

Map Validation

Map validation was completed on the draft vegetation maps for three of the four APPA project areas (SBR, CAP, and LNE); the map validation was canceled for the NAP project area because the cost-benefit ratio from the previous three project-area map validations was determined insufficient by the NPS VMI Program. The purpose of map validation was to test the initial vegetation map and determine its readiness for the AA process. With the use of a cost-surface analysis that modeled landscape accessibility, one or two site locations were randomly selected for each map class. The NPS coordinated the field-data collection, which proceeded during the field season following each map completion of an APPA project area. A total of 269 validation sites were collected. Because only one or two validation sites were collected for each map class, the small sample size lacked vigor to properly assess the vegetation map to address issues; however, the validation sites did prove useful for improving the field keys to vegetation associations. More details on map validation are provided in the "Vegetation Mapping" section of this report.

Accuracy Assessment Study

An AA was completed on draft versions of the vegetation map layer. A cost-surface analysis was applied to determine areas that would allow field crews to safely access AA sites in a timely and effective manner. The AA sites were randomly selected by map-class theme within areas deemed accessible from the cost-surface analysis. During the 2014 and 2015 field seasons, field crews collected data from 3,265 stratified-random sites to evaluate the accuracy of the vegetation map layer for those map classes representing USNVC associations. The AA field data were compared to the vegetation map data, with the initial results reviewed by the AA and mapping teams (Figure 14), and the map data were reconciled as necessary with agreement by NPS staff. Results from the AA study indicate an overall accuracy of 80.18% (kappa index of 79.94%, which accounts for chance

agreements) based on an analysis of data from 3,204 of the 3,265 AA sites. The results were tabulated into a contingency matrix. Methods and results of the AA are provided in greater detail in the "Accuracy Assessment" section of this report.

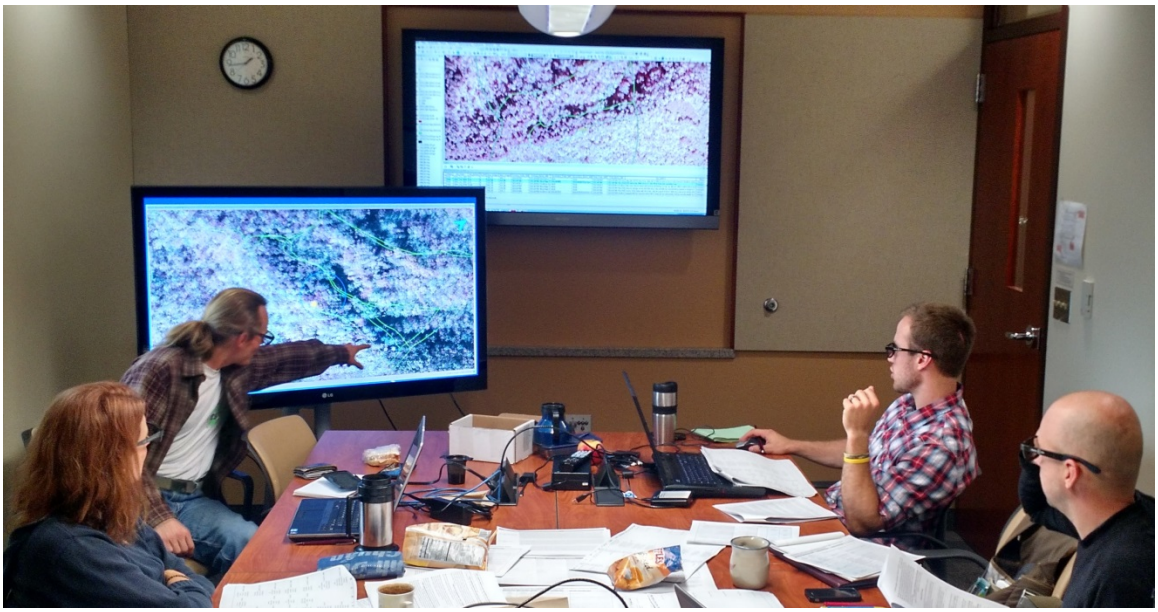


Figure 14. The accuracy assessment analysis team meeting with mappers to review the initial accuracy results of vegetation maps for the Appalachian National Scenic Trail vegetation mapping project.

Product Development and Delivery

The suite of end products developed and compiled for the APPA vegetation mapping project includes a project geodatabase, an orthorectified mosaic for each flight line of aerial imagery collected for the project, metadata documentation for geospatial datasets, a digital map book displaying the project aerial imagery, a vegetation database with the formal field data collected during this project (vegetation plots, verification sites, validation sites, and AA sites), digital images of the formal field-site locations, maps and graphics showing a representation of each feature class within the project geodatabase, and this NPS Natural Resource Report summarizing the APPA vegetation mapping project. The set of products are delivered to NPS staff from the VMI Program, Northeast Temperate Network, and APPA. The VMI Program posts the products to the Integrated Resource Management Applications Portal, providing easy access to these end products by NPS, partners, and the public.

The project geodatabase contains the following five feature classes: (1) polygon features showing the locations of vegetation types and general land-cover features; (2) point features showing the locations of vegetation plots, verification sites, validation sites, and AA sites; (3) point features showing the locations of the digital aerial imagery set obtained for the APPA vegetation mapping project; (4) line features showing the locations of flight lines to the aerial imagery obtained for the APPA vegetation mapping project; and (5) polygon features showing the APPA project boundary extent. Included in the geodatabase are tables that provide more information about the features, including links to classifications and detailed sampling data. Geospatial products were projected in the UTM, Zone 18 North, by using NAD83.

Digital Aerial Imagery

Digital aerial imagery provides baseline data for mapping vegetation types and other land-cover features. Vertical photographs (photographs taken with the aerial camera pointed straight down at the ground) collected with proper overlap for each flight line allows an interpreter to study the photographs in 3D with a stereoscope (Avery 1978) or, as with the APPA vegetation mapping project, to view stereo models of digital aerial images in 3D using computers and specialized GIS software. Because ecologic settings are taken into account when mapping vegetation types, viewing the aerial images in 3D helps recognize those ecologic settings.

Digital 4-band—true-color and color-infrared—aerial imagery was acquired in the months of October during 3 years (2009–11) for the APPA vegetation mapping project using a plane-mounted digital camera. This set of imagery became the primary source for image interpretation and mapping. The aerial imagery was collected at a pixel resolution of 30.48 centimeters (centimeter measurement calculated from a standard 12-inch measurement). The goal of fall-dated imagery, particularly with the color infrared bands, was to capture peak leaf-phenology change of hardwood trees; thus, aiding mappers in viewing distinctions among various hardwood-forest types.

Staff from the UMESC of the USGS coordinated the collection of digital aerial imagery with the following requirements:

- a fall-dated imagery set showing peak leaf-phenology change of trees,
- a date to capture peak leaf-phenology change that was coordinated with APPA staff,
- a suitable pair of images for stereo viewing with 60% forward lap and 30% side lap,
- a collection time that would avoid long shadows and maintain proper color balance,
- a pixel resolution of 30.48 centimeters (equivalent to 12 inches), and
- a minimum of a 100-meter buffer beyond the APPA administrative boundary.

The aerial flight contractor, Photo Science, Inc., used a plane-mounted, high-resolution panchromatic digital mapping camera with electronic forward motion compensation to eliminate image blur. The digital mapping camera uses a camera assembly combining panchromatic and multispectral camera heads to output a full resolution (7,680 by 13,824 pixels) panchromatic scene with coregistered red, green, blue and near-infrared outputs. The final 4-band output image can be displayed as either true color or color-infrared when mapping. The camera system uses a sophisticated inertial measurement unit (IMU) and a sensitive global positioning system (GPS) to track the precise location and position of the camera sensor at the instance of exposure. Image processing software uses these positional data to reference each image frame to the surface of the Earth within 1 meter (Ip et al. 2007).

With the AT corridor being nearly 3,525 kilometers in length, the aerial imagery mission was flown in segments over 3 years to capture peak-leaf phenology, after leaf color change but prior to leaf fall. Priority was given to peak-leaf phenology in the higher elevations to ensure that all forest species were in leaf-on status for viewing on computers to successfully complete fieldwork and mapping (Figure 15).

Baseline information about the digital aerial imagery collected for the APPA vegetation mapping project is listed in Table 3. The aerial imagery missions captured 271 flight lines of aerial imagery and covered the AT corridor with a minimum 100-meter buffer beyond the APPA boundary. The entire SBR and CAP project areas and the southern-most LNE project area were captured in 2009, most of the LNE project area in 2010, and the northern-most LNE project area and the entire NAP project areas in 2011. Each year the acquisition window was determined through coordination among the USGS, Photo Science, and NPS Northeast Temperate Network Natural Resource I&M Program staff to capture imagery as close to peak-leaf color as possible. The flight line locations for the digital aerial imagery collected for the APPA vegetation mapping project are shown in Figure 16.



Figure 15. Viewing aerial imagery on a computer to complete fieldwork for vegetation mapping.

Table 3. Digital aerial imagery sets collected for the Appalachian National Scenic Trail vegetation mapping project.*

Imagery Date	Imagery type	Pixel Resolution	Footprint (pixels)	Footprint (m)	Area (ha)
10-19-2009	4-band imagery	30.48 cm (12 in)	7,680 by 13,824	2,340.9 by 4,213.6	986.4
10-20-2009	4-band imagery	30.48 cm (12 in)	7,680 by 13,824	2,340.9 by 4,213.6	986.4
10-21-2009	4 band imagery	30.48 cm (12 in)	7,680 by 13,824	2,340.9 by 4,213.6	986.4
10-03-2010	4-band imagery	30.48 cm (12 in)	7,680 by 13,824	2,340.9 by 4,213.6	986.4
10-08-2010	4-band imagery	30.48 cm (12 in)	7,680 by 13,824	2,340.9 by 4,213.6	986.4
10-09-2010	4-band imagery	30.48 cm (12 in)	7,680 by 13,824	2,340.9 by 4,213.6	986.4
10-06-2011	4-band imagery	30.48 cm (12 in)	7,680 by 13,824	2,340.9 by 4,213.6	986.4
10-07-2011	4-band imagery	30.48 cm (12 in)	7,680 by 13,824	2,340.9 by 4,213.6	986.4
10-08-2011	4-band imagery	30.48 cm (12 in)	7,680 by 13,824	2,340.9 by 4,213.6	986.4

*m, meter; ha, hectare; cm, centimeter; in, inch

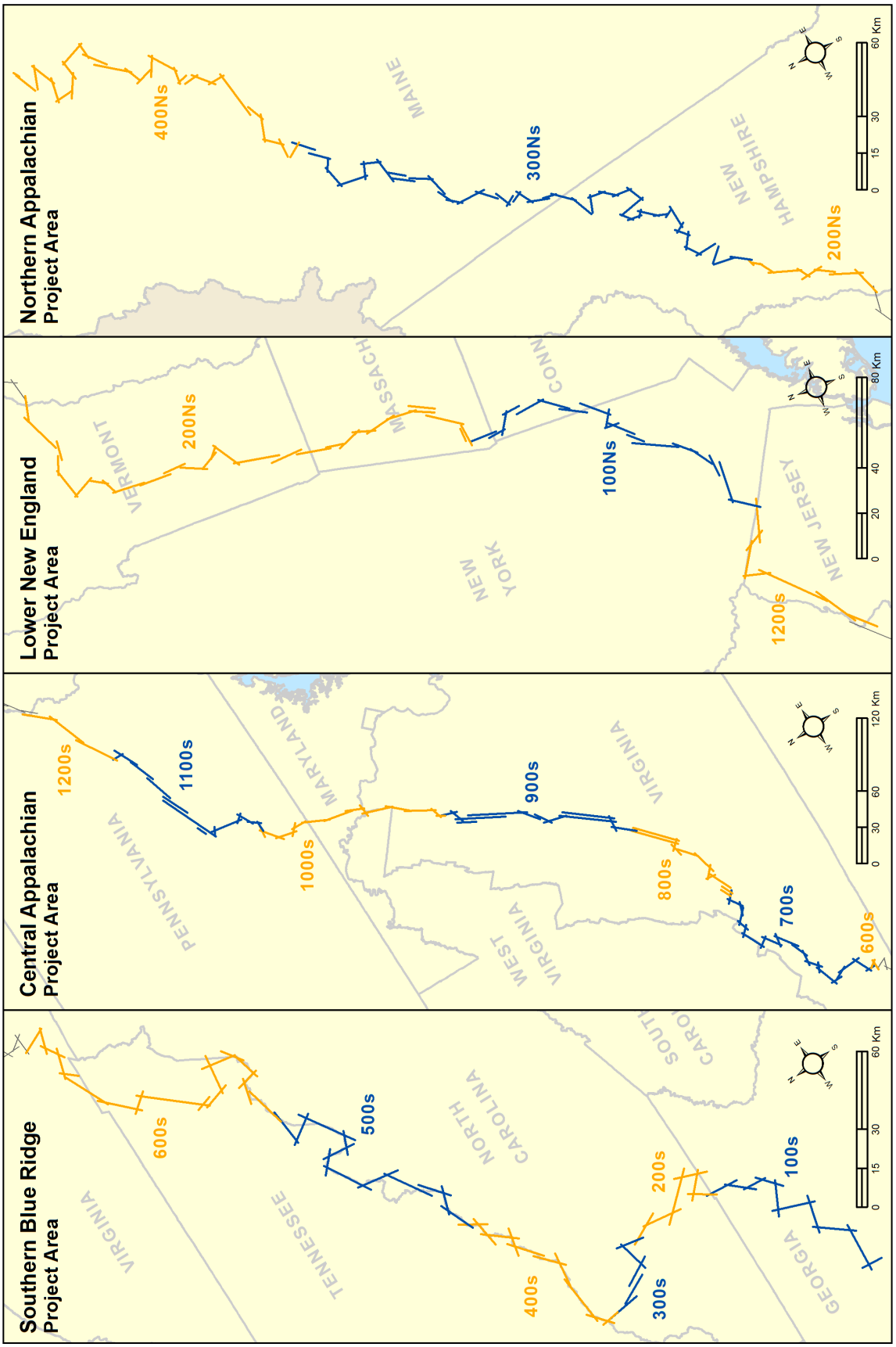


Figure 16. Flight line locations of the digital aerial imagery collected for the Appalachian National Scenic Trail (APPA) vegetation mapping project. Flight lines are shown within the set of four APPA project areas. The four APPA project areas are shown at different scales and directions.

The digital aerial imagery was reviewed to assure that requirements for mapping purposes were met[5]. Upon acceptance, exposures were adjusted for viewing and interpreting purposes. The aerial imagery was then processed for both field and mapping purposes. Processing resulted in the creation of the following two products: (1) a two-dimensional orthorectified mosaic of each flight line for background display in a GIS and (2) stereo models to view and map images in 3D using a GIS and specialized 3D computer hardware and software.

Orthorectified Mosaic

Individual image tiles from the digital aerial imagery collected for the APPA vegetation mapping project were converted to Tagged Image File Format and referenced to the Earth using the camera generated GPS and IMU records. Because the IMU records the rotation values from the camera sensor in three directions (roll, pitch, and yaw) and the GPS records the horizontal and vertical values from the sensor at the moment of exposure, specific software programs can reference each digital aerial image precisely to its ground position. To further increase the fit of the images to the Earth, software programs drape each aerial image over the landscape using digital elevation models.

Once referenced, or orthorectified, the individual digital aerial images were color balanced and "stitched" together to form an orthoimage mosaic for each flight line. Each mosaic was compressed into Joint Photographic Experts Group 2000 to accommodate computer hardware systems and GIS software with manageable file sizes. Each orthoimage mosaic was projected in the UTM, Zone 18 North, by using NAD83. An example of an orthoimage mosaic is shown in Figure 17.

Stereo Models

Digital aerial images were collected with a 60% overlap of each frame along a flight line. This overlapping coverage of the ground on the images is what allows for the creation of a 3D onscreen view in specialized computer software. Before the aerial imagery can be viewed in 3D, a number of processing steps must take place. For the APPA vegetation mapping project, stereo models were produced using IMAGINE Photogrammetry (ERDAS, Inc.). A stereo model is a flight line of imagery, along with a separate georeferencing file, called a block file, which establishes the relation of each aerial image to the adjacent image in order to precisely align the image pair (also known as a stereo pair), and make it viewable in 3D and display in the correct geospatial position. When the stereo model is imported into the software program called "Stereo Analyst for ArcGIS" (ERDAS, Inc.), the imagery can be viewed in 3D and map interpretation performed. Because the block file associated with each stereo model contains georeferencing information, the delineations made on-screen by the interpreter are also georeferenced as they are drawn, creating the vegetation map. More information on the use of stereo models with specialized stereo viewing equipment for mapping is provided in the "Vegetation Mapping" section of this report.

In addition to mosaic orthoimages and stereo models, feature-class layers were produced to show in a GIS the flight line locations and the center locations of individual aerial images. These feature

[5]Since the dates of aerial imagery collection, the APPA administrative boundary has expanded. This boundary expansion resulted in instances of imagery holidays; these instances are few and minor, largely because the flight planning included a minimum of a 100-meter buffer beyond the APPA administrative boundary.

classes are incorporated into the geodatabase product for the APPA vegetation mapping project. Aerial orthoimagery mosaics by flight line also are included as products, along with a nonspatial digital map book of aerial images.

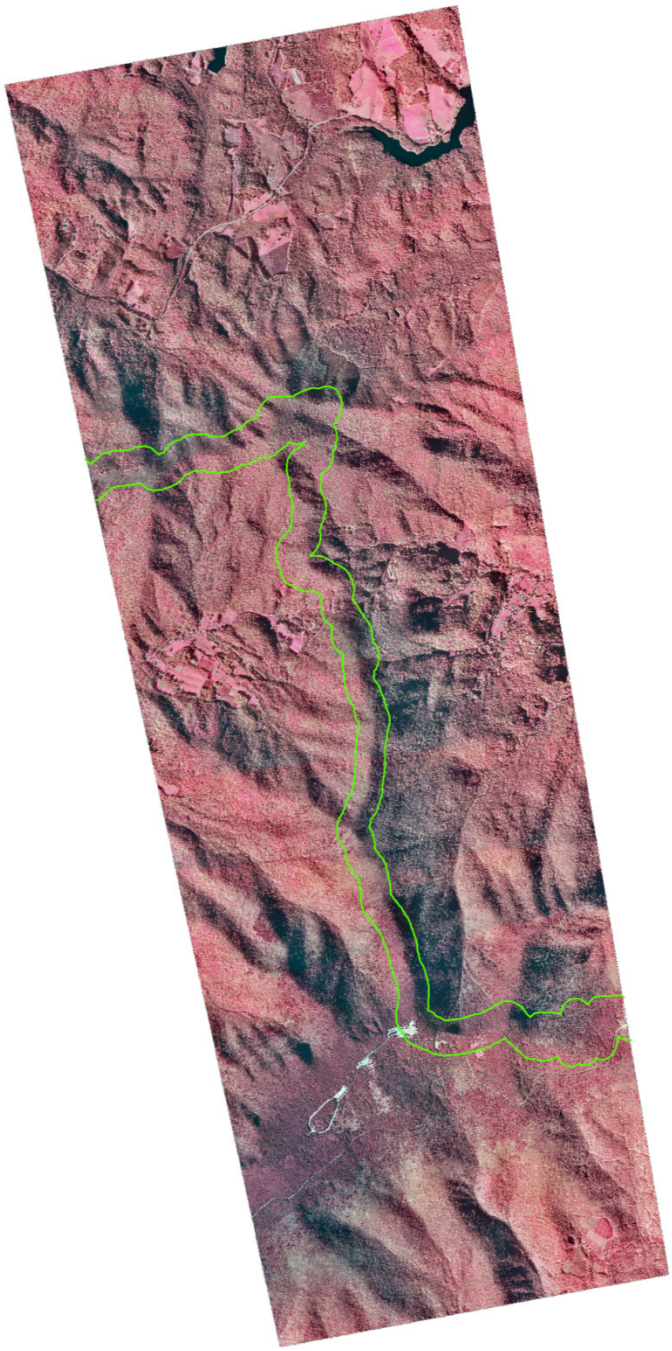


Figure 17. An example of an orthoimage mosaic developed of a flight line of 4-band digital aerial imagery that was acquired for the Appalachian National Scenic Trail (APPA) vegetation mapping project. (This flight line of 4-band digital aerial imagery is shown with the color-infrared bands. The flight line of imagery covers the Roan Mountain area along the North Carolina-Tennessee State line. The APPA project boundary is overlaid in green for reference.)

Vegetation Classification

Classifying the vegetation of the Appalachian National Scenic Trail (APPA, also referred to as the "AT corridor" for the Appalachian Trail corridor) for the APPA vegetation mapping project consisted of generating a preliminary classification list, acquiring vegetation data from legacy data, collecting vegetation-plot data, performing analyses of vegetation data, and assigning U.S. National Vegetation Classification (USNVC) associations to the results of the analyses.

Methods

Preliminary Vegetation Classification

The first step in classifying natural (including ruderal) vegetation of APPA was to prepare a preliminary classification report prior to the May 2006 scoping meeting. This report served as a working list to compare existing datasets and determine the need for additional vegetation plots. This classification was produced by querying the NatureServe Biotics database for all vegetation associations in the USNVC known to occur within the vicinity of the AT corridor. This yielded an initial listing of 349 vegetation associations that represented a broader area than the AT corridor and included some associations that did not exist in APPA lands. An assumption with this initial listing of associations was that the list included some associations not yet accounted for in legacy datasets. This preliminary classification list was presented at the scoping meeting in 2006 to determine what data already existed with the network of Natural Heritage Programs and what data were needed to adequately classify the vegetation of the AT corridor. A plan was organized to build a comprehensive database of existing vegetation information from legacy data to determine the vegetation sampling needs for the APPA vegetation mapping project.

Legacy Vegetation Data

To build the initial vegetation database with legacy data, NatureServe acquired existing vegetation data from sampling plots and observation sites (also known as observation points) that had been collected within or nearby the AT corridor as a part of previous vegetation inventory projects. Data contributions were from the National Park Service (NPS) and the following network of Natural Heritage Programs:

- Carolina Vegetation Survey,
- Connecticut Natural Heritage,
- Maine Natural Areas Program,
- Massachusetts Natural Heritage,
- New Hampshire Natural Heritage Bureau,
- New Jersey Natural Heritage Program,
- New York Natural Heritage Program,
- Pennsylvania Natural Heritage Program,
- Vermont Natural Heritage Program, and
- Virginia Natural Heritage Program.

The assemblage of legacy vegetation data from the Natural Heritage Programs and the NPS resulted in a large dataset of vegetation information existing in various formats. Sampling plots and observation sites of vegetation differ from each other in the amount and kinds of data recorded. A sampling plot is defined as a predetermined area that is dependent on the structure of the vegetation (e.g., 400-square meters within forest vegetation) where the abundance of all plant species within the predetermined area is measured, along with a suite of environmental characteristics, to help define the vegetation association in the USNVC. An observation site is similar to a sampling plot, but abundance of only dominant plant species is measured and limited environmental data are collected.

NatureServe evaluated the vegetation legacy dataset, then categorized each sampling plot or observation site by their suitability for quantitative and qualitative analyses and for classification and mapping purposes (Table 4) using a five-tier system. A tier 1 data category described the legacy data most suitable for quantitative analysis, classification, and mapping purposes, where a tier 5 category described data as being unsuitable for any analysis, classification, or mapping purpose and was omitted from use. Intermediate tiers identified varying suitability of the legacy data for quantitative, qualitative, classification, and mapping purposes. Examples of tier 1 legacy data were sampling plots that supported vegetation classifications for other vegetation mapping projects of five national park units that the AT corridor passes through (Table 5).

Table 4. Criteria and suitability categories by tier ratings to assess legacy data for contribution to the vegetation classification for the Appalachian National Scenic Trail vegetation mapping project.

Tier	Criteria	Suitability
Tier 1	Georeferenced classification plot data, and contains a complete record of species and abundance in all strata.	Suitable for quantitative analysis, vegetation classification, and mapping.
Tier 2	Classification plot data not georeferenced, but contains a complete record of species abundance in all strata.	Suitable for quantitative analysis and vegetation classification, but not mapping.
Tier 3	Georeferenced observation point data, and contains a partial record of species abundance in all strata.	Suitable for qualitative classification and mapping.
Tier 4	Observation point data that is not georeferenced, and contains partial record of species abundance in all strata.	Suitable for qualitative classification.
Tier 5	Observation point data or classification plots that are not georeferenced, and contains substantial data omissions, transcription and entry errors, or data collected in a format incompatible for classification purposes.	Unsuitable for classification or mapping; data omitted.

Table 5. Tabulation of legacy data from national park units that the Appalachian Trail corridor passes and that meet tier 1 data criteria and suitability for contribution to the vegetation classification for the Appalachian National Scenic Trail vegetation mapping project.

National Park	State	Plots
Blue Ridge Parkway	Virginia	6
Delaware Water Gap National Recreation Area	New Jersey, Pennsylvania	16
Great Smoky Mountains National Park	North Carolina, Tennessee	15
Harpers Ferry National Historical Park	Maryland, West Virginia	13
Shenandoah National Park	Virginia	63

Legacy data from 391 vegetation plots (sampling plots and observation sites collectively) were determined suitable for classification and mapping purposes. These 391 legacy data were imported into the PLOTS Database Version 2.0 (NatureServe 2005), resulting in standardized cover values for species records, environmental data, geocoordinates and metadata. Each legacy sampling plot and observation site was accepted as a tangible vegetation plot for the APPA vegetation mapping project and assigned a unique PLOT code (APPA.####); the original legacy plot and site codes were retained for archival purpose. Spatial coordinates providing locations to these vegetation plots of legacy origin were standardized into decimal degrees using the North American Datum of 1983 because the AT corridor crosses several (four) Universal Transverse Mercator (UTM) zones[6]. Some legacy vegetation plots have previously received analyses and classification to USNVC association as part of other vegetation mapping projects with the NPS Vegetation Mapping Inventory (VMI) Program, as listed in Table 6. Other legacy vegetation plots had either been classified to a state-specific classification (non-USNVC) or had received no classification of any kind. These vegetation plots without USNVC association assignment were screened and tentatively assigned, when possible, to an association in the USNVC by using classification crosswalks between state classifications and the USNVC or by assessing best fit of species composition and environmental data to association descriptions in the USNVC.

Supplemental Vegetation Data

In addition to assembling legacy vegetation data, supplemental vegetation data also were assembled from the network of Natural Heritage Programs. These supplemental data consisted of georeferenced ecological community and species element occurrence records from within the AT corridor. Although these records are limited in the type of information needed for full classification analysis, they help verify the existence of certain vegetation associations within the AT corridor that were not represented by the legacy vegetation data. The supplemental data were retrieved from 16 community and species inventories for each state that the AT corridor crosses (Table 6).

Identifying Classification Gaps

After gathering all known data that were determined suitable to classify the vegetation for APPA, the classifications from the legacy vegetation plots were then compared to the preliminary classification list. This comparison revealed the number of vegetation plots giving support to various vegetation associations that exist along the AT corridor. Then the reports detailing community and species inventories were reviewed to identify vegetation associations not represented by vegetation-plot data. The resulting tally of vegetation plots by vegetation association provided a listing of associations requiring vegetation-plot data for analysis to ultimately characterize the vegetation associations for the APPA vegetation mapping project.

[6]Near the close of the APPA vegetation mapping project, all spatial coordinate data were projected to UTM, Zone 18 North, by using the North American Datum of 1983 (NAD83) to comply with NPS VMI Program standards.

Table 6. Supplemental data sources from community and species inventories used to help develop the vegetation classification for the Appalachian National Scenic Trail vegetation mapping project.

Natural Heritage Program Community and Species Inventories	State	Reference
Natural Heritage Inventory of the Appalachian Trail Corridor and Approach Trail in Georgia	Georgia	Noel and Zartman 2000
Significant Natural Communities and Rare Plant and Animal Habitats of the Appalachian Trail Corridor in North Carolina and Tennessee	North Carolina, Tennessee	North Carolina Natural Heritage Program 1993
A Natural Diversity Inventory of the Appalachian Trail Corridor in Northeast Tennessee and Adjacent North Carolina	Tennessee, North Carolina	Donaldson 1996
A Natural Heritage Inventory of the Appalachian Trail in Virginia	Virginia	Virginia Department of Conservation and Recreation, Division of Natural Heritage 1994
A Natural Heritage Inventory of the Appalachian Trail Corridor in West Virginia	West Virginia	Donaldson 1997
A Natural Heritage Trail Inventory of the Appalachian Trail Corridor in Maryland	Maryland	Motivans 2000
Significant Ecological Features of the Appalachian Trail Corridor in Pennsylvania	Pennsylvania	The Nature Conservancy, Pennsylvania Science Office 1990
A Natural Heritage Inventory of the Appalachian Trail Corridor in New Jersey	New Jersey	Elliman 2000a
A Natural Heritage Inventory of the Appalachian Trail Corridor in New York	New York	Elliman 2000b
A Natural Heritage Inventory of the Appalachian Trail in New York State (Interim Report)	New York	Schneider 1999
Significant Ecological Features of the Appalachian Trail Corridor in Connecticut	Connecticut	Connecticut Department of Environmental Protection 1992
A Floristic and Plant Community Inventory of the Appalachian Trail Corridor in Connecticut	Connecticut	Elliman 2004
Biological and Ecological Features of the Appalachian Trail Corridor in Massachusetts	Massachusetts	Massachusetts Natural Heritage and Endangered Species Program 2000
Significant Ecological Features of the Appalachian Trail Corridor in Vermont	Vermont	Vermont Fish and Wildlife Department, Nongame & Natural Heritage Program 1991
Significant Ecological Features of the Appalachian Trail Corridor in New Hampshire	New Hampshire	New Hampshire Natural Heritage Program 1992
A Natural Heritage Inventory of the Appalachian Trail in Maine	Maine	The Maine Natural Areas Program, Maine Department of Conservation 1998

Additional Vegetation Plots

To confirm the existence of and to characterize vegetation associations of APPA that were not recognized by legacy vegetation plots, additional vegetation-plot data were necessary. The additional vegetation-plot data were collected either as vegetation-sampling plots or as observation sites.

Additional Vegetation-Sampling Plots

The additional vegetation-sampling plots were collected during 2007–08. Sampling plot locations were determined by state to accommodate the magnitude of scale of the entire AT corridor. Locations of legacy vegetation plots varied widely by state. For example, in Connecticut and Massachusetts, sampling plots were thoroughly distributed throughout the AT corridor and additional

vegetation plots were determined unnecessary. Conversely, in Pennsylvania, vegetation plots and supplemental vegetation data were few and limited for the AT corridor.

Although the selection of additional sampling plots was done by state, the analyses and classification of vegetation plots were completed by The Nature Conservancy (TNC) ecoregions (The Nature Conservancy 2007) to address distinct patterns of vegetation within the four main ecoregions of APPA. Therefore, the details in deciding locations for collecting plot-sample data are given by state within each of the four ecoregions; Southern Blue Ridge, Central Appalachian Forest, Lower New England / Northern Piedmont, and Northern Appalachian / Acadian.

Southern Blue Ridge Ecoregion

The Southern Blue Ridge ecoregion, which includes the AT corridor through Georgia, North Carolina, Tennessee, and southwestern Virginia, provides the most ecologically diverse section of APPA. Numerous endemic plant species and unique plant communities exist in this ecoregion. This diversity would normally complicate the development of a vegetation sampling design. However, the vegetation within the AT corridor of the Southern Blue Ridge ecoregion had been sampled extensively with past vegetation inventory projects and with legacy vegetation plots sampled by the U.S. Forest Service and Carolina Vegetation Inventory. Vegetation-plot data from other vegetation mapping projects of the NPS VMI Program, including the Blue Ridge Parkway (BLRI) and Great Smoky Mountains National Park (GRSM), provided sufficient vegetation plots for the AT corridor in North Carolina and Tennessee. Therefore, North Carolina and Tennessee were considered a lower priority for collecting additional sampling plots, and emphasis was placed on Georgia and Virginia for collecting additional sampling plots.

Central Appalachian Forest Ecoregion

The Central Appalachian Forest ecoregion, which includes the AT corridor from southwestern Virginia northward through West Virginia, Maryland, and Pennsylvania to the Delaware River, is the longest ecoregion segment of APPA. The existence of legacy vegetation plots along the AT corridor were variable within this ecoregion. Vegetation-plot data from other vegetation mapping projects of the NPS VMI Program, including the BLRI, Harpers Ferry National Historic Park (HAFE), and Shenandoah National Park (SHEN), yielded a substantial amount of suitable vegetation-plot data for the AT corridor in Virginia. Conversely, legacy vegetation plots for the AT corridor through Maryland, Pennsylvania, and West Virginia were lacking, and an emphasis was placed on these three states for collecting sampling plots.

Lower New England / Northern Piedmont Ecoregion

The Lower New England ecoregion includes the AT corridor from the Delaware River at the Pennsylvania-New Jersey State line northward through New Jersey, New York, Connecticut, and Massachusetts, and continues through portions of Vermont and into the southwestern one-fourth of New Hampshire. (The AT corridor through the Green Mountains in Vermont is of the Northern Appalachian / Acadian ecoregion.) The Lower New England ecoregion is one of the shortest ecoregion segments of APPA. Most of the legacy vegetation plots along the AT corridor within the Lower New England ecoregion were collected for vegetation community inventories of Connecticut and Massachusetts (Elliman 2003; 2004). Vegetation-plot data from the Delaware Water Gap

National Recreation Area vegetation mapping project (of the NPS VMI Program) provided several suitable vegetation plots for the AT corridor in New Jersey. However, only a few legacy vegetation plots were available along the AT corridor through the rest of New Jersey, New York, and Vermont.

Existing classification concepts were sufficient for the ecoregion; however, substantial geographic gaps were in vegetation-plot data. For this reason, a full-scale, comprehensive vegetation community inventory using a stratified sampling approach was needed for New Jersey and Vermont and part of New York. The stratified sampling approach was based on two major geospatial data sources, including (1) the National Land Cover Database 2001 (NLCD) (Homer et al. 2007) and (2) the ecological land unit raster file developed by TNC (Ferree and Anderson 2008). The NLCD is a 16-class land cover classification developed for classification using satellite imagery nested. The upper level classification of cover types include water, barren, shrubland, herbaceous, wetlands, developed, forested, nonnatural woody (e.g., orchards), and planted herbaceous. The ecological land unit classification for the northeast United States was developed from bedrock geology, elevation, and landform layers; the latter two are derivatives from a 30-meter digital elevation model.

Northern Appalachian / Acadian Ecoregion

The Northern Appalachian / Acadian ecoregion, includes the AT corridor through the Green Mountain portions of Vermont, the northeastern three-fourths of New Hampshire, and Maine. Most of the legacy vegetation plots along the AT corridor in the Northern Appalachian / Acadian ecoregion were concentrated in the White Mountains of New Hampshire at high elevations; the remaining legacy vegetation plots existed in the Bigelow Preserve in Maine. Therefore, a full-scale effort to collect sampling plots of vegetation within the AT corridor was given to nonalpine regions; more emphasis was given to Maine because this State had the fewest legacy vegetation plots available for analysis and classification. The same stratified sampling approach was applied that was used for the Lower New England ecoregion.

Additional Vegetation Observation Sites

In 2009—after completion of the additional vegetation sampling plots—the NPS VMI Program issued a directive to collect additional observation-site data across all four APPA project areas over 4 years; one project area for each year. Vegetation data at observation sites were collected in the Southern Blue Ridge (SBR) project area during 2009, in the Central Appalachian (CAP) project area during 2010, in Lower New England (LNE) project area during 2011, and in the Northern Appalachian (NAP) project area during 2012. (Refer to the "Introduction and Project Overview" section of this report for detailed locations of the four APPA project areas (Figures 6–9) and for an explanation of the differences between the four TNC ecoregions and the four APPA project areas.)

The main goal for additional observation sites was to collect vegetation data to support common or ruderal vegetation types that were undersampled. Another goal for the additional sites was to test early drafts of the field keys to vegetation associations, by APPA project area. Staff from the U.S. Geological Survey (USGS) at the Upper Midwest Environmental Sciences Center (UMESC) located observation sites by viewing the aerial imagery acquired for the APPA vegetation mapping project. The coordinate locations (for use in a geospatial positioning system) to targeted observation sites were provided to field crews for navigating for field data collection.

Field Sampling Methodology

The sampling methodology for the additional vegetation-sampling plots was adapted from field-method standards of the NPS VMI Program (NatureServe 2004). Sampling plots were square or rectangular in shape and either 100 meter squared (10 meters by 10 meters) or 400 meter squared (20 meters by 20 meters) and were intentionally placed to represent the character of an entire stand of vegetation. Within each plot sample, the vegetation was visually separated into strata, and the canopy cover and average height of each stratum was estimated. Within each stratum, all taxa within the plot sample area were identified, and the foliar cover of each taxon was estimated by using the cover classes in Table 7.

Table 7. Codes to cover scales and vegetation strata used during vegetation-sampling plot to develop the vegetation classification for the Appalachian National Scenic Trail vegetation mapping project.

Cover Scales		Vegetation Strata	
T	0–1%	T1	Emergent canopy
P	>1–5%	T2	Main canopy
1	>5–15%	T3	Subcanopy
2	>15–25%	S1	Tall shrubs
3	>25–35%	S2	Short shrubs
4	>35–45%	S3	Dwarf-shrubs
5	>45–55%	H	Herbaceous (field layer, including tree seedlings)
6	>55–65%	A1	Floating-leaved aquatics
7	>65–75%	A2	Submerged-leaved aquatics
8	>75–85%	–	
9	>85–95%	–	
10	>95%	–	

For each plot sample location, field crews recorded environmental information, including slope, aspect, topographic position, hydrologic regime, soil drainage, soil texture, and evidence of disturbance on a vegetation plot sampling form. For an example of a vegetation plot sampling form, see "Appendix A: Vegetation Plot Sampling Form." Any unvegetated area of the plot was characterized by the exposed substrate with categories drawn from a standardized list (e.g., bare soil, woody debris, and open water). Location information, including spatial coordinates, was obtained by using a global positioning system (GPS) and then recorded. Digital photograph images were taken to provide additional information and assist in classifying the plot. Notes were taken of the surrounding vegetation and any other significant environmental information, such as landscape context, stand health, recent disturbance, or evidence of historic disturbance to establish how representative the observed plot was in relation to other plots of the same type. Finally, the field crew gave the plot a provisional classification name. An example of a vegetation plot is shown in Figure 18.

Data Analyses and Vegetation Classification

Analysis and classification of vegetation-plot data that were acquired for the APPA vegetation mapping project, whether from obtaining legacy plots or collecting additional vegetation plots, were done by TNC ecoregion (The Nature Conservancy 2007) because of the large geographic extent and

ecological diversity of the AT corridor[7]. The additional vegetation-plot data that were collected within the AT corridor during the 2007–12 field seasons included 461 sampling plots and 747 observation sites; this is in addition to the 410 legacy plots previously obtained. The vegetation field data from the additional sampling plots and observation sites were entered into PLOTS Database Version 2.0 (NatureServe 2005) for the APPA vegetation mapping project, adding to the vegetation data from the legacy vegetation plots.[8] Species were assigned standardized codes and names based on the PLANTS 3.5 database developed by Natural Resources Conservation Service in cooperation with the Biota of North America Program (U.S. Department of Agriculture, Natural Resources Conservation Service 2006). A collection of 1,618 vegetation plots was then available for the analyses to classify the vegetation of the entire AT corridor.



Figure 18. An example of a vegetation-sampling plot to classify vegetation for the Appalachian National Scenic Trail vegetation mapping project.

Although final preparations of vegetation-plot data for analyses were different among ecoregion, the analyses methodology for classification followed similar protocols. The analyses and classification of vegetation-plot data were done by ecoregion. For the Southern Blue Ridge ecoregion, the analyses and classification were completed by the Virginia Natural Heritage Program. For the Central Appalachian Forest ecoregion, the classification of legacy vegetation plots was complete from other vegetation classification projects (Pennsylvania Natural Heritage Program 2002, 2004; Vanderhorst,

[7]Although the selection of additional sampling plots was done by state, and the selection of additional observation sites was done by each of the four APPA project areas, the analyses and classification of vegetation plots (sampling plots and observation sites) were completed by TNC ecoregion (The Nature Conservancy 2007) to address distinct patterns of vegetation within four unique sections of the AT, including the Southern Blue Ridge, Central Appalachian Forest, Lower New England / Northern Piedmont, and Northern Appalachian / Acadian ecoregions.

[8]Near the completion of the APPA vegetation mapping project, all vegetation-plot data were converted to the NPS PLOTS version 4.0 (National Park Service 2015) database to comply with NPS VMI Program standards.

2000) and database sources[9] and met tier 1 legacy data suitability (Table 4). The analyses and classification of these legacy vegetation-plot data in this ecoregion were completed either by or for the organizations listed in Table 8.

Table 8. Organizations with completed vegetation classification that contributed to classification development of the Appalachian Trail corridor within the Central Appalachian Forest ecoregion for the Appalachian National Scenic Trail vegetation mapping project.

Organization	Project Location	State	Year
National Park Service	Blue Ridge Parkway	Virginia	2003
Virginia Natural Heritage Program	Fauquier, Loudoun and Clarke Counties	Virginia	1994
Virginia Natural Heritage Program	George Washington and Jefferson National Forest	Virginia	1992–94, 1999
Environmental Protection Agency	Cumberland County	Pennsylvania	2001, 2003
National Park Service	Harpers Ferry National Historic Park	Maryland, West Virginia	2004–05
West Virginia Natural Heritage Program	Monroe County	West Virginia	2008
National Park Service	Shenandoah National Park	Virginia	1990, 1999, 2000–01, 2003, 2006

The additional vegetation-plot data that were collected specifically for the Central Appalachian Forest ecoregion were classified to USNVC associations by NatureServe, either quantitatively with standard analyses protocols or qualitatively. Qualitative classification was applied to vegetation plots in Maryland and Pennsylvania because of the lack of complexity with the vegetation within the AT corridor passing through these States. For the Lower New England / Northern Piedmont and Northern Appalachian / Acadian ecoregions, the quantitative analyses and classification were completed by NatureServe. Most of the analyses were on vegetation-plot data that were collected specifically for the APPA vegetation mapping project. Supplemental vegetation-plot data from outside of the AT corridor were used to support the understanding of data within the AT corridor.

Vegetation-plot data were imported to PC–ORD 5.15 software (McCune and Mefford 2006) for multivariate numerical analyses. The analytical process was designed to progressively partition the large dataset of vegetation plots into more workable subsets using (1) cluster analysis to identify groups of similar vegetation-plot concepts, (2) statistical analysis to validate those vegetation-plot groups, and (3) ordination studies to examine compositional gradients between vegetation-plot groups and their correlations with important environmental gradients. Finer-scale subsets of the vegetation-plot data were exported into Microsoft software products (Microsoft Corp.) to calculate summary statistics. The process of these analyses was iterative, as finer groups of vegetation plots were increasingly identified and analyzed, until vegetation classification could be assigned to

[9]Database sources from the Ecological Society of America VEGBANK database (http://vegbank.org/vegbank/index.jsp), including the Virginia Department of Conservation and Recreation Division of Natural Heritage Vegetation Plots database and the West Virginia Division of Natural Resources Plots 2 community ecology plots database.

vegetation plots. For each ecoregion, NatureServe ecologists met with regional ecologists to comprehensively review the analyses and vegetation classification as defined by the cluster analysis. Without a cluster analysis, the vegetation classification would rely solely on expert opinion. A cluster analysis, however, provides an initial ordination of the vegetation data, allowing for a more consistent and repeatable vegetation classification process.

Cluster Analysis

Hierarchical, agglomerative cluster analysis using the Lance-Williams Flexible-Beta linkage method (Lance and Williams 1966; 1967) and the Bray-Curtis dissimilarity measure (Bray and Curtis 1957) was used to identify compositionally similar groups of vegetation-plot data. The Flexible-Beta method is a generalized sorting strategy, the performance of which varies with user-specified emphasis (beta) on different measures of between-group distance. In general, beta settings ranging from the default -0.25 to -0.5 to produced optimal results with vegetation-plot data, performing similarly to minimum-variance clustering (e.g., Ward 1963). The Bray-Curtis coefficient (also known as the Sorensen coefficient) has been used with demonstrable success in a wide range of ecological studies (Beals 1984). Among available measures of ecological "distance," represented as a mathematical dissimilarity between samples, the Bray-Curtis coefficient is a balanced measure that places some emphasis on dominant (i.e., high-cover) species while still giving minor (i.e., low-cover) species considerable weight in the analysis (Gauch 1982).

Cluster analysis of every dataset or subset of vegetation-plot data were run using the Bray-Curtis coefficient and four alternative data treatment protocols, including (1) raw cover-class scores, (2) cover-class scores relativized by site totals (equalizing the total abundances in plot samples and thus equalizing the mathematical weight of samples in the analysis), (3) cover-class scores relativized by species maxima (giving low-cover species more weight in the analysis), and (4) cover-class scores relativized by both site totals and species maxima. A fifth protocol was run using the Relative Euclidian (Chord) distance measure and raw cover-class scores (McCune and Grace 2002), which procedure is conceptually similar to protocol (2), except that squared abundance values are relativized such that the sum of squares for each plot equals 1, and Euclidian distance is used to calculate dissimilarity.

After examining the results from all five protocols, the most ecologically interpretable dendrogram for each dataset of vegetation plots was accepted. Varying the beta setting in Flexible-Beta clustering affects the level at which group of vegetation plots are resolved in a dendrogram and can produce subtle changes in group membership. An initial beta setting of -0.5 was used in all analyses, but was occasionally changed to -0.25 once the optimal data-treatment protocol was identified for a given group. Experience has indicated that all five data-treatments protocols will perform similarly in the analyses for a given dataset and in combination, will identify many groups of vegetation plots that always cluster together regardless of the protocol used. However, an advantage of this method is that the method also will readily identify those vegetation plots or groups of plots whose larger group plot memberships change when different data-treatment protocols are used. Invariably, these vegetation plots represent plot samples or observation sites that are more problematic (e.g., ecotonal, transitional, and heterogeneous) and fit less clearly into classified groups of vegetation plots.

The initial vegetation-plot dataset was progressively fragmented by identifying one or more homogeneous subset of plots at each iteration, removing those subsets and reclustering the remaining plots. More comprehensive cluster, statistical, and ordination analyses were completed on these subsets of vegetation plots. In addition, special subsets of vegetation plots were assembled to more intensively examine relations between vegetation-plot groups that were in different subsets of plots. Groups of individual vegetation plots were fine-tuned during the cluster analyses of each vegetation-plot subset. During analysis, group membership of vegetation plots that proved problematic were ultimately reassigned from their initial groups to other groups after evaluating the statistical interpretability of each affected group with and without the questionable plot and by examining the position of the vegetation plot on the axes of non-metric multidimensional scaling ordinations.

Compositional Summary Statistics

Compositional statistics were calculated to evaluate the adequacy of vegetation-plot groups recognized in cluster analysis and ultimately to assist in classifying and locally describing the community types. Total mean cover and total frequency across all vegetation plots were determined for every taxon. To compute mean cover, cover-class scores were converted to the midpoints of their respective percent ranges. The midpoints were averaged, and the resulting values were back-transformed to cover-class scores. For each taxon in each group of vegetation plots that was under consideration, the following summary statistics were then calculated.

- Frequency—the number of samples in a group of vegetation plots in which a species occurs.
- Mean Cover—back-transformed cover-class value corresponding to mean percent cover calculated from midpoint values of cover-class ranges. All samples assigned to a group of vegetation plots were considered when calculating mean cover, not just samples in which a taxon was present; absences were assigned a cover value of zero.
- Relative Cover—the arithmetic difference between mean cover (for a given group of vegetation plots) and total mean cover (for the entire vegetation-plot dataset) (equals Mean Cover minus Total Mean Cover). Expressed by plus or minus symbols, this value provides a relative approximation of how much more, or less, abundant a particular species is in a vegetation-plot group compared to the overall dataset.
- Constancy—the proportion of vegetation plots in a group in which a species occurs, expressed as a percentage (equals Frequency divided by the number of samples in a group, multiplied by 100).
- Fidelity—the degree to which a species is restricted to a group, expressed as the proportion of total frequency that frequency in a given group of vegetation plots constitutes (equals Frequency divided by Total Frequency, multiplied by100). An accidental or exotic species can have maximal (100) Fidelity to a type if the species occurs in only one sample in the entire dataset. As a result, fidelity alone can perform poorly as a criterion for identifying characteristic species and distinguishing among types.
- Diagnostic Value (DV) (equals Constancy multiplied by Fidelity, divided by 100)—a synthetic value indicating species that are both frequent within and relatively restricted to a group of vegetation plots.

- Diagnostic Value Adjusted by Cover, Scaled (Adj DV [scaled]) (equals DV multiplied by Mean Cover, divided by 9)—by dividing DV by 9, the maximum possible cover value, this statistic synthesizes information about frequency, DV, and mean abundance. A species entirely restricted to a particular group of vegetation plots, occurring in every plot of that group, and attaining maximum mean cover will have an Adj DV (scaled) of 100 for that vegetation type. Empirically, taxa most characteristic of a vegetation type will have a much lower Adj DV (scaled), although the exact range of values in any given vegetation type or vegetation-plot dataset may vary considerably.
- Diagnostic Value Adjusted by Cover, Unscaled (Adj DV [unscaled]) (equals DV multiplied by Relative Cover)—an alternative, unscaled synthetic measure of adjusted DV, using Relative Cover as the modifier of DV. Because cover classes form a logarithmic, rather than linear scale of values, Adj DV (unscaled) is a statistically more legitimate means of incorporating information on cover and has the advantage of not favoring only dominant species and, therefore, can better identify species that are considerably more abundant within a given group of vegetation plots than in the vegetation-plot dataset as a whole. This statistic, however, is sensitive to vegetation types that have few vegetation plots assigned to them and to species with low overall frequency.

Additionally, the following statistics were generated for each group of vegetation plots.

- Mean Species Richness—the average number of species present per vegetation plot (S).
- Homoteneity—the mean constancy of the S most constant species, expressed as a fraction. This value (sensu Curtis 1959) can be considered the constancy of the average species in a community type; higher values for homoteneity indicate greater uniformity in species composition among vegetation plots. Although homoteneity is not independent of size of a vegetation-plot group, often increasing as the number of group members decrease, homoteneity can be used to evaluate if community types have been defined at an appropriate level. Ordinarily, approximately 0.600 or higher would be considered a desirable homoteneity value for association-level groups of vegetation plots in a landscape-level dataset where data were collected consistently by one or a few people. However, because of many data collectors, differences in data collection protocols, the geographic scope and natural diversity of some vegetation types, and the size of groups represented in the vegetation-plot dataset for APPA, 0.500 was set as the lowest acceptable homoteneity for associations, with few exceptions.
- Goodness of fit (Bray-Curtis similarity)—the mean distance between vegetation plots constituting a community type is another useful measure of within-group homogeneity. The similarity coefficient (C) can be calculated as 1 minus Bray-Curtis dissimilarity, or as C equals 2 (MC) divided by MA, plus MB multiplied by 100, where MA equals sum of cover values in plot A, MB equals sum of cover values in plot B, and MC equals sum of cover-class values of species shared by vegetation plots A and B, using the lower mean cover value for each species (Bray and Curtis 1957). Mean within-group similar values greater than 0.45 indicate very homogeneous groups of vegetation plots when applied to large-patch forest

vegetation. However, geographically extensive and variable forest types, and isolated, small-patch vegetation types (e.g., rock outcrops and bogs) often have much lower similar values.

These procedures were executed in Microsoft Access and Excel (Microsoft Corp.) using macros written in Visual Basic. This macro greatly reduced the time required for calculations and made it possible to efficiently evaluate a large number of vegetation-plot groups in the competing dendrograms generated by different cluster analysis protocols.

Also, similar groups of vegetation plots were compared statistically head-to-head by calculating total frequency and total mean cover and then by generating summary statistics solely for the vegetation-plot groups in question. This type of analysis was used to compare similar vegetation types. The analysis also was used to compare problematic or questionable vegetation types with related types by identifying within-plot group differential and diagnostic species. In combination with ordination studies, these comparison studies were especially helpful in evaluating whether certain groups of vegetation plots should be treated as its own association in the USNVC or merely a variant of another association already identified.

Ordination

The ordination method of non-metric multidimensional scaling (NMS; Kruskal 1964) was used to validate the vegetation classification of vegetation plots, detect compositional variation and trends that are obscured in cluster analysis process, and aid in identifying the environmental gradients along which vegetation types are distributed. The NMS is a type of indirect gradient analysis that assigns vegetation plots to coordinates in ordination space in a way that maximizes, to the extent possible, the rank-order (i.e., non-parametric) correlation between intersample distance in ordination space and intersample dissimilarity (i.e., ecological distance; Minchin 1987). The NMS initially assigns spatial coordinates to vegetation plots at random, then calculates stress as the mismatch between the set of ordination distances and the matrix of dissimilarity between vegetation plots. The vegetation-plot coordinates are then moved such that stress is reduced and recalculated, and then the process is repeated iteratively until stress cannot be further reduced. Because NMS does not converge on a single, tractable solution for a given ordination, a sufficient number of iterations are required to reach a point at which decreases in stress are negligible and several starting configurations are necessary to avoid reaching local minima of stress. Additionally, unlike the axes of a detrended correspondence analysis ordination, the dimensions of an NMS ordination do not form a decreasing series of variance in composition explained and, therefore, actual axis numbers are arbitrary. The NMS will extract as many dimensions as are specified, and an appropriate number of dimensions must be determined a priori by examining the rate at which stress declines with an increasing number of dimensions.

The NMS process was implemented in PC–ORD 5.15 software (McCune and Mefford 2006). Each dataset or subset of vegetation plots was examined with cluster analysis and analyzed in an NMS ordination using the same distance measure used for clustering (Figure 19). Smaller subsets of vegetation plots having closely related community types also were ordinated using the Bray-Curtis coefficient. Outliers (average within-group distance greater than 2.5 standard deviations), which frequently distort distribution patterns in ordinations, were removed from each subset. Each ordination was computed using 50 random starting configurations and runs with real data, 400

iterations, and an instability criterion of 0.00001. Following this procedure, two- or three-dimensional (3D) solutions with the lowest stress levels were used for interpretation, and the coefficients of determination (r2) for each axis, representing the percent variation explained in the reduced ordination space compared to the original distance matrix, were calculated. Varimax rotation was used to optimize axis placement in all ordinations.

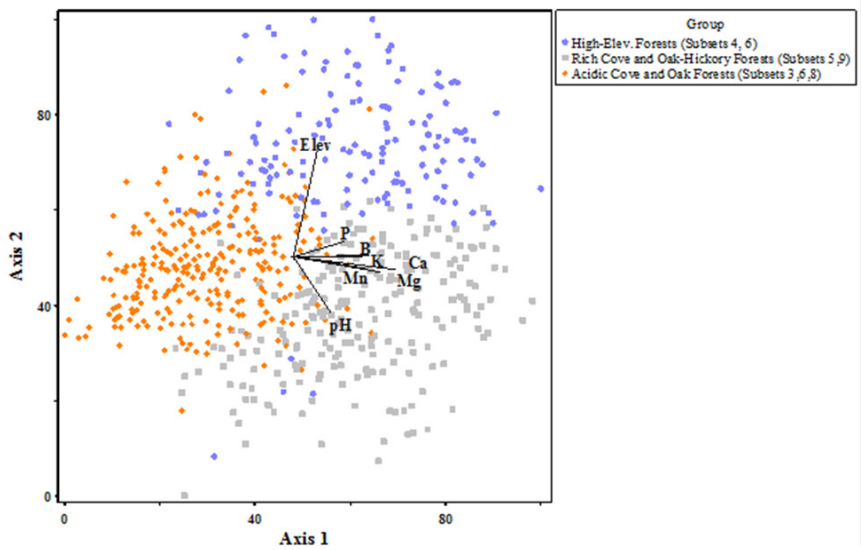


Figure 19. An example of ordination grouping from non-metric multidimensional scaling to analyze vegetation-plot data for the Appalachian National Scenic Trail vegetation mapping project.

The relation between compositional variation and environmental gradients was examined by calculating Pearson correlations between environmental variables and sample coordinates on each axis and by displaying significant correlations ($r > 0.45$) with joint plot overlays. Environmental variables used in ordination analyses were ordinal variables for slope, slope shape, topographic position, and topographic relative moisture index and were continuous variables for arcsine-transformed surface substrate and soil values, Beers transformed aspect, elevation, and natural log-transformed soil chemistry values. Missing or unmeasured environmental values, particularly soil chemistry values, imposed significant constraints on this process. In subsets where large numbers of plots were missing soil data, ordinations were performed using only topographic variables. In cases where smaller numbers of plots in a given subset had missing data, either those plots were deleted before running the ordinations, or missing values were populated with average values for a group of vegetation plots.

Environmental Summary Statistics

Mean values for continuous and ordinal environmental variables were calculated for each classified group of vegetation plots to aid in describing vegetation communities and identifying the differences between those vegetation communities. These calculations were made with raw (untransformed) values, which were averaged across all vegetation plots representing a given group of vegetation plots. Mean aspect was calculated as the average position along an arc defined by the range of aspect values.

Vegetation Community Assignments to USNVC Associations

Once vegetation communities were classified by analyses of the vegetation plots, the vegetation communities were subjectively compared to associations in the USNVC. All classified community types from vegetation-plot analyses were assigned to a conceptually similar USNVC association or used as a basis for a potentially new association to be added into the USNVC. To select nominals for new USNVC associations, or to recommend name changes of existing USNVC associations, high-constancy species (especially those with high mean cover and high DV, if available) were favored to facilitate identification of the vegetation type from the vegetation-plot data. A "constant" species was generally considered to be a species occurring in greater than 67% of vegetation plots. In a few cases, species that were less constant in a vegetation association but had high mean cover and DV were selected as parenthetical nominals. Pertinent new information of a vegetation association discovered during the classification development for the APPA vegetation mapping project was assimilated into the global (regional) descriptions in the USNVC, as appropriate, for those respective associations. Global information was then appended to all local descriptions of associations for APPA to provide a broader context (regional) to the vegetation associations that exist in the AT corridor.

Classification Review Meetings

Meetings were held by TNC ecoregion to comprehensively review the analyses and classification of vegetation plots. NatureServe ecologists met with local ecologists who were familiar with the classification procedure to review the analyses and vegetation classification. Adjustments to the vegetation classification were made accordingly following each ecoregion meeting.

The classification review meeting for the Southern Blue Ridge and Central Appalachian Forest ecoregions was hosted by the Virginia Natural Heritage Program in October 2009. Participants included ecologists from NatureServe and Virginia and West Virginia Natural Heritage Programs. The classification review meeting for the Lower New England / Northern Piedmont and Northern Appalachian / Acadian ecoregions was hosted by the New York Natural Heritage Program in February 2011. Participants included ecologists from NatureServe; an independent contractor; and New York, New Jersey, New Hampshire, and Maine Natural Heritage Programs.

Results and Discussion

Vegetation Classification Results

A listing of 280 USNVC associations that are recognized for the APPA vegetation mapping project is provided in “Appendix B: Vegetation Classification by U.S. National Vegetation Classification.” The 280 associations are a result of the vegetation classification, vegetation mapping, and AA efforts with this vegetation mapping project. Of these 280 associations, 224 were a direct result from the analyses and classification of the vegetation plots; however, several more associations were anticipated to occur within the AT corridor and were included in the early drafts of the field keys to vegetation associations for each APPA project area. Of these anticipated associations, 29 were confirmed during the field reconnaissance for vegetation mapping, and another 24 vegetation associations that were not anticipated were recognized during the field reconnaissance for vegetation mapping; these associations were added to the vegetation classification for APPA. Lastly, another three associations were recognized from the AA field data and were added to the vegetation classification.

Vegetation Descriptions

All USNVC associations identified with the APPA vegetation mapping project are described in "Appendix C: Descriptions of Vegetation Associations." These descriptions list the position of each vegetation association hierarchically placed in the USNVC, a concept summary, information about environmental characteristics, vegetation, important species, classification issues, relation to other classification systems, and distribution. Most fields in the descriptions have separate sections with information on the global characteristics (prefaced by "Global" and referring to its range-wide characteristics) and on the local characteristics (prefaced by "Appalachian National Scenic Trail" and referring to its APPA-specific characteristics).

The global information in the vegetation association descriptions in Appendix C applies to the vegetation association across its entire range; this information has been gathered from scientific literature and other field data and is stored in NatureServe's central database. For the descriptive text fields, global information (listed as "Global") can be thought of as an average or modal expression of a natural stand of the association throughout its range. The local information (listed as "Appalachian National Scenic Trail") is derived from data from the classification phases of the APPA vegetation mapping project, which consisted mostly of plot data from the plots sampled before and during this project; however, some information also is included from AA field data and less formal field observations. The local information is separated by the four project areas established for the APPA vegetation mapping project, including the SBR, CAP, LNE, and NAP project areas.

Toward the close of the vegetation mapping project, conifer forest plantations were moved to the cultural portion of the USNVC; however, descriptions to those forest plantations remain in Appendix C and are identified by their Cultural Subtype code. Vegetation associations without any type of vegetation-plot data—including those associations that were discovered after the collection of vegetation plots—have descriptions included in Appendix C, but any local information is based on general or cursory field observations or notes on abundant species.

Vegetation Field Keys

A field key to vegetation associations of APPA is provided in "Appendix D: Field Key to Vegetation Associations," which can be used with the vegetation descriptions in "Appendix C: Descriptions of Vegetation Associations." The vegetation field key consists mostly of dichotomous options that ultimately lead to a USNVC association. The start of the field key quickly separates into four main field keys, one for each of the four APPA project areas (SBR, CAP, LNE, and NAP). Each of these four field keys focuses on vegetation associations existing to their respective APPA project area, rather than the entire AT corridor extent. Several vegetation associations exist in more than one of the four APPA project areas, especially when associations exist near convergence of those project areas. Some vegetation associations exist in all four APPA project areas and are included in each field key by project area.

The vegetation association descriptions provided in "Appendix C: Descriptions of Vegetation Associations" are recommended to complement the vegetation field key to determine a correct assessment of vegetation classification. As with the descriptions of vegetation associations, cultural plantations are included in the field key to vegetation associations of APPA.

Plant Species List

A listing of plant species that were recorded while collecting field data to support the APPA vegetation mapping project are provided in "Appendix E: List of Plant Species." This listing of plant species is an export of all plant taxa generated from the PLOTS database for the vegetation mapping project and includes plant species that were documented at vegetation plots, validation sites, and AA sites[10]. Although the primary purpose of vegetation plots (sampling plots and observation sites collectively) was to characterize USNVC associations, the primary purpose of validation and AA sites was to assess the vegetation map layer produced for the vegetation mapping project. The list of plant species is not intended to be a comprehensive list of every taxon within the AT corridor; however, more than 2,100 plant species are listed from the field-data collection efforts.

This list includes taxa identified to the genus, species, and subspecies level. Some tree and shrub seedlings and immature herbaceous plants only could be identified to the genus level and, therefore, are listed as such. The plant taxa list provides scientific and common names and is organized alphabetically by scientific name. Taxa names were standardized to the PLANTS Database (U.S. Department of Agriculture, Natural Resource Conservation Service 2016), which is in accordance with the NatureServe Ecology vascular plant taxonomic standard (Kartesz 1999).

Discussion of Vegetation Classification by Ecoregion

Vegetation of APPA is discussed by TNC ecoregion. These vegetation discussions are derived from the analyses of vegetation-plot data to develop the vegetation classification for the APPA vegetation mapping project. For clarification, these discussions reference the vegetation that is within the AT corridor portion of an ecoregion and not of an entire ecoregion area.

Southern Blue Ridge Ecoregion

The vegetation within the AT corridor of the Southern Blue Ridge ecoregion consists mainly of three matrix-type forests, including upland oak, northern hardwood, and cove forests. These three matrix forests often include small-patch shrub and herbaceous vegetation. The most common of the three matrix forests is upland oak and is represented by several USNVC oak-forest associations of the Appalachian Oak / Chestnut Forest and Piedmont-Central Atlantic Coastal Plain Oak Forest Groups (G015 and G165, respectively). These oak forest associations are commonly positioned on middle to upper slopes at elevations up to 1,200 meters. These forest associations are dominated by canopy trees of white oak (*Quercus alba*), chestnut oak (*Q. prinus*), northern red oak (*Q. rubra*), black oak (*Q. velutina*) and hickory species (*Carya* spp.), with the forest understory vegetation composed of heath shrubs where soils are drier and more acidic, such as blueberry species (*Vaccinium* spp.), huckleberry species (*Gaylussacia* spp.), and rhododendron species (*Rhododendron* spp.). When the oak forest associations are positioned in more sheltered, mesic locations with richer soils, the oak-

[10]Plant taxa from vegetation plots, along with other plot sample data, had been entered into the National Park Service PLOTS Database Version 2.0 (NatureServe 2005) and later converted into the PLOTS version 4.0 (National Park Service 2015) database. Plant taxa from validation and accuracy assessment sites, along with other site and environmental data, had been entered into the PLOTS version 4.0 (National Park Service 2015) database according to National Park Service specifications.

canopy composition remains largely the same, but the forest understory vegetation shifts from a dominance by heath shrubs toward a dominance by mesophytic forbs and graminoids.

In elevations from 1,000 to 1,500 meters, the matrix forest transitions from one of oak dominance to northern hardwood dominance. The forest matrix of northern hardwood is represented by various USNVC associations of the Appalachian-Allegheny Northern Hardwood - Conifer Forest Group (G742). Northern hardwood forest associations are not recognized within the AT corridor of Georgia, but they are recognized within the AT corridor on middle to upper slopes at higher elevations of Tennessee and North Carolina. These forest associations are dominated by canopy trees of American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), yellow buckeye (*Aesculus flava*), yellow birch (*Betula allegheniensis*), eastern hemlock (*Tsuga canadensis*), and northern red oak, with the forest understory vegetation composed of heath, herb, forb, and fern species, depending on moisture availability.

The matrix forest of low-elevation slopes in sheltered landforms is of forested coves. These sheltered cove forests are typically with northern to eastern exposures and have high moisture availability; sheltered slopes at low elevation support mesophytic hardwood forests. This matrix forest of coves is represented by several USNVC forest associations of the Appalachian-Central Interior Mesic Forest Group (G020). These forest associations are dominated by canopy trees of American basswood (*Tilia americana*), white ash (*Fraxinus americana*), tuliptree (*Liriodendron tulipifera*), yellow buckeye, eastern hemlock, and sweet birch (*Betula lenta*). Forest understory vegetation is variable with a heath-shrub dominance in acidic and nutrient-poor sites and a lush herbaceous-vegetation dominance in richer sites.

In addition to the vegetation components making up the three matrix forests, other vegetation components that are notable integrate with these matrix forests, including spruce-fir forests, shrub and herbaceous balds, vegetated rocky outcrops, dry-pine forests and woodlands, white pine-oak forests, wetland forests, seeps, and ruderal vegetation.

At the highest elevations (above 1,500 meters) on exposed upper slopes and ridges, the matrix forest of northern hardwood transitions to a forest of spruce and fir. Spruce-fir forests are represented by various USNVC associations of the Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest Group (G632). These forest associations are dominated by canopy trees of Fraser fir (*Abies fraseri*) and red spruce (*Picea rubens*). Spruce-fir forest associations are uncommon because of the limited locations of high-elevation environment to support spruce and fir growth and because of decline in Fraser fir as a result of infestation by balsam wooly adelgid (*Adelges piceae*). Spruce-fir forest associations are recognized on Unaka and Roan Mountains along the North Carolina-Tennessee border and on Whitetop Mountain in southern Virginia.

Also at high elevations (above 1,200 meters), shrub and herbaceous balds are uncommon. These balds are represented by several USNVC associations of the Southern Appalachian Grass Bald and Southern Appalachian Shrub Bald Groups (G657 and G658, respectively). These bald associations either are dominated by heath shrubs, such as mountain laurel (*Kalmia latifolia*) and rhododendron species, or by various graminoid and sedge species (Carex spp.). Outcrop and edaphic locations exist

at all elevations and are represented by various USNVC associations of the Central & Southern Appalachian Rocky Outcrop Group (G670); these associations are variable from sparsely-vegetated herbaceous associations at high elevations on extremely exposed sites to an encroachment of shrubs and trees at middle and low elevations.

On convexed, exposed rocky slopes, forests and woodlands of dry-pine trees commonly exist as small-scale patches within the large-scale matrix forest of upland oak. Dry-pine forests and woodlands are represented by various USNVC dry-pine associations of the Virginia Pine - Table Mountain Pine Woodland & Barrens and the Shortleaf Pine - Oak Forest Groups (G162 and G012, respectively). For these dry-pine forest and woodland associations, the dominant pine trees consist of pitch pine (*Pinus rigida*), Virginia pine (*P. virginiana*), and Table Mountain pine (*P. pungens*), and the common oak trees consist of chestnut oak and bear oak (*Quercus ilicifolia*). Carolina hemlock (*Tsuga caroliniana*) formerly dominated some of these forest and woodland patches; however, the spread of hemlock woolly adelgid (*Adelges tsugae*) has decimated hemlock stands. Within the locally common upland-oak forest matrix are USNVC white pine-oak forest associations of the Appalachian Oak / Chestnut Forest Group (G015). These forest associations are dominated by canopy trees of eastern white pine (*Pinus strobus*) with a subcanopy of mixed oaks.

The AT corridor in the Southern Blue Ridge ecoregion crosses few rivers. Riverine and floodplain vegetation is rare, usually as small-patch stands. Riverine and floodplain forests, woodlands, and river scour vegetation are represented by various USNVC associations of the Eastern North American Riverine Wetland Vegetation and the Silver Maple - Sugarberry - Sweetgum Floodplain Forest Groups (G755 and G673, respectively). These associations are dominated by canopy trees of silver maple (*Acer saccharinum*), river birch (Betula nigra), and American sycamore (*Platanus occidentalis*). Other wetland vegetation types in this ecoregion are small-patch seeps existing under the tree canopy of upland forests. Seep vegetation is represented by several USNVC associations of the Central & Southern Appalachian Seep and Central Interior-Appalachian Seepage Swamp Groups (G184 and G044 respectively). Within the mountainous topography, palustrine wetland vegetation is uncommon.

Ruderal vegetation is represented by various USNVC associations of the Southeastern Ruderal Grassland & Shrubland, Eastern North American Ruderal Meadow & Shrubland, and the Eastern North American Native Ruderal Forest Groups (G583, G059, and G030, respectively). These ruderal vegetation associations represent (1) successional old fields composed of a variety of shrub and herbaceous vegetation species; (2) successional forests composed of tuliptree, Virginia pine, and black locust (*Robinia pseudoacacia*); and (3) old home sites composed mostly of black walnut (*Juglans nigra*).

Central Appalachian Forest Ecoregion

The matrix forest of upland oak within the AT corridor of the Central Appalachian Forest ecoregion is overwhelmingly represented by several USNVC oak-forest associations of the Appalachian Oak / Chestnut Forest Group (G015); however, the compositional variation within these associations varies dramatically as the AT corridor proceeds northward from the Southern Blue Ridge ecoregion and into Maryland and Pennsylvania. In the southern portion of the AT corridor within the Central

Appalachian Forest ecoregion, plant species and community diversity is higher than the central and northern portions as a result of greater range of environmental gradients in the southern portion, most notably elevation and geologic substrates. In the southern portion, the oak forest associations of G015 have oak-tree canopy dominance similar to the upland-oak forest matrix of the Southern Blue Ridge ecoregion; that is, a tree canopy dominated by mixed oak species. In the more central and northern portions, the oak forest associations of G015 take on a tree canopy dominance that is more common to the Central Appalachian Forest ecoregion; that is, a tree canopy dominance of chestnut oak with few other oak species. On drier, nutrient-poor and acidic sites, the forest understory vegetation tends to be shrubby and dominated by heath shrubs such as mountain laurel, blueberry species, and huckleberry species. When the oak forest associations are in more sheltered, mesic locations with richer soils, the oak-canopy composition remains largely the same, but the forest understory vegetation shifts from a dominance by heath shrubs toward a dominance by mesophytic forbs and graminoids.

Forests dominated by northern-hardwood trees exist within the AT corridor of the Central Appalachian Forest ecoregion, although less widespread and a more discontinuous pattern than in the Southern Blue Ridge ecoregion. Northern hardwood forests are represented by several USNVC associations of the Appalachian-Allegheny Northern Hardwood - Conifer Forest Group (G742). Northern hardwood forest associations are most common in the Blue Ridge escarpment of Virginia; these forests decline dramatically as the AT corridor enters the Ridge and Valley geography of Maryland and Pennsylvania. Forest associations of G742 are dominated by canopy trees of American beech, sugar maple, yellow buckeye, yellow birch, eastern hemlock, and northern red oak, with the forest understory vegetation composed of heaths, herbs, forbs, and ferns, depending on moisture availability.

Related to northern hardwood forests, forests of mesophytic-hardwood trees are positioned in sheltered landforms of low-elevation slopes in coves. These mesophytic hardwood forests are typically positioned with northern to eastern exposures with high moisture availability and are represented by various USNVC forest associations of the Appalachian-Central Interior Mesic Forest Group (G020). These hardwood forest associations are dominated by canopy trees of American basswood, white ash, tuliptree, yellow buckeye, eastern hemlock, and sweet birch. Forest understory vegetation is variable with a heath-shrub dominance in acidic and nutrient-poor sites and a lush herbaceous-vegetation dominance in richer sites.

Forests and woodlands dominated by dry-pine trees exist as small-scale patches within the large-scale matrix forest of upland oak. Dry-pine forests and woodlands are represented by various USNVC associations of the Virginia Pine - Table Mountain Pine Woodland & Barrens Group (G162). These forest and woodland associations are characterized by short-statured canopy trees, usually positioned on exposed rocky south- and west-facing slopes, ridge spurs, crests, and clifftops. The dominant trees include pitch pine, Virginia pine, and Table Mountain pine, and the common oak trees consist of chestnut oak and bear oak. On mafic and calcium rich glades in the Blue Ridge escarpment of Virginia, small-patch wooded barrens exist that are represented by various USNVC

associations of the Appalachian Mafic Glade Group (G180). These wooded barren associations are dominated by canopy trees of white ash and eastern redcedar (*Juniperus virginiana*).

With a lack of suitable habitat, areas of shrubland, grassland, and sparse vegetation are uncommon. Where shrubland, grassland, and sparse vegetation areas exist, they are represented by various USNVC associations of the North-Central Appalachian Acidic Scrub & Grassland Group (G789) for shrublands and grasslands and the Appalachian Cliff & Rock Vegetation Group (G840) for sparse vegetation areas. These vegetation associations are typically in the Shenandoah National Park (SHEN) of Virginia and in Delaware Water Gap National Recreation Area (DEWA) of Pennsylvania (and New Jersey). Mountain laurel and blueberry species are occasional to shrubland sites on acidic rock outcrop. An array of tolerant forb and low-shrub species that are adapted to the mafic conditions dominate herbaceous vegetation sites on mafic rock.

Palustrine and riverine wetlands are uncommon because of low topographic diversity. Where wetlands are present, palustrine and riverine wetlands are in seeps, springs, basins, depressions, and alluvial terraces. Seep, spring, basin, and depression vegetation are represented by several USNVC associations of the Central Interior-Appalachian Seepage Swamp and Laurentian-Acadian-Appalachian Acidic Swamp Groups (G044 and G045, respectively). These vegetation associations are recognized in the acidic flats of Pennsylvania and are dominated by canopy trees of red maple (*Acer rubrum*), ash species, birch species, and blackgum (*Nyssa sylvatica*). Alluvial terrace forest is represented by various USNVC associations of the Silver Maple - Sugarberry - Sweetgum Floodplain Forest Group (G673). These alluvial associations are dominated by canopy trees of silver maple, with American sycamore uncommon; however, American sycamore are present on the embankments of major rivers where the AT corridor crosses. Alluvial terrace shrub and herbaceous vegetation are represented by various USNVC associations of the Eastern North American Riverine Wetland Vegetation Group (G755) and are dominated by a variety of graminoid and forb species. These shrub and herbaceous vegetation associations exist in small patches along high-dynamic streams and low-dynamic rivers.

Ruderal vegetation is represented by various USNVC associations of the Southeastern Ruderal Grassland & Shrubland, Eastern North American Ruderal Meadow & Shrubland, Eastern Ruderal Wet Meadow & Marsh, Eastern North American Native Ruderal Forest, and Eastern North American Exotic Ruderal Forest Groups (G583, G059, G556, G030, and G032, respectively). These ruderal vegetation associations represent (1) successional old fields composed of a variety of shrub and herbaceous vegetation species; (2) successional forests composed of tuliptree, Virginia pine, and black locust; and (3) old home sites composed mostly of tree of heaven (*Ailanthus altissima*) and other exotics tree species.

Lower New England / Northern Piedmont Ecoregion

Where the AT corridor crosses the Delaware River, a transition exists from the southward vegetation components of the Central Appalachian Forest ecoregion to the northward vegetation components of the Lower New England / Northern Piedmont ecoregion. As with the Southern Blue Ridge and Central Appalachian Forest ecoregions, the matrix oak and oak-hickory forests are largely represented by several USNVC oak-forest associations of the Appalachian Oak / Chestnut Forest

Group (G015) throughout the southern portion of the AT corridor within the Lower New England / Northern Piedmont ecoregion; however, these oak associations of G015 become almost nonexistent as the AT corridor proceeds north of Connecticut, marking the northernmost limit of chestnut oak and black oak. Northern red oak, with its broad ecological amplitude, remains an important component of other forest types throughout the northern portion. The oak-hickory forest component is common and is represented by USNVC associations of the Northeastern Oak - Hickory Forest & Woodland Group. These oak-hickory forest associations are dominated by varying canopy trees of white oak, chestnut oak, northern red oak, black oak, and hickory species. Forest understory vegetation is variable, but typically dominated by blueberry species.

Northward into Massachusetts, the matrix forest becomes northern hardwood where elevations increase and the climate is generally colder and more mesic. The northern hardwood forest component within the AT corridor that is southward in the Lower New England / Northern Piedmont ecoregion is represented by various USNVC associations of the Appalachian-Allegheny Northern Hardwood - Conifer Forest Group (G742). These northern hardwood forest associations are dominated by canopy trees similarly as they are in the southern two ecoregions. The northern hardwood forest component within the AT corridor that is northward in the Lower New England / Northern Piedmont ecoregion is represented by various USNVC forest associations of the Laurentian-Acadian Hardwood Forest Group (G743). These northern hardwood forest associations are dominated by canopy trees in various combinations of sugar maple, red maple, white ash, American beech, yellow birch, sweet birch, American basswood, and northern red oak. Eastern white pine and eastern hemlock become important in this group within coves, low slopes, and more sheltered positions.

At elevations above 700 meters, a broad transitional zone exists where northern hardwood and spruce-fir forests intermix. The northern hardwood forest components that are represented by various USNVC forest associations of the G743 and the Laurentian-Acadian Hemlock - White Pine - Hardwood Forest Group (G741) intermix with the spruce-fir forest components that are represented by various USNVC forest associations of the Northern Appalachian-Acadian Red Spruce - Fir - Hardwood Forest Group (G744). In this transition zone, spruce-fir-hardwood forest associations of G744 are dominated by canopy trees of red spruce, balsam fir (*Abies balsamea*), paper birch (*Betula papyrifera*), and yellow birch. The landscape above this intermixing transitional zone until tree line is reached produces stands of spruce-fir forest without northern hardwood and is dominated by canopy trees of red spruce and balsam fir.

Other small-patch forests and woodlands are nestled into the larger matrix forests of oak and oak-hickory. Small-patch forests and woodlands on rich-alkaline summits, upper slopes, and glades within the AT corridor throughout New Jersey, New York, Connecticut, and Massachusetts are represented by various USNVC associations of the Northeastern Chinquapin Oak - Red-cedar Alkaline Forest & Woodland Group (G016). These forest and woodland associations are dominated by canopy trees of sugar maple and chinquapin oak and occasionally with eastern redcedar and white ash. Woodlands and shrublands on acidic outcrops of summits and upper slopes within the AT corridor of New York and New Jersey are represented by various USNVC associations of the North-

Central Appalachian Acidic Scrub & Grassland Group (G789). These woodland and shrubland associations are dominated by tree and shrub canopies of pitch pine and bear oak, and sandcherry (*Prunus pumila*) may occasionally exist at grassy openings where herbaceous vegetation consists of little blue stem (*Schizachyrium scoparium*), poverty oat grass (*Danthonia spicata*), and Pennsylvania sedge (*Carex pennsylvanica*).

Wetlands consist of floodplain forests, acidic and alkaline forest swamps, shrub bogs and fens, shrub swamps, herbaceous wet meadows, marshes, and aquatic vegetation. Although wetlands as a whole are common, floodplain forests are not common. Floodplain forests are mostly represented by a USNVC association of the Silver Maple - Green Ash - Sycamore Floodplain Forest Group (G652). This floodplain forest association is dominated by canopy trees of silver maple and box elder (*Acer negundo)* and is recognized at Vernon Valley and Wallkill River in New Jersey. A flatwoods forest type is in this same vicinity and is represented by a USNVC association of the Central Hardwood Flatwoods & Swamp Forest Group (G597). This flatwoods forest association is dominated by canopy trees of pin oak (*Quercus palustris*), green ash (*Fraxinus pennsylvanica*), and red maple.

Particularly in New Jersey and New York, the acidic swamp forests exist within basin floors, low flats, and depressions and are represented by various USNVC associations of the Laurentian-Acadian-Appalachian Acidic Swamp Group (G045). These acidic swamp forest associations are dominated by canopy trees of red maple, ash species, red spruce, balsam fir, and eastern hemlock. Alkaline swamp forests are represented by various USNVC associations of the Laurentian-Acadian-Appalachian Alkaline Swamp Group (G046). These alkaline swamp forest associations are rare and are dominated by canopy trees of black ash (Fraxinus nigra), tamarack (*Larix laricina*), and arborvitae (*Thuja occidentalis*, also known as northern white cedar).

Shrub bog and fen wetlands are represented by USNVC associations of the Eastern North American Sub-boreal Bog & Acidic Fen Group (G745) and are dominated by leatherleaf (*Chamaedaphne calyculata*), highbush blueberry (*Vaccinium corymbosum*), swamp loosestrife (*Decodon verticillatus*), common buttonbush (*Cephalanthus occidentalis*), and shrubby cinquefoil (*Dasiphora fruticosa*). Acidic shrub swamp wetlands are uncommon and are represented by various USNVC associations of the Eastern North American Shrub Swamp (G167). These shrub swamp associations are dominated by speckled alder (*Alnus incana*) and are often codominated by dogwood species (*Cornus* spp.). Wet meadows are common and are represented by various USNVC associations of the Laurentian-Northeastern Wet Meadow (G771). These wet-meadow associations are characterized by dense herbaceous vegetation with a low coverage of shrubs and are dominated by sedges and graminoids, including upright sedge (*Carex stricta*), bluejoint (*Calamagrostis canadensis*), and three-way sedge (*Dulichium arundinaceum*).

Freshwater marshes and aquatic vegetation areas are uncommon, only recognized at a few locations within permanently flooded basins. Graminoid marshes are represented by various USNVC associations of the Eastern North American Freshwater Marsh Group (G125) and are dominated by cattail species (*Typha* spp.) and other graminoid and sedge species. Aquatic vegetation areas exist within the most deeply inundated wetlands and are represented by various USNVC associations of the Eastern North American Freshwater Aquatic Vegetation Group (G114). These aquatic vegetation

associations are typically dominated by aquatic floating species, including yellow pond-lily (*Nuphar advena*) and American white waterlily (Nymphaea odorata).

Ruderal vegetation is represented by various USNVC associations of the Eastern North American Native Ruderal Forest, Eastern North American Ruderal Meadow & Shrubland, and Eastern Ruderal Wet Meadow & Marsh Groups (G030, G059, and G556, respectively). These ruderal vegetation associations represent (1) successional forests composed of white pine, oak species, birch species, and maple species; (2) successional old fields composed of a variety of shrub and herbaceous vegetation species; and (3) herbaceous marshes invaded by common reed (*Phragmites australis*) and reed canarygrass (*Phalaris arundinacea*).

Northern Appalachian / Acadian Ecoregion

The vegetation within the AT corridor of the Northern Appalachian / Acadian ecoregion is considerably more boreal in composition than that of the southern three ecoregions; this is because of the high elevations that exist for the northern latitude of the Northern Appalachian / Acadian ecoregion. The Northern Appalachian / Acadian ecoregion is the only ecoregion where, within the AT corridor, alpine vegetation exists and oak species other than northern red oak are essentially absent.

Mixed forests of white pine, hemlock, and hardwood mixture of trees exist at lower elevations, particularly in more sheltered sites of low slopes, ravines, and coves. The mixtures of white pine, hemlock, and hardwood forests are represented by various USNVC associations of the Laurentian-Acadian Hemlock - White Pine - Hardwood Forest Group (G741). These mixed forest associations are dominated by canopy trees of eastern white pine and eastern hemlock. Within these pine-hemlock-hardwood forests, talus woodlands represented by associations of other USNVC groups exist on steep colluvial slopes. Talus woodlands of rich substrates are dominated by canopy trees of sugar maple, American basswood, and white ash. Talus woodlands of acidic substrates may form nearly monotypic stands of yellow birch.

The matrix forest is northern hardwood and is represented by several USNVC forest associations of the Laurentian-Acadian Hardwood Forest Group (G743). These northern hardwood forest associations reach elevations of about 760 meters and are dominated by canopy trees with various combinations of sugar maple, red maple, white ash, American beech, yellow birch, and American basswood. Above 760 meters and to about 1,220 meters, an extensive transition zone exists between the matrix northern hardwood forest and the spruce-fir matrix forest. The matrix spruce-fir forest in these high elevation zones above 1,220 meters and up to tree-line elevation is represented by various USNVC forest associations of the Northern Appalachian-Acadian Red Spruce - Fir - Hardwood Forest Group (G744). These spruce-fir forest associations are dominated by canopy trees of red spruce and balsam fir. The matrix forest within the 760- to 1,220-meter transitional zone is spruce-fir-northern hardwood forest and also is represented by various USNVC forest association of the G744. These spruce-fir-northern hardwood forest associations are dominated by canopy trees of red spruce, balsam fir, paper birch, and yellow birch.

Between 1,220 and 1,430 meters in elevation, the spruce and fir have a low, stunted growth form (known as krummholz) and are represented by USNVC spruce shrub associations of the Eastern Alpine Tundra Group (G104); these spruce shrub associations are mostly dominated by canopy trees of black spruce (*Picea mariana*). The highly exposed and harsh environments that are at elevations above tree line are home to a mosaic of alpine vegetation consisting of low heaths, herbs, and graminoids. This mosaic of vegetation is represented by several USNVC low-shrub and herbaceous associations of G104. Depending on exposure, wind, water availability, and depth of snow cover, the vegetation composition is variable. Characteristic low shrub and herbaceous species include leatherleaf, black crowberry (*Empetrum nigrum*), pincushion plant (*Diapensia lapponica*), Lapland rosebay (*Rhododendron lapponicum*), bog blueberry (*Vaccinium uliginosum*), tufted bulrush (*Trichophorum caespitosum*), Bigelow's sedge (*Carex bigelowii*), Pickering's reedgrass (*Calamagrostis pickeringii*), and highland rush (*Juncus trifidus*). Within this mosaic of alpine vegetation, small-patch areas of rock, scree, and talus exist with their vegetation restricted to cracks or small shelves where regular moisture is present. Sparse vegetation areas of rock, scree, and talus areas of the alpine zone are represented by various USNVC associations of the Eastern Alpine Cliff, Scree & Rock Vegetation Group (G108). Sparse vegetation areas of rock, scree, and talus areas of lower elevations below tree line are represented by various USNVC associations of the Laurentian-Acadian-Great Lakes Cliff & Rock Vegetation Group (G839), depending on whether the substrate is acidic or alkaline.

Wetlands are mainly associated with ponds, basins, and streams and are a mix of alluvial and non-alluvial vegetation. Non-alluvial vegetation includes forested swamps and also shrub and herbaceous bogs and fens that range from acidic to slightly alkaline. The tree canopy of forest swamps can range from completely deciduous to completely coniferous, with the most common being mixed deciduous and coniferous. Acidic swamps are most common of the non-alluvial wetlands and are represented by various USNVC associations of the Laurentian-Acadian-Appalachian Acidic Swamp Group (G045). These acidic swamp associations are dominated by canopy trees of red maple, eastern hemlock, red spruce, and balsam fir; one instance is recognized of an acidic swamp dominated by canopy trees of black spruce (*Picea mariana*). Alkaline swamps are uncommon (with only a few stands within the AT corridor of Maine) and are represented by various USNVC associations of the Laurentian-Acadian-Appalachian Alkaline Swamp Group (G046). These alkaline swamp associations are dominated by canopy trees of red spruce and balsam fir, but are distinguished by the dominance or codominance by arborvitae (*Thuja occidentalis*, also known as northern white cedar). Small patch shrub-herbaceous seeps are scattered about as wetlands in the understory of matrix upland forest canopies and are represented by various USNVC associations from the North-Central & Northeastern Seep Group (G189).

Non-alluvial vegetation of bogs, fens, and wet herbaceous meadows exists outside of the high elevations. Acidic bogs and fens are uncommon and are represented by various USNVC associations of the Eastern North American Sub-boreal Bog & Acidic Fen Group (G745). These acidic bog and fen associations are characterized by heath shrubs, including leatherleaf and rhodora (*Rhododendron canadense*) and various sedge species; the non-vascular layer is typically well developed with abundant moss species. Acidic shrub swamps are scattered and are represented by various USNVC

associations of the Eastern North American Shrub Swamp Group (G167). These acidic shrub swamp associations are dominated by speckled alder and are often codominated by dogwood species. Alkaline shrub fens are unique and are represented by a pair of USNVC associations of the Eastern North American Sub-boreal Alkaline Fen Group (G185). These alkaline fen associations are dominated by heath shrubs, including sweetgale (*Myrica gale*) and leatherleaf and various sedge species. Wet herbaceous meadows are scattered and are represented by various USNVC association of the Laurentian-Northeastern Wet Meadow Group (G771). These wet meadows are characterized by dense herbaceous vegetation with low-shrub cover and are dominated by sedges and graminoids, including upright sedge, bluejoint, and three-way sedge.

Freshwater marshes and aquatic vegetation areas are uncommon and only recognized at a few locations within permanently flooded basins. Emergent herbaceous and graminoid marshes are represented by various USNVC associations of the Eastern North American Freshwater Marsh Group (G125) and are dominated by pickerelweed (*Pontederia cordata*), broadleaf arrowhead *(Sagittaria latifolia*), green arrow arum (*Peltandra virginica*), or cattail species and other graminoid and sedge species. Aquatic vegetation areas exist within the most deeply inundated wetlands and are represented by various USNVC associations of the Eastern North American Freshwater Aquatic Vegetation Group (G114). These aquatic vegetation associations are typically dominated by aquatic floating species, including yellow pond-lily and American white waterlily.

Areas of alluvial vegetation, which are on rich-minerotrophic floodplains of slightly elevated alluvial terraces of rivers and streams, are uncommon. Alluvial forests are represented by various USNVC associations of the Silver Maple - Green Ash - Sycamore Floodplain Forest and Silver Maple - Green Ash - Black Ash Floodplain Forest Groups (G652 and G653, respectively). These alluvial forest associations are dominated by canopy trees of sugar maple, ash species, and American basswood. On coarse substrates deposited along rivers and streams, areas of alluvial vegetation are represented by various USNVC associations of the Eastern North American Riverine Wetland Vegetation, Northeastern Riverscour Barrens & Prairie, and Laurentian-Acadian Riverscour Vegetation Groups (G755, G754, and G792, respectively). These alluvial vegetation associations are characterized by perennial plants that tolerate inundation and flood scouring, including twisted sedge (*Carex torta*), Indian hemp (*Apocynum cannabinum*), and flatsedge species (*Cyperus* spp.); battered and stunted trees and shrubs are sometime sparsely present, including American sycamore and willow species (*Salix* spp.).

Ruderal vegetation is represented by various USNVC associations of the Eastern North American Native Ruderal Forest, Eastern North American Ruderal Meadow & Shrubland, and Eastern Ruderal Wet Meadow & Marsh Groups (G030, G059, and G556, respectively). These ruderal vegetation associations represent (1) successional forests composed of white pine, northern red oak, birch species, maple species, and quaking aspen (*Populus tremuloides*) and (2) successional old fields and wet meadows composed of a variety of shrub and herbaceous vegetation species.

Vegetation Mapping

Methods

Mapping vegetation of the Appalachian National Scenic Trail (APPA, also referred to as the "AT corridor" for the Appalachian Trail corridor) involved the following six primary steps: (1) preliminary map classification with a vegetation primer for each APPA project area, (2) field reconnaissance for each APPA project area, (3) map classification by each APPA project area, (4) aerial image interpretation and mapping by each APPA project area, (5) compilation of a final classification and map layer covering the entire AT corridor following accuracy assessment (AA), and (6) database development of the map layer. Although these steps proceeded sequentially, they overlap to some degree. Steps 1–4 proceeded sequentially by APPA project area starting in the Southern Blue Ridge (SBR) project area in 2010, moving north to the Central Appalachian (CAP) project area in 2011, then to the Lower New England (LNE) project area in 2012, and ending in the Northern Appalachian (NAP) project area in 2013. (See Figures 6–9 in the "Introduction and Project Overview" section of this report for detailed locations of the four APPA project areas.) Steps 5 and 6 compiled all APPA project areas into a contiguous map classification and map layer.

Preliminary Map Classification

Prior to field reconnaissance of each APPA project area, mappers needed to become familiar with the vegetation types expected to exist in the AT corridor. To accomplish this for APPA, the mappers met with vegetation classifiers and regional experts and reviewed the vegetation classification and field key to vegetation associations for each APPA project area. During these meetings, each vegetation association was discussed, including what defines it, where it was known to exist within the specific APPA project area, what other associations it is likely to be confused with, and any other aspects of the vegetation association that could help define its location or aerial imagery signature on the landscape.

Using this information and personal experience, the mappers formed an initial map classification for each APPA project area. This preliminary map classification promoted continuity from the classifiers to the mappers at the onset of the vegetation mapping process. Additionally, this preliminary step put in the hands of the mappers the foundations of a working map classification to test, update, and refine during field reconnaissance.

Field Reconnaissance

Field reconnaissance efforts were initiated to prepare for mapping vegetation types in APPA. Mappers and classifiers visited the AT corridor by APPA project areas and compared, with the aid of weatherized field computers, the ground conditions to their aerial signatures on the digital 4-band (true-color and color-infrared) imagery that was obtained for the APPA vegetation mapping project. Vegetation classification was determined by the appropriate APPA project area vegetation field key and a classifier. This process was necessary, as Hershey and Befort (1995) explain, because color-infrared photography (or imagery) is not sufficiently consistent between image sets to allow a species to be depicted precisely. Sun angle, light intensity, shadow, exposure, and difference in digital postcapture processing can affect image appearance. Additionally, differences in site history, hydrologic regime, intraspecific variation, elevation, latitude, and seasonality can change the

appearance of a single species across a single image. Hence, ground exploration of the imagery is a critical endeavor. Ultimately, the field reconnaissance efforts in each APPA project area helped correlate the imagery signatures of the vegetation with the vegetation classification on the ground (Figure 20).



Figure 20. Field reconnaissance to correlate aerial-image signatures with ground vegetation for the Appalachian National Scenic Trail vegetation mapping project.

Field reconnaissance also allowed mappers to become familiar with the local ecology of vegetation types in each APPA project area because ecologic concepts may differ. Where mappers discovered limitations to interpreting vegetation types by using digital aerial imagery, environmental models were tested to determine if vegetation types could be consistently separated by environmental elements. In APPA, the history of disturbance (both man-made and natural) that pervades the AT corridor prevented models from being a reliable tool for aerial-imagery interpretation.

The mappers and classifiers proceeded with field reconnaissance in the SBR project area during 2010, the CAP project area during 2011, the LNE project area during 2012, and the NAP project area during 2013. Fieldwork within each APPA project area was done over three 2-week long trips. The first and second trips each year focused on collecting information on each individual association or map class. The third trip focused on the verification process, which tested a draft version of the vegetation field keys and a sampling of preliminary map polygons. The third trip also included additional opportunities for note collection. During each field trip, the mappers and classifiers worked as a team to ensure correct assessment of vegetation types and to promote correct classification during mapping. The team became familiar with the vegetation and local ecology of

each APPA project area as they discussed the structural, floristic, and habitat characteristics of the vegetation present in the field and compared the vegetation types to the appearance of the vegetation in the imagery. Through this process in each of the APPA project areas, the team built an understanding of how to map the vegetation types, established a working map classification with mapping protocols, and helped the classifier to refine the vegetation classification and the field key to vegetation associations. A representative sample of the natural landscape of APPA was reviewed by the mappers during the field reconnaissance that included more than 24 weeks of fieldwork in 4 years. During the field efforts, several different vegetation types were determined, including vegetation types that had not been represented by the vegetation plots. These vegetation types were reviewed for inclusion and were added accordingly to the vegetation and map classifications.

Project orthoimagery mosaic sets of the 4-band digital aerial imagery allowed for easy in-field use. The file sizes were much smaller, and most of the imagery signature was maintained. This imagery was accessed using ArcMap in ArcGIS (Version 10.3, Esri), which also allowed the mapping team to digitally collect notes on vegetation and imagery signatures in the field, such as recording the map-class assignment. Notes to promote proper perspective of species composition, such as comments regarding significant species, also were recorded. An example of species composition is heterogeneous versus monotypic forest stand.

Verification

Between the second and third field reconnaissance efforts for each of the APPA project areas, small areas of the AT corridor with both familiar and novel signatures were mapped for field verification. The 4-band digital aerial imagery collected for the APPA vegetation mapping project was interpreted by the mappers, who applied the mapping conventions established from the earlier field reconnaissance efforts. During the third field reconnaissance effort for each APPA project area, the mappers and classifiers visited sites to verify that the test mapping was correct and that the field key to vegetation associations functioned correctly.

A total of 289 verification sites were assessed within the AT corridor with 82, 54, 90, and 63 assessed in the SBR, CAP, LNE, and NAP project areas, respectively. Specific map verification sites were selected in the field during the third field reconnaissance effort for each of the APPA project areas. Locations of verification sites were chosen in an attempt to cover the suite of vegetation types present along the 3,525-kilometer length of the AT corridor. At each verification site, field data were collected, and the field key to vegetation associations, map classification, and mapping conventions were assessed and adjusted as needed. The mappers and classifiers collected coordinate location information using field computers equipped with a global positioning system (GPS) in conjunction with the digital aerial imagery. The field key to vegetation associations for each APPA project area was then used to determine the vegetation association of the area greater than a minimum mapping unit (MMU). The vegetation association was compared to the map class assigned by the mappers, and an electronic data sheet was completed for each verification site. These data were entered into a feature-class layer with relate tables and incorporated into the geodatabase for the APPA vegetation mapping project. The field data also were imported into a NPS PLOTS version 4.0 (National Park Service 2015) database for the mapping project.

Map Classification

A map class represents a definable feature (e.g., a vegetation type, a non-vegetated feature, and an anthropogenic area) that can be consistently distinguished on aerial imagery or by use of an environmental model, or both. The set of map classes that represents all the mapped features defines the map classification. The map classification and protocols that define the mappable features are based on existing classification systems. For the APPA vegetation mapping project, all map classes, except those representing park-special vegetation and open-water types, were linked to the U.S. National Vegetation Classification (USNVC), as identified by NatureServe. For natural (including ruderal) vegetation, map classes were linked to natural types in the USNVC at the finest level, association. For cultural vegetation, map classes were linked to cultural vegetation types in the USNVC at the lowest applicable level.

After a draft of the map classification was developed for each of the APPA project areas, a "mapping tree" was created to facilitate the mapping process. A mapping tree is a diagram that divides the map classes into logical groups (e.g., Northern Hardwood Forest, Herbaceous Wetland, and Shrub Dominated) and then further divides the groups into subgroups (e.g., Floodplain Forest, Rank Vegetation, and Ruderal), with a final selection of choices between the similar map classes in each subgroup. The choices in a mapping tree are meant to present the mappers with a limited and consistent set of options and to remind the mappers of possible alternative map classes. Although each mapping tree is unique by APPA project area, some map classes are shared among mapping trees. A graphic version of each mapping tree by APPA project area is provided in the final products for the APPA vegetation mapping project.

To develop map-class names, for those map classes representing a single vegetation association in the USNVC, the association's common name was used (e.g., Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest). For those map classes representing more than one association in the USNVC, a comparable name (e.g., Chestnut Oak / Heath Forest map class for the collective associations of Central Appalachian-Northern Piedmont Chestnut Oak Forest and Low-Elevation Mixed Oak / Heath Forest) was derived. For those map classes representing cultural vegetation, either the common name at the lowest level mapped in the USNVC (e.g., Herbaceous Agricultural Vegetation, which is a Cultural Subclass) was used, or a generic name (e.g., Developed Area) was derived. For vegetation map classes lacking a direct link to the USNVC, a descriptive name was derived (e.g. Recently Burned Landscape). For those map classes representing non-vegetation features, a generic name (e.g., Open Water Lake) was derived.

Throughout the project, the map classification remained fluid. Each field endeavor, including the AA effort, revealed new information that prompted modifications to the map classes and their definitions. Revisions also were made to the map classification as the vegetation classification matured and the USNVC was revised; as aerial images were interpreted, new problems forced redefinition, expansion, conjunction, or minor adjustment to map-class definitions. As individual map classes changed, these changes were consistently reapplied to areas that had already been mapped in each of the APPA project areas to ensure consistent mapping within each APPA project area and across the entire AT corridor.

A map-class code was derived for each map class for ease of assigning information to map polygons. Each map-class code was made using four alpha characters and was to represent an independent map class; each code was to begin with one of the following first alpha characters to represent the major physiognomic characteristic:

- F—Forest (typically >60% tree cover),
- W—Woodland (>25% tree cover),
- S—Shrubland (>25% shrub cover and <25% tree cover),
- H—Herbaceous Vegetation (>10% herbaceous cover and <25% tree or shrub cover),
- V—Sparse (1-10% vegetation cover),
- C—Cultural (agricultural and developed landscapes),
- X—Park special vegetation, and
- Z—Open water with <10% vegetation cover.

The second character was to represent one of the following two possible scenarios: (1) to denote a ruderal map class with an "X" or (2) to denote the first significant term in the map-class name. The subsequent two characters were to represent other significant terms in the map-class name (e.g., FCWH for Central Appalachian White Pine - Hemlock Forest, SXMW for Ruderal Mixed Wet Shrub Swamp, and XPLM for Palmerton Smelter Ecological Restoration Area).

Aerial Image Interpretation and Mapping

The vegetation of APPA was mapped by U.S. Geological Survey (USGS) Upper Midwest Environmental Sciences Center (UMESC) staff using digital-onscreen three-dimensional (3D) mapping systems running geographic information system (GIS) software. The mapping team performed onscreen interpretation of digital imagery that was spatially referenced in GIS. The appropriate mapping tree by APPA project area was used to further assist the mapping process and enforce consistent application of the map classification. A draft version of the vegetation map—a spatial-database layer—was then prepared for the validation study for the SBR, CAP, and LNE project areas; a validation study was not conducted on the NAP project area. The vegetation map was then adjusted per the validation results prior to AA. The vegetation map was adjusted again according to the results from the analysis of the AA to meet accuracy criteria set by the National Park Service (NPS) Vegetation Mapping Inventory (VMI) Program.

The digital aerial imagery used for the onscreen mapping was obtained over 3 years starting in the fall of 2009 using a plane-mounted digital camera. (Refer to the "Introduction and Project Overview" section in this report for more information on the digital aerial imagery collected for the APPA vegetation mapping project.) The mappers used systems that incorporated passive stereo technology that uses polarized glasses to produce a 3D image on a liquid-crystal-display monitor for a computer. The stereo models were imported into the software program called "Stereo Analyst for ArcGIS" (ERDAS, Inc.) for 3D viewing and editing.

Mapping proceeded from fall 2010 to spring 2014 with one APPA project area mapped per mapping season. A mapper would map a single flight line of aerial imagery and then give this draft work to another mapper for quality assurance/quality control. This mapper would then assess the draft work

for errors in mapping and return the draft for review and modification. Areas of high complexity could be revised more than once. This review process ensured that all portions of the AT corridor were examined at least twice and by different individuals.

ArcGIS software was used as the GIS platform for the onscreen digital mapping. Because the 3D images were viewed directly in the GIS environment, vegetation could be mapped directly in ArcGIS (Figure 21). The polygon vector data were stored using an ArcGIS file geodatabase, which was projected in in Universal Transverse Mercator (UTM), Zone 18 North, by using North American Datum of 1983 (NAD83).



Figure 21. A computer workstation running ArcGIS (Esri) and three-dimensional software for onscreen digital mapping of vegetation for the Appalachian National Scenic Trail vegetation mapping project.

Standard image signature characteristics were applied—including texture, color, pattern, and position in the landscape—to guide placement of polygons during mapping. In addition to image signature characteristics, mappers needed to understand the environmental distribution of the vegetation types by APPA project area across the landscape to help identify those vegetation types and to properly place polygon boundaries. For each polygon, the appropriate map-class code was applied.

Supplemental imagery and datasets were used by the mappers to visualize and understand the landscape. These layers increased the mappers' ability to understand historical landscape change and use, determine wet and dry areas, and better visualize conifers. The supplemental imagery and datasets included digital aerial imagery and field data from the field reconnaissance efforts and vegetation plot and verification site data. Many of these supplemental imagery and datasets were only available at the state- or county-level; therefore, a decision was made to only use this information for mapping if a concept could be applied across an entire APPA project area. For

example, if leaf-off winter imagery in New Hampshire was determined to help split wetland forest types, then a similar leaf-off winter imagery set was needed in Maine to ensure that vegetation was mapped consistently across the entire NAP project area.

The NPS VMI Program's standard MMU of 0.5 hectare (ha) was applied to mapping forest, cultural, and park-special vegetation map classes. For woodland, shrubland, herbaceous, and sparse vegetation map classes, as well as nonvegetated open-water map classes, a MMU of 0.25 ha was applied, with the exception of nine map classes[11] representing alpine shrub, herbaceous, and sparse vegetation associations in the USNVC. The nine map classes were mapped with a MMU of 0.125 ha and were used only in the alpine zone of New Hampshire and Maine. The 0.25-ha MMU was applied to woodland map classes because they were comparatively rare along the AT corridor. The 0.25-ha MMU was applied to non-alpine shrubland, herbaceous, and sparse vegetation map classes because of their frequent interface with each other and general rarity within the AT corridor. The 0.125-ha MMU was specifically applied to the nine alpine map classes in New Hampshire and Maine because of the consistent occurrence of mappable small-patch variation within the very restricted alpine zone. Without this 0.125-ha MMU, most of the mappable variation within the alpine zone would not have been mapped.

For the many polygons that represent vegetation crossing outside the boundary of the APPA vegetation mapping project, mappers allowed those map classes to be mapped less than the MMU if the vegetation that continued over the project boundary was contiguous and covered at least the standard MMU for that map class. In these instances, map classes with a 0.5-ha MMU were mapped down to 0.1 ha and map classes with a 0.25-ha or 0.125-ha MMU were mapped down to 0.05 ha. For example, a 0.18-ha polygon of the Acidic Hardwood Swamp Forest (FAHS) map class would be mapped inside the project boundary if at least 0.32 ha of contiguous connected FAHS was outside the boundary.

Map Validation

Following the initial mapping of the SBR, CAP, and LNE project areas, a map validation was initiated. The intent of the map validation was to determine if the mapping had any gross systematic errors before the vegetation map was submitted into the much more resource- and time-intensive AA process.

For the map validation, one or two site locations were randomly selected for each map class. A cost-surface analysis that modeled landscape accessibility was applied to the site selection. Geographic coordinates to these site locations were then sent to the NPS, which assigned the field assessment to NPS staff or private contractors. At each validation site, a quick assessment of vegetation was made using the appropriate field key to vegetation associations. In the SBR project area, 62 validation sites were assessed during 2011; in the CAP project area, 72 sites were assessed during 2012; and in the

[11]The nine map classes receiving a 0.125-ha MMU are of the following map-class codes: HAWM, HBAM, HMSF, SAHM, SCAB, SCTH, SSSB, SWAR, and VAFB. Refer to one of several map-classification tables within this report for descriptions of map-class codes.

LNE project area, 135 sites were assessed during 2013. Following completion of map validation for the LNE project area, the NPS determined that the cost-benefit ratio for map validation was insufficient to warrant continuing the map validation process for the NAP project area.

Applying the results from the map validation to the APPA vegetation map was deemed impossible because of the very small sample size, issues with inconsistent data collection, and variation in data quality among field crews. Furthermore, the NPS deemed the costs of collecting validation data in the NAP project area overweighed the benefits to the entire vegetation mapping project so no validation data exists for the NAP project area. This provided the project with an inconsistent, sparsely populated dataset that did not cover the entire APPA project boundary.

The most direct value of the map validation process was as an independent review and testing of the field keys to vegetation associations for the three southern APPA project areas. The validation process exposed numerous systematic and structural errors within these vegetation field keys. These errors were fixed, resulting in refined and strengthened vegetation field keys for the AA process. This validation process improved the field keys for the three southern APPA project areas.

Incorporation of Other National Park Unit Map Layers

The AT corridor passes through several NPS park units along its 3,525-kilometer path from Georgia to Maine. Many of these NPS park units had existing vegetation map layers and each map layer was examined for incorporation into the final APPA map layer. The idea was to use the existing park unit map layers as is to (1) save time and resources and (2) ensure that the APPA map layer fit seamlessly with the other park-unit map layers.

Each NPS park-unit map layer was examined individually to determine if inclusion of the map layer into the APPA map layer was appropriate. The following is a list of determinations; individual park units are listed from south to north.

- Great Smoky Mountains National Park (GRSM)—the existing GRSM map layer (unpublished report) was not incorporated into the final APPA map layer because of the age of the GRSM map layer, differences in the vegetation and map classifications between the map layers for GRSM and for the SBR project area for APPA, and systematic disagreements between the existing GRSM map layer and interpretation of signatures on the aerial imagery obtained for the APPA vegetation mapping project.
- Blue Ridge Parkway (BLRI)—the existing BLRI map layer (unpublished report) was not incorporated into the final APPA map layer because of the age of the map, the amount of edge mapping needed to join the BLRI map layer to the APPA map layer, and the small amount of the BLRI map layer that would be inclusive to the APPA map layer.
- Shenandoah National Park (SHEN)—the existing SHEN map layer (Young et al. 2009) was not incorporated into the final APPA map layer because of a highly different mapping methodology. The SHEN map was developed using a GIS based environmental gradient model combined with the MaxEnt software program (Phillips et al. 2006) and 15-meter hyperspectral satellite imagery.

- Harpers Ferry National Historical Park (HAFE) and the Chesapeake & Ohio Canal National Historical Park (CHOH)—at the time of APPA mapping, HAFE and CHOH did not have completed map layers; these map layers could not be assessed for inclusion and were not incorporated into the final APPA map layer.
- Delaware Water Gap National Recreation Area (DEWA)—the existing DEWA map layer (Perles et al. 2007) was incorporated into the final APPA map layer because the mapping methodology, map classification, and vegetation classification matched those used for the APPA map layer. To complete the AT corridor through DEWA, the APPA project boundary was clipped though the DEWA map layer. Slight modifications were made to the DEWA-based map polygons along the edge of the AT corridor to remove polygons that fell below the MMU protocols for the APPA vegetation mapping project. Once the DEWA-based map polygons were added to the APPA map layer, the map and vegetation classifications for the APPA vegetation mapping project were similarly updated to include the data from the DEWA vegetation mapping project.

The DEWA portion of the AT corridor was excluded from the AA process for APPA because an AA analysis of the DEWA map layer was completed during the DEWA vegetation mapping project.

Database Development

Following the AA reconciliation, the map layer would have only map-attribute codes assigned to each polygon. To assign meaningful information to each polygon (e.g., map-class names and links to USNVC types), a feature-class table and other supportive tables were produced and ArcGIS was used to relate the tables of polygon information within a geodatabase. A geodatabase provides access to a variety of interrelated datasets, is expandable, and equips resource managers and researchers with a powerful GIS tool. The geodatabase developed for the APPA vegetation mapping project includes many feature-class layers produced from this project, including the map layer, vegetation plots, verification sites, validation sites, AA sites, aerial image locations, aerial flight line locations, and project boundary extent. Geospatial products for the APPA vegetation mapping project have been projected in UTM, Zone 18 North, by using NAD83.

Results

Map Classes

After reconciling map classes from the AA analysis, 169 map classes represent APPA; 150 of the 169 map classes represent vegetation types in the USNVC. Prior to the AA study, 194 map classes existed to map the AT corridor, of which 175 map classes represented vegetation types in the USNVC. The AA study determined that confusion in mapping existed among some map classes; these map classes were listed with accuracy levels less than 80% (in the 90% confidence interval), as set by the NPS VMI Program. Map classes with low accuracy were examined for consistent sources of error and then NPS staff from APPA and the Northeast Temperate Network Natural Resource Inventory and Monitoring (I&M) Program were consulted to determine if map classes should be merged to reduce error rates. The map classes with low accuracies were merged with the map classes that they were most often confused with during the mapping, unless the lower accuracy was accepted by the NPS staff. Various reasons are recognized for where confusion in mapping existed among the

map classes, including a breakdown of the mapping tree or ecological mapping conventions, inconsistent signatures on the aerial imagery across and among map classes, aerial imagery signatures of vegetation and vegetation on the ground that shift with latitude and elevation, and disagreement in classification between field reconnaissance and AA. Further details regarding the mapping confusion are provided in the "Accuracy Assessment" section of this report and in individual map-class descriptions in "Appendix F: Descriptions of Map Classes." The descriptions in Appendix F also explain the link among map classes and the vegetation types they represent. Ground photograph images showing representations of the map classes are provided where possible.

A total of 150 map classes represent 261 vegetation associations in the USNVC. From this vegetation mapping project, 280 vegetation associations in the USNVC are recognized for APPA; however, 19 associations were not directly mapped within the AT corridor. Because these associations exist below the MMU within the AT corridor and are otherwise integrated into other overarching map classes in no consistent manner, the associations are not represented by any one map class. Of the 150 map classes representing vegetation associations, 92 represent a single association (when it exists above a MMU), 33 represent 2 associations mapped together, 15 represent 3 or 4 associations mapped together, and 10 represent 5 or more associations mapped together.

Nineteen map classes are not specifically tagged to natural vegetation types in the USNVC. Among these 19 map classes, 11 represent cultural vegetation types in the USNVC. Of these 11 map classes, 5 represent developed areas and 6 represent agricultural landscapes, including agroforestry. Five of the remaining eight map classes represent natural landscapes that have undergone catastrophic disturbance or some other form of modification to natural vegetation preventing accurate vegetation classification and placement in the USNVC. The three remaining map classes represent nonvegetated water (non-USNVC).

The map classification for the APPA vegetation mapping project is listed in "Appendix G: Map Classification by Map-Class Category" and "Appendix H: Map Classification by U.S. National Vegetation Classification." Appendix G lists the map classification from a map-class perspective and lists the vegetation types in the USNVC that are assigned to each map class. Appendix H lists the map classification from a vegetation classification perspective and lists how the map classes relate to the USNVC in hierarchical order.

Summary Report of the Map Layer

A summary report is provided in Table 9 of the spatial-data layer (vegetation map) by individual map class at the most detailed level of polygon attribution (map class). The table summarizes frequency of polygons, area, average polygon size, and percent map coverages for each map class.

Table 9. Frequencies of polygons and areas for map classes represented in the vegetation map layer for the Appalachian National Scenic Trail vegetation mapping project.*

Map-Class Category Map-Class Code - Name	MMU (ha)	Poly Freq	Area (ha)	Ave (ha)
High-Elevation Deciduous Forest & Woodland				
FABF - Southern Appalachian Boulderfield Forest (Currant & Rockcap Fern Type)	0.5	6	3.3	0.6
FBGP - Southern Appalachian Beech Gap	0.5	119	256.0	2.2
FCAB - Central Appalachian High-Elevation Boulderfield Forest	0.5	20	19.7	1.0
FCRO - Central Appalachian Northern Red Oak Forest	0.5	146	1,023.3	7.0
FROH - High-Elevation Red Oak Forest	0.5	325	2,195.1	6.8
WROT - Red Oak Talus Woodland	0.25	188	341.6	1.8
High-Elevation Mixed Deciduous-Conifer Forest				
FBHH - Blue Ridge Hemlock - Northern Hardwood Forest	0.5	184	387.6	2.1
FMFB - Montane Balsam Fir - Birch Forest	0.5	230	5,675.2	25.0
FSHH - Red Spruce - Northern Hardwood Forest (Herb Type)	0.5	218	636.8	2.9
FSHS - Spruce - Hardwood / Shrub Forest	0.5	65	97.6	1.5
FTHS - Transitional Northern Hardwood - Red Spruce Forest	0.5	1,448	4,004.0	2.8
High-Elevation Conifer Forest & Woodland				
FFFS - Fraser Fir / Shrub Forest	0.5	27	118.1	4.4
FMSF - Montane Spruce - Fir Forest	0.5	556	2,419.6	4.4
FSFD - Red Spruce - Fraser Fir Forest (Deciduous Shrub Type)	0.5	197	479.5	2.4
FSFE - Red Spruce - Fraser Fir Forest (Evergreen Shrub Type)	0.5	67	108.4	1.6
WPPS - Pitch Pine Rocky Summit	0.25	63	37.1	0.6
WSFR - Northern Appalachian Red Spruce Rocky Ridge	0.25	282	287.3	1.0
Low-Elevation Oak Forest				
FAMO - Appalachian Mixed Oak Forest	0.5	901	6,047.5	6.7
FAOH - Central Appalachian Oak - Hickory Forest	0.5	986	5,973.6	6.1
FCAO - Central Appalachian Oak Forest	0.5	787	2,764.5	3.5
FCHO - Central Appalachian Hemlock - Chestnut Oak Forest	0.5	72	231.4	3.2
FCNO - Central & Northern Oak Forest	0.5	723	8,324.1	12.0
FCOH - Chestnut Oak / Heath Forest	0.5	709	6,234.4	8.8
FCOM - Chestnut Oak - Mixed Oak Forest	0.5	1,094	4,973.5	4.5
FMCO - Appalachian Sugar Maple - Chinquapin Oak Limestone Forest	0.5	1	1.4	1.4
FOHG - Oak - Hickory Forest & Woodland	0.5	94	227.7	2.4
FSCO - Lower New England High Slope Chestnut Oak Forest	0.5	288	4,143.9	14.0
FSMC - Sugar Maple - Chinquapin Oak / Sedge Forest	0.5	5	8.2	1.6
Low-Elevation Hardwood Forest				
FARB - Southern Appalachian Hardwood Rich Boulderfield Forest	0.5	6	7.4	1.2
FCHW - Central Appalachian Hardwood Forest & Woodland	0.5	1,289	3,047.9	2.4
FNAH - Northern Appalachian Hardwood Forest	0.5	1,193	10,088.7	8.5
FOTM - Oak - Tuliptree - Maple Forest	0.5	188	539.2	2.9
FRVL - Southern Appalachian Limestone Rich Cove Forest	0.5	2	7.6	3.8
FSAH - Southern Appalachian Hardwood Forest	0.5	1,527	5,558.8	3.6
Low-Elevation Mixed Deciduous-Conifer Forest				
FCHH - Central Appalachian Hemlock - Hardwood Forest	0.5	252	574.4	2.3
FCHP - Central Appalachian Hardwood - White Pine Forest	0.5	252	368.2	1.5

*Tally results represent the vegetation map layer at the most detailed level of map-class attribution.
MMU, minimum mapping unit; Poly, polygon; Freq, frequency; ha, hectare; Ave, average

Table 9 (continued). Frequencies of polygons and areas for map classes represented in the vegetation map layer for the Appalachian National Scenic Trail vegetation mapping project.*

Map-Class Category Map-Class Code - Name	MMU (ha)	Poly Freq	Area (ha)	Ave (ha)
Low-Elevation Mixed Deciduous-Conifer Forest (continued)				
FHHO - Hemlock - Hardwood - Oak Forest	0.5	369	1,071.3	2.9
FHNH - Hemlock - Northern Hardwood Forest	0.5	68	117.2	1.7
FHSH - Hemlock - Spruce - Hardwood Forest	0.5	483	1,183.8	2.5
FHWO - White Pine - Hemlock - Oak Forest	0.5	114	153.6	1.3
Low-Elevation Conifer Forest				
FCWH - Central Appalachian White Pine - Hemlock Forest	0.5	34	78.9	2.3
FLSF - Low-Elevation Spruce - Fir Forest	0.5	600	1,904.0	3.2
FPHD - Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest	0.5	88	147.7	1.7
FPHS - White Pine - Hemlock - Red Spruce Forest	0.5	322	635.1	2.0
FRWP - White Pine - Red Pine Forest	0.5	20	24.9	1.2
Low-Elevation Woodland				
WCNH - Calcareous Northern Hardwood Talus Woodland	0.25	4	9.1	2.3
WCRS - Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest	0.25	2	1.0	0.5
WDMP - Blue Ridge Mixed Pine Dry Woodland	0.25	122	152.3	1.2
WHOT - Hardwood - Oak Talus Woodland	0.25	50	46.2	0.9
WJPR - Jack Pine Heath Barrens	0.25	1	0.3	0.3
WMBH - Montane Basic Hardwood - Red-cedar Woodland	0.25	42	40.3	1.0
WMDP - Appalachian Mixed Pine - (Oak) Dry Woodland	0.25	680	961.3	1.4
WPOS - Central Appalachian Pine - Oak Xeric Shale Woodland	0.25	11	11.6	1.1
WSTS - Red Spruce Talus Slope Woodland	0.25	36	23.8	0.7
WTRR - Traprock Ridge	0.25	43	46.8	1.1
Floodplain Forest				
FAMA - Appalachian Montane Alluvial Forest	0.5	19	11.6	0.6
FFAW - Ash - Willow Floodplain Forest	0.5	35	34.1	1.0
FFCR - Piedmont-Central Appalachian Rich Floodplain Forest	0.5	18	35.8	2.0
FFHH - High-gradient Hardwood Floodplain Forest	0.5	47	41.2	0.9
FFTH - Terrace Hardwood Floodplain Forest	0.5	10	10.9	1.1
FMEF - Midwestern Silver Maple - Elm Floodplain Forest	0.5	5	5.3	1.1
FMHF - Silver Maple - Hardwood Floodplain Forest	0.5	57	97.0	1.7
FPOF - Pin Oak Small River Floodplain Forest	0.5	5	4.4	0.9
Deciduous & Mixed Deciduous-Conifer Wetland Forest & Woodland				
FAHS - Acidic Hardwood Swamp Forest	0.5	215	266.0	1.2
FCAS - Central Appalachian Swamp Forest	0.5	17	27.5	1.6
FCMS - Red Spruce - Red Maple Acidic Swamp Forest	0.5	113	92.0	0.8
FRHS - Rich Hardwood Swamp Forest	0.5	122	153.6	1.3
WMUM - Red Maple / Upright Sedge Wet Woodland	0.25	10	13.3	1.3
WNWF - Northern White-cedar Wooded Fen	0.25	15	16.4	1.1
WPAF - Pasture Fen	0.25	4	2.3	0.6
Conifer Wetland Forest & Woodland				
FAWS - Inland Atlantic White-cedar Swamp Forest	0.5	1	3.8	3.8
FBSB - Black Spruce Open Bog Woodland	0.5	51	40.4	0.8

*Tally results represent the vegetation map layer at the most detailed level of map-class attribution.
MMU, minimum mapping unit; Poly, polygon; Freq, frequency; ha, hectare; Ave, average

Table 9 (continued). Frequencies of polygons and areas for map classes represented in the vegetation map layer for the Appalachian National Scenic Trail vegetation mapping project.*

Map-Class Category Map-Class Code - Name	MMU (ha)	Poly Freq	Area (ha)	Ave (ha)
Conifer Wetland Forest & Woodland (continued)				
FHHS - Hemlock - Hardwood Swamp Forest	0.5	19	25.7	1.4
FMSS - Mixed Spruce Swamp Forest & Woodland	0.5	268	186.4	0.7
FNWS - Northern White-cedar Swamp Forest	0.5	128	142.0	1.1
Ruderal Deciduous & Mixed Deciduous-Conifer Forest				
FXAH - Appalachian Ruderal Hardwood Forest	0.5	429	1,017.9	2.4
FXBL - Ruderal Black Locust Forest	0.5	2	2.5	1.3
FXCH - Central Appalachian Ruderal Hardwood Forest	0.5	1,875	6,744.5	3.6
FXHO - Southern & Central Appalachian Ruderal Hawthorn Forest	0.5	29	17.7	0.6
FXNH - Ruderal Northern Hardwood Forest	0.5	928	3,177.6	3.4
FXOM - Northeastern Ruderal Oak - Red Maple Forest	0.5	479	938.9	2.0
FXTT - Ruderal Tuliptree Forest	0.5	721	2,200.3	3.1
Ruderal Conifer Forest				
FXER - Northeastern Ruderal Red-cedar Forest	0.5	59	60.3	1.0
FXSF - Successional Mixed Spruce - Fir - Hardwood Forest	0.5	804	2,250.0	2.8
FXVP - Ruderal Virginia Pine Forest	0.5	108	149.5	1.4
FXWP - Ruderal Eastern White Pine Forest	0.5	499	888.8	1.8
Alpine Herbaceous & Shrub				
HAWM - Alpine Herbaceous Wet Meadow	0.125	15	6.3	0.4
HBAM - Bigelow's Sedge Alpine Meadow	0.125	33	33.9	1.0
HMSF - Northern Appalachian Alpine Bulrush Cliff	0.125	10	3.5	0.3
SAHM - Alpine Heath Meadow	0.125	119	191.0	1.6
SCTH - Cold Air Talus Heathland	0.125	2	1.6	0.8
SSSB - Subalpine Slope Bog	0.125	5	0.8	0.2
SWAR - Windswept Alpine Ridge	0.125	11	5.3	0.5
SWEB - Black Crowberry Wet Alpine Bog	0.125	6	1.7	0.3
Upland Herbaceous & Shrub				
HALD - Appalachian Low-Elevation Granitic Dome	0.25	16	5.3	0.3
HBGF - Graminoid & Forb Bald	0.25	21	65.4	3.1
HCAB - Central Appalachian Wooded Herbaceous Barrens	0.25	24	15.5	0.6
HHGB - High-Elevation Greenstone Barrens	0.25	10	3.8	0.4
HLMO - Low- to Mid-Elevation Little Bluestem - Poverty Oatgrass Outcrop Opening	0.25	26	9.6	0.4
SBAA - Southern Appalachian Alder Bald	0.25	3	8.7	2.9
SBAB - Southern Appalachian Blackberry Bald	0.25	10	5.9	0.6
SBAH - Southern Appalachian Heath Bald	0.25	46	30.1	0.7
SBCH - Southern Appalachian Catawba Rosebay Heath Bald	0.25	31	26.9	0.9
SBDH - Southern Appalachian Deciduous Heath Bald	0.25	31	25.9	0.8
SBGB - Blueberry Granite Barrens	0.25	16	13.9	0.9
SBOB - Ridgetop Bear Oak Barrens	0.25	46	41.9	0.9
SCAB - Central Appalachian Blueberry Dwarf-shrubland	0.25	41	27.9	0.7
SCHB - Central Appalachian Heath Barrens	0.25	8	3.9	0.5
SHBT - High-Elevation Blackberry Thicket	0.25	69	38.6	0.6

*Tally results represent the vegetation map layer at the most detailed level of map-class attribution. MMU, minimum mapping unit; Poly, polygon; Freq, frequency; ha, hectare; Ave, average

Table 9 (continued). Frequencies of polygons and areas for map classes represented in the vegetation map layer for the Appalachian National Scenic Trail vegetation mapping project.*

Map-Class Category Map-Class Code - Name	MMU (ha)	Poly Freq	Area (ha)	Ave (ha)
Upland Herbaceous & Shrub (continued)				
SHOB - High-Elevation Outcrop Barrens (Black Chokeberry Igneous / Metamorphic Type)	0.25	6	2.4	0.4
SMBT - Mixed Shrub Bald & Thicket	0.25	58	33.9	0.6
SMCK - Mixed Conifer Krummholz	0.25	282	450.1	1.6
Ruderal Upland & Wetland Herbaceous & Shrub				
HXCM - Cultivated Grassland	0.25	30	22.5	0.7
HXFM - Grazed Montane Grassland / Fire Meadow	0.25	97	362.7	3.7
HXNE - Northeastern Ruderal Grassland	0.25	669	1,086.8	1.6
SXBG - Ruderal Blackberry - Greenbrier Shrub Thicket	0.25	126	94.7	0.8
SXCN - Central & Northern Ruderal Shrubland	0.25	580	566.9	1.0
SXHE - Successional Heath Shrubland	0.25	31	25.4	0.8
SXKV - Ruderal Kudzu Vineland	0.25	3	1.5	0.5
SXMW - Ruderal Mixed Wet Shrub Swamp	0.25	27	20.3	0.8
Wetland Herbaceous & Shrub				
HCRB - Central Appalachian Herbaceous Riverbank	0.25	2	0.4	0.2
HCRM - Common Rush Marsh	0.25	2	1.9	0.9
HECM - Eastern Cattail Marsh	0.25	23	25.6	1.1
HGFM - Graminoid & Forb Wet Meadow & Marsh	0.25	83	58.0	0.7
HMSM - Mixed Sedge Fen & Wet Meadow	0.25	52	26.9	0.5
HRGS - Graminoid & Scour Riverbank	0.25	7	2.3	0.3
HTSM - Southern New England Threeway Sedge Fen	0.25	1	0.1	0.1
HWBS - Water-willow Rocky Bar and Shore	0.25	4	2.3	0.6
HXCR - Eastern Ruderal Common Reed Marsh	0.25	39	31.9	0.8
HXSC - Ruderal Steeplebush - Reed Canarygrass Marsh	0.25	100	83.2	0.8
SABR - Southern Appalachian Bog (Rhododendron Type)	0.25	2	0.7	0.4
SASB - Southern Appalachian Shrub Bog (Long Hope Valley Type)	0.25	5	3.1	0.6
SAST - Alder Shrub Thicket & Swamp	0.25	154	149.1	1.0
SBBT - Blueberry Peatland Thicket	0.25	29	13.9	0.5
SDBF - Dwarf-shrub Peatland	0.25	4	1.4	0.4
SLBS - Swamp-Loosestrife & Buttonbush Shrub Swamp	0.25	3	1.0	0.3
SNAS - Northern Appalachian High-Elevation Seepage Shrubland	0.25	7	3.4	0.5
SRBS - Rocky Bar and Shore (Alder - Yellowroot Type)	0.25	4	1.8	0.5
SSLF - Sweetgale - Leatherleaf Fen	0.25	130	69.9	0.5
SSNB - Southern New England Bog	0.25	6	2.5	0.4
Floating & Submerged Aquatic Vegetation				
HAFV - Aquatic Floating Vegetation	0.25	95	81.2	0.9
HEDP - Eastern North America Duckweed Pond	0.25	2	0.6	0.3
HEVP - Eastern Woodland Vernal Pool	0.25	1	0.3	0.3
Sparse Vegetation				
VAFB - Alpine Fell-field & Bald	0.125	151	91.3	0.6
VBAC - Near-Boreal Alkaline Cliff	0.25	4	7.6	1.9
VCAB - Central Appalachian Acidic Boulderfield	0.25	40	18.3	0.5

*Tally results represent the vegetation map layer at the most detailed level of map-class attribution.
MMU, minimum mapping unit; Poly, polygon; Freq, frequency; ha, hectare; Ave, average

Table 9 (continued). Frequencies of polygons and areas for map classes represented in the vegetation map layer for the Appalachian National Scenic Trail vegetation mapping project.*

Map-Class Category Map-Class Code - Name	MMU (ha)	Poly Freq	Area (ha)	Ave (ha)
Sparse Vegetation (continued)				
VCMB - Central Appalachian Mafic Boulderfield	0.25	3	0.8	0.3
VEAC - Eastern Temperate Acidic Cliff	0.25	9	4.2	0.5
VNBC - Northern Appalachian Barrens & Cliff	0.25	32	12.4	0.4
VNRR - Northern Riverscour Rock Outcrop	0.25	3	1.3	0.4
Park Special Vegetation				
XBMV - Beaver Meadow Vegetation Complex	0.5	37	27.0	0.7
XCMC - Constructed Wetland Ruderal Vegetation Complex	0.5	3	40.0	13.0
XPLM - Palmerton Smelter Ecological Restoration Area	0.5	4	324.6	81.0
XPRO - Potomac River Outcrops	0.5	4	1.7	0.4
XRBL - Recently Burned Landscape	0.5	10	10.9	1.1
Cultural Agriculture				
CHAV - Herbaceous Agricultural Vegetation	0.5	108	374.6	3.5
CMCP - Eastern North American Temperate Forest Plantation	0.5	112	168.0	1.5
CNHP - Native Northern Hardwood Plantation	0.5	2	2.1	1.1
CORC - Native Northern Spruce-Fir Plantation	0.5	2	1.9	0.9
CSFP - Tropical & Temperate Fruit Orchard	0.5	9	4.8	0.5
CVNY - Tropical & Temperate Grape Vineyard	0.5	1	1.2	1.2
Cultural Developed				
CBRN - Barren Land	0.5	40	24.9	0.6
CDVH - Developed Area - High Intensity	0.5	85	223.7	2.6
CDVL - Developed Area - Low Intensity	0.5	466	574.4	1.2
CDVM - Developed Area - Medium Intensity	0.5	419	629.1	1.5
CDVO - Developed Area - Open Space	0.5	557	511.2	0.9
Water				
ZOSR - Open Water Pond	0.5	181	558.4	3.1
ZOWL - Open Water Stream & River	0.5	69	937.0	14.0
ZOWP - Open Water Lake	0.5	90	90.7	1.0
Totals		**30,395**	**110,917.7**	**3.6**

*Tally results represent the vegetation map layer at the most detailed level of map-class attribution. MMU, minimum mapping unit; Poly, polygon; Freq, frequency; ha, hectare; Ave, average

Brief Analysis and Discussion

General Overview of the Vegetation Map

Collectively, the spatial-database layer (vegetation map) produced for the APPA vegetation mapping project consists of 30,395 polygons and covers 110,919.7 ha, with an average polygon size of 3.6 ha. The 150 map classes representing natural (including ruderal) vegetation in the USNVC apply to 92.9% of polygons (28,242 polygons; average size of 3.8 ha) and cover 95.9% of the AT corridor (106,413.0 ha). Further broken-down, map classes representing natural vegetation in the USNVC indicate that the AT corridor is 92.4% forest and woodland (102,480.8 ha), 1.7% shrubland (1866.3 ha), and 1.8% herbaceous cover (2,065.9 ha). Map classes representing cultural vegetation in the USNVC apply to 5.8% of polygons (1,777 polygons; average size of 1.4 ha) and cover 2.3% of the AT corridor (2,516.3 ha). Map classes representing park special vegetation apply to 0.2% of polygons (58 polygons; average size of 7.0 ha) and cover 0.4% of the AT corridor (404.3 ha). Map

classes representing nonvegetated open and flowing water (non-USNVC) apply to 1.1% of polygons (332 polygons; average size of 4.8 ha) and cover 1.4% of the AT corridor (1,586.2 ha).

Forest and Woodland

Overall, map classes representing ruderal forest (there are no ruderal woodland) associations account for 24.2% (5,986) of all mapped forest and woodland polygons and 17.1% (17,482.9 ha) of forest and woodland areas within the AT corridor, whereas map classes representing nonruderal forest and woodland associations account for 75.8% (18,743) of the forest and woodland polygons, but 82.9% (84,997.9 ha) of forested areas within the AT corridor. This difference indicates that nonruderal forest and woodland associations are generally in larger, more homogenous and contiguous blocks, and the average area of a ruderal forest block is 2.9 ha compared to 4.5 ha for nonruderal forest and woodland map classes. These nonruderal forest and woodland coverage figures also discount the value of large blocks of contiguous forest composed of numerous different nonruderal map classes.

By area, the 10 most common forest and woodland map classes cover more than 62% of the forested and woodland landscape within the AT corridor (57.5% of the corridor). These 10 map classes represent a diverse mix of mesophytic and northern hardwood, oak, and conifer forests and woodlands, both ruderal and nonruderal, across the AT corridor in every APPA project area. The remaining 38% of forest and woodland landscape within the AT corridor is represented by 76 map classes; many of these map classes are very rare and isolated, but represent a wealth of ecological diversity.

Shrublands

Overall, map classes representing ruderal shrubland associations account for 40.6% (775) of the mapped shrubland polygons and 38.0% (708.9 ha) of shrubland areas within the AT corridor, whereas map classes representing nonruderal shrubland associations account for 59.4% (1,133) of the shrubland polygons and 62.0% (1,157.4 ha) of shrubland areas within the AT corridor. This difference indicates that nonruderal shrubland associations are slightly larger and more homogenous than ruderal shrublands, with an average polygon size of 1.0 ha compared to 0.9 ha for ruderal shrubland map classes.

By area, two shrubland map classes consist of 54.5% of the shrub cover within the AT corridor. The first map class, which is the more common of the two map classes, is the Central & Northern Ruderal Shrubland (SXCN). The SXCN map class defines ruderal shrublands from Virginia to southern New Hampshire and generally exist in small patches at low elevation. The second map class is the Mixed Conifer Krummholz (SMCK). The SMCK map class defines the short-statured conifer forest at the highest elevations in the Green and White Mountains and generally exists in large, contiguous patches.

Herbaceous and Sparse Vegetation

Overall, map classes representing ruderal herbaceous and sparse vegetation associations account for 70.6% (1,605) of the mapped herbaceous and sparse polygons and 81.2% (2,065.9 ha) of herbaceous and sparse areas within the AT corridor, whereas map classes representing nonruderal herbaceous and sparse associations account for only 29.4% (669) of the herbaceous and sparse polygons and

18.8% (478.7 ha) of APPA herbaceous and sparse areas. This difference indicates that nonruderal herbaceous and sparse vegetation associations are rarer and more fragmented than ruderal herbaceous and sparse vegetation association.

By area, two herbaceous and sparse vegetation map classes consist of 57.0% of herbaceous and sparse vegetation cover within the AT corridor. These two map classes are ruderal herbaceous vegetation map classes and are defined by unimproved pasture and hay field, by occasionally maintained roadsides, and by fallow agriculture, all of which are common within the corridor.

Park-Special Vegetation

Five park-special map classes were developed to address vegetation that does not easily or consistently classify in the USNVC. The following is a list of the park-special vegetation map classes.

- Constructed Wetland Ruderal Vegetation Complex (XCMC)
- Palmerton Smelter Ecological Restoration Area (XPLM)
- Recently Burned Landscape (XRBL)
- Potomac River Outcrops (XPRO)
- Beaver Meadow Complex (XBMV)

Overall, map classes representing park-special vegetation account for 0.2% (58) of the mapped polygons and 0.4% (404.3 ha) of area within the AT corridor.

The XCMC and XPLM map classes represent landscapes being actively managed and restored. Both of these map classes contain vegetation that is highly modified from a natural state and that does not conform well to existing ruderal vegetation associations in the USNVC. The applications of these map classes in mapping were limited to specific locations. The application of the XCMC map class was limited to the Liberty Marsh of the Wallkill River National Wildlife Refuge in New York and New Jersey, and the application of the XPLM map class was limited to the U.S. Environmental Protection Agency superfund site that is under restoration near Palmerton, Pennsylvania.

The XRBL map class represents areas where stand-replacing fires happened before the aerial imagery for the APPA vegetation mapping project was collected. In some cases, depending on fire intensity and vegetation regeneration, the map class may have been used for areas where a stand-replacing fire happened a few years prior to aerial imagery acquisition, but the map class was generally applied to areas where stand-replacing fires happened the year aerial imagery was collected. These fires resulted in areas with insufficient vegetation regeneration for classification in the USNVC; therefore, the mappers had no reasonable way to determine what the vegetation was regenerating into. Where vegetation regeneration within a prior stand-replacing fire could be classified to a USNVC association, the applicable map class representing the association was applied.

The XPRO map class represents a very limited and unique area of sparsely vegetated bedrock outcrops in the Potomac River where the AT corridor crosses along the Virginia-Maryland border. For the XPRO map class, no formal vegetation data exist to support classification in the USNVC.

Lacking options for the mappers, a park-special vegetation map class was created as a place holder for this sparse vegetation pending future investigation.

The XBMV map class represents a mosaic of wetland vegetation types within active and recently abandoned beaver ponds. In these wetlands, vegetation associations have not differentiated into distinct mappable units (considering the MMU of 0.25 ha for herbaceous vegetation). Or, although the vegetation has differentiated into distinct associations, none of the associations were greater than a MMU and, therefore, mapping the wetland as dominated by a single vegetation association would be incorrect. The XBMV map class represents vegetation with high heterogeneity, but that heterogeneity is limited to associations in the USNVC that naturally exist in wetlands.

Cultural Vegetation

A final aspect of APPA is the cultural landscape. The cultural landscape covers 2.3% (2,516.3 ha) of the AT corridor spread among 1,777 polygons (1.4-ha average). Eleven map classes represent cultural vegetation in the USNVC. Five of these 11 cultural map classes represent developed landscapes, which account for 1.8% (1,963.7 ha) of the AT corridor and 5.1% (1,543) of the polygons. These map classes represent everything from natural landscapes recently razed for development to parking lots devoid of vegetation. Another four map classes represent agroforestry for timber production, which accounts for 0.2% (174.9 ha) of the AT corridor and 0.4% (123) of the polygons. These map classes represent conifer and hardwood trees specifically planted and actively managed for timber production. Two more map classes represent woody crops for food production, which account for 0.003% (3.1 ha) of the AT corridor and 0.007% (2) of the polygons. These map classes represent fruit orchards and vineyards. And lastly, one map class represents herbaceous crops, which account for 0.3% (374.6 ha) of the AT corridor and 0.4% (108) of the polygons. This map class represents row crops such as corn, wheat, and soybean and other improved and actively managed herbaceous crops.

Open Water

Although open water in APPA is uncommon, open water covers 1.1% (1,586.2 ha) of the AT corridor. More than one-third of the open water is due to two lakes that the AT corridor encircles in Maine, which together cover 540.9 ha. The remainder comes from smaller lakes scattered throughout the AT corridor and the many large rivers that the AT corridor parallels and crosses.

Map Layer Presentation

A sample presentation of the map layer for each APPA project area is shown in Figures 22–25. The linear nature and length of APPA precludes full map presentation in this report. Insets are included in Figures 22–25 to provide examples of the details that exist in the map at a fine scale; however, with this presentation, the color symbology is generalized with map classes grouped into broader categories. These categories are the same as the bolded categories provided in “Appendix G: Map Classification by Map-Class Category” and Table 9.

Detailed map polygons and their classification to the USNVC are provided in the project geodatabase and can be accessed using GIS software.

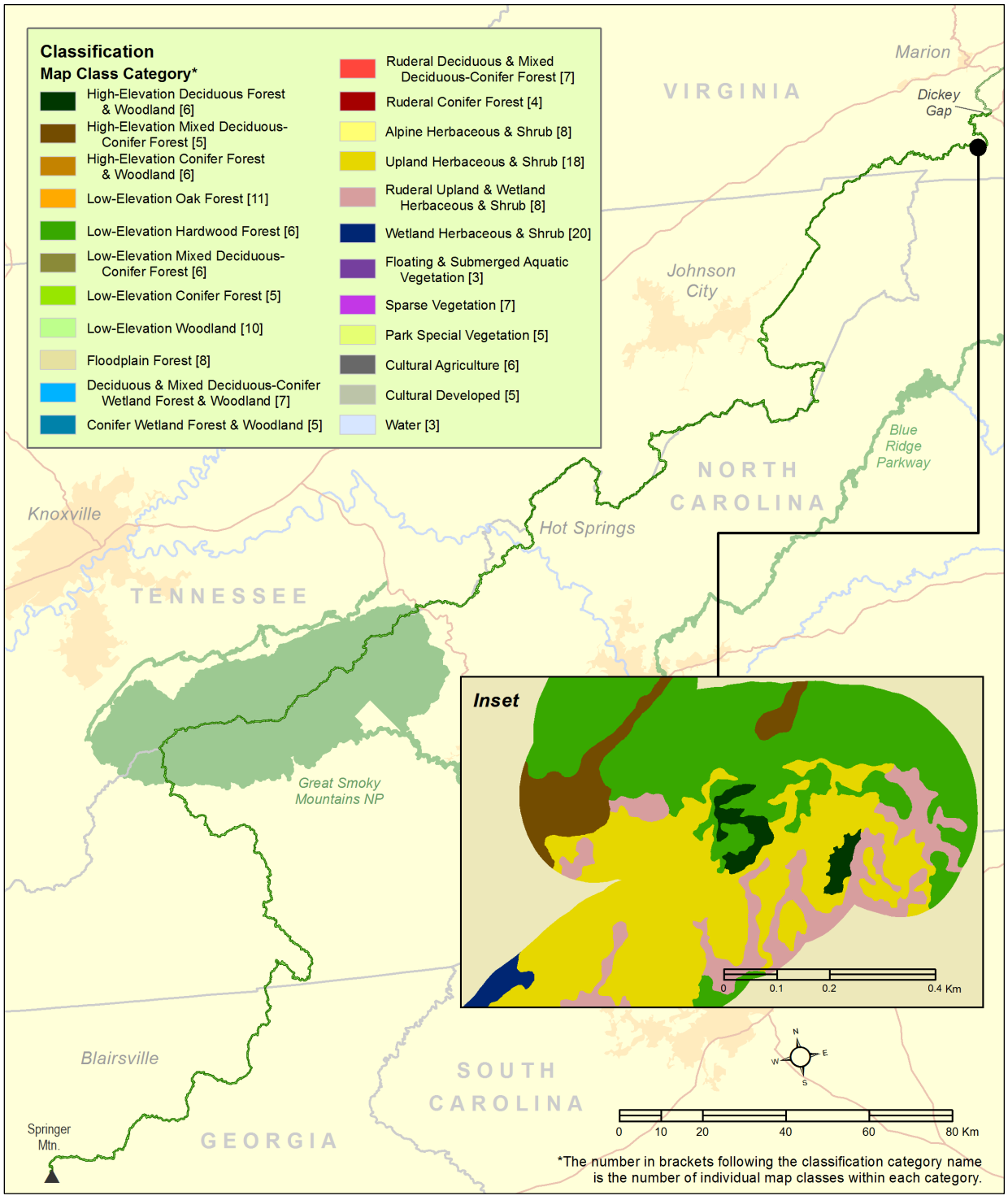


Figure 22. Vegetation map display of the Southern Blue Ridge project area for the Appalachian National Scenic Trail vegetation mapping project.

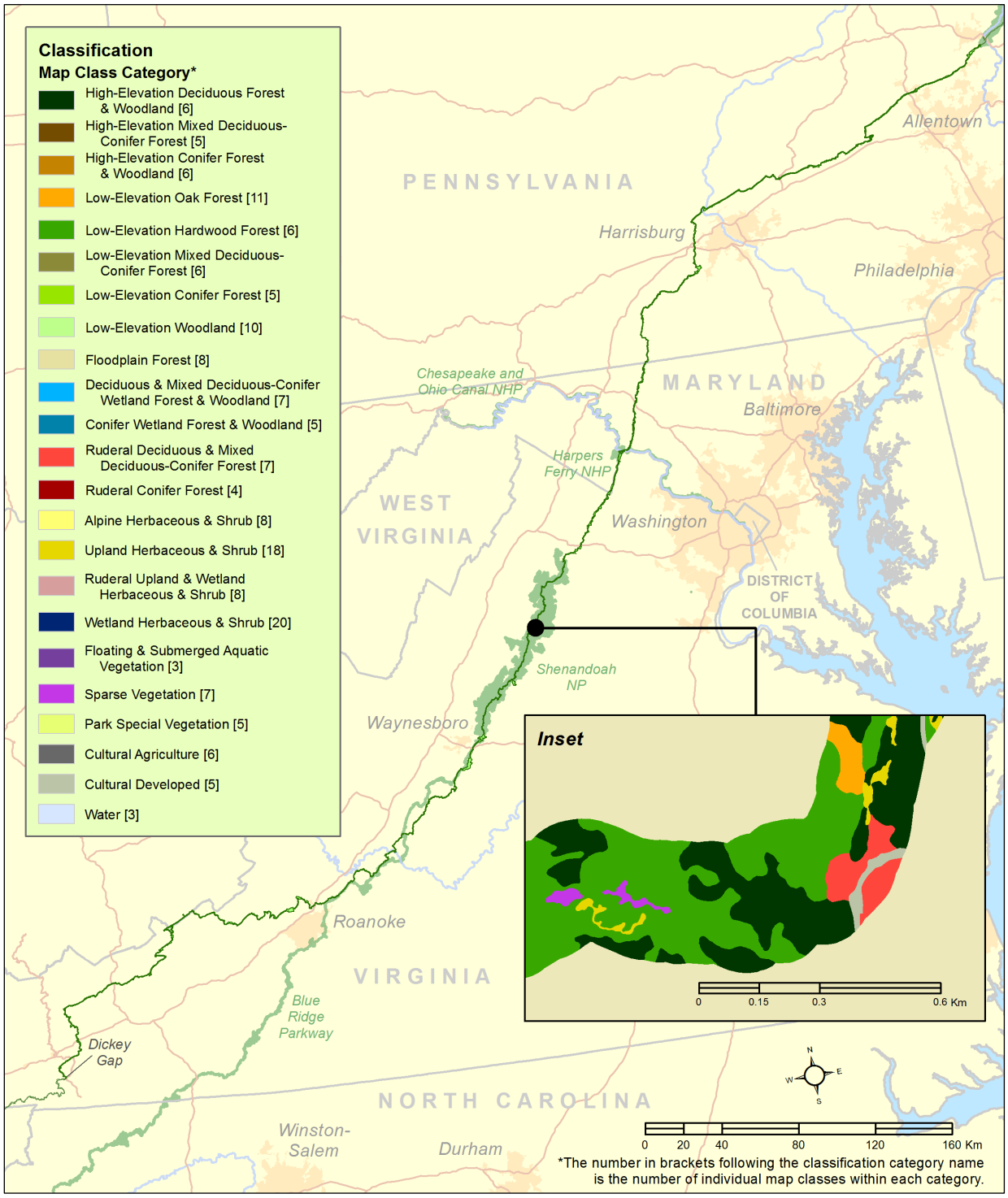


Figure 23. Vegetation map display of the Central Appalachian project area for the Appalachian National Scenic Trail vegetation mapping project.

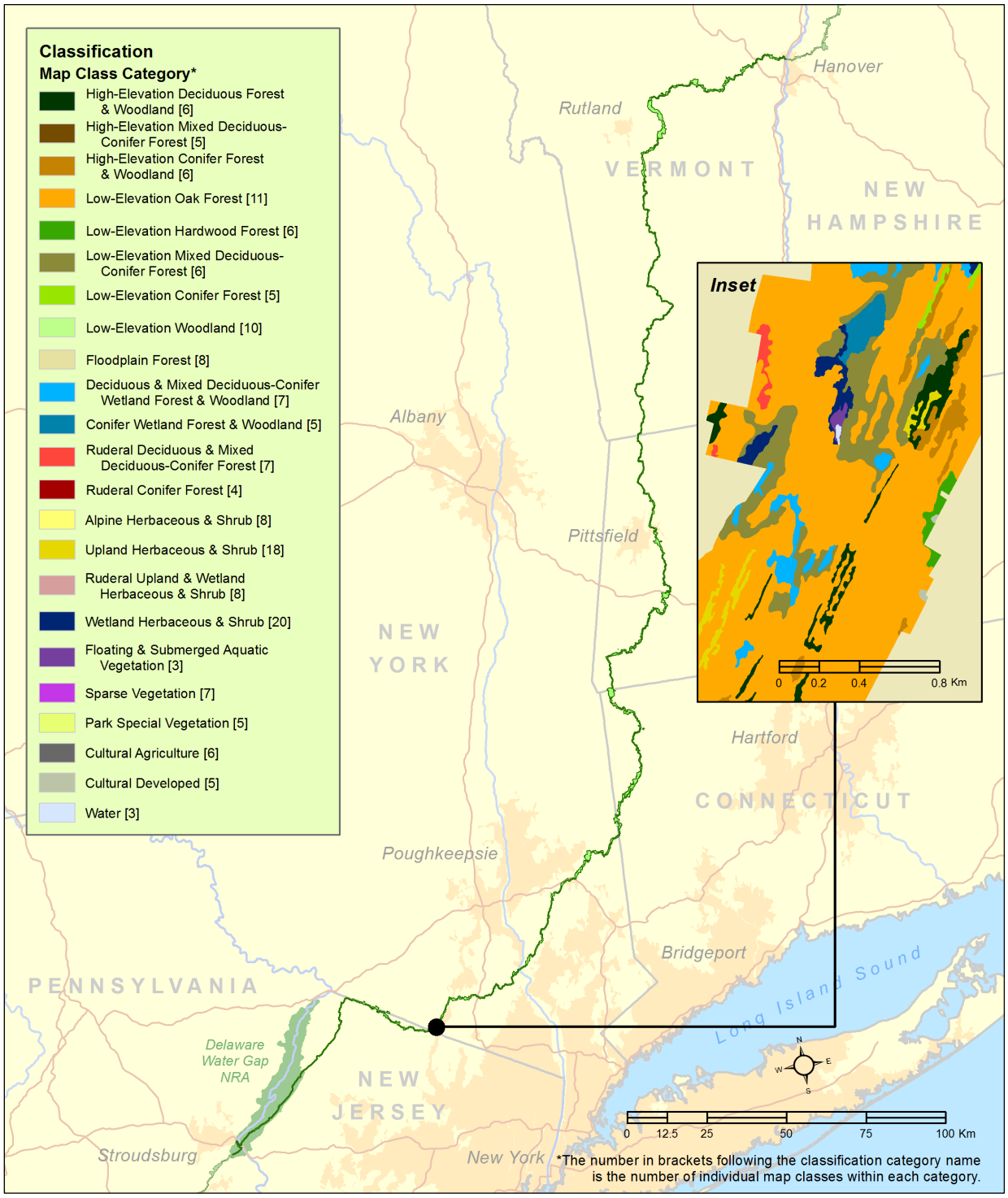


Figure 24. Vegetation map display of the Lower New England project area for the Appalachian National Scenic Trail vegetation mapping project.

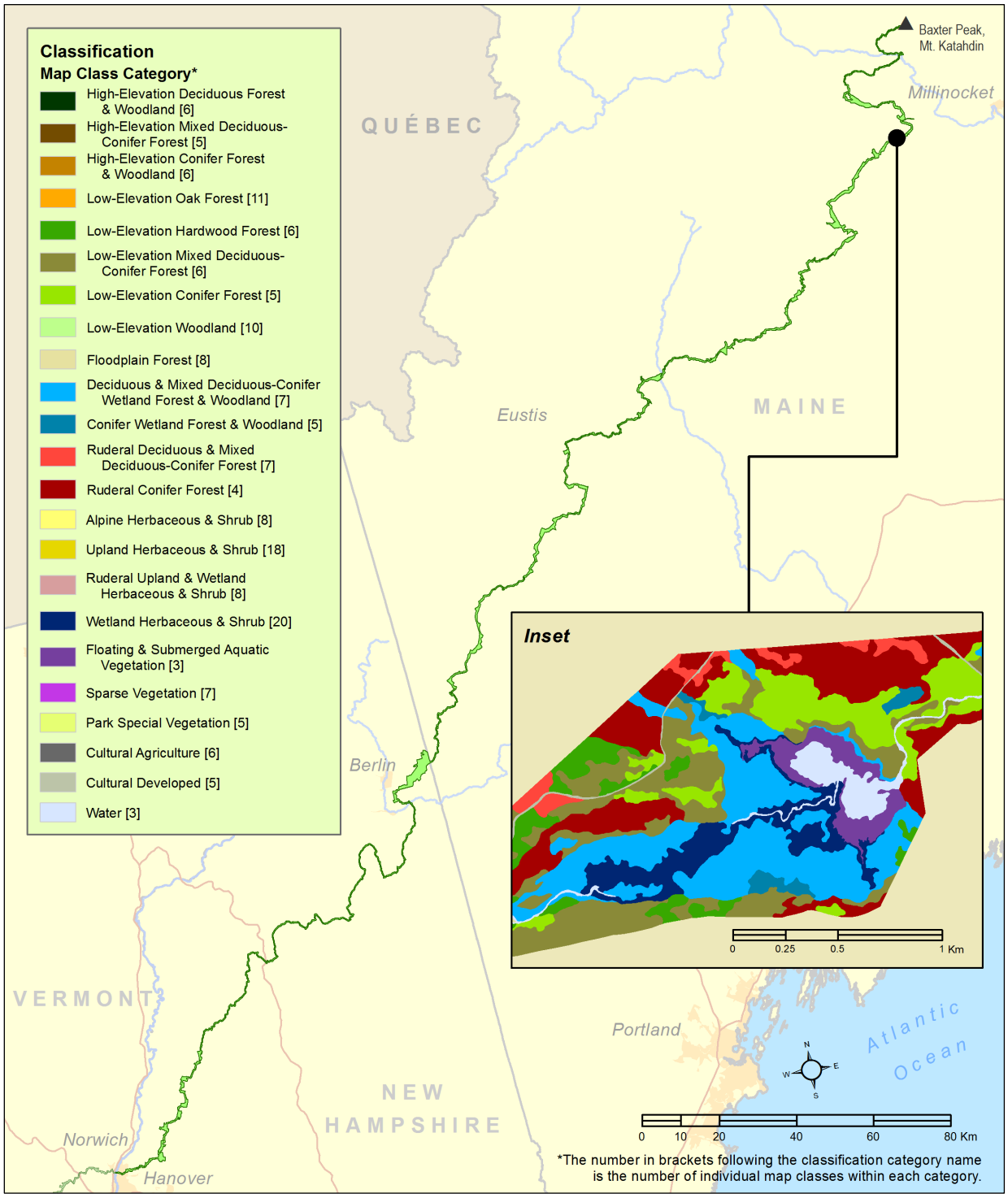


Figure 25. Vegetation map display of the Northern Appalachian project area for the Appalachian National Scenic Trail vegetation mapping project.

Accuracy Assessment

Methods

Objective and Overview

The objective of an accuracy assessment (AA) is to measure the probability that a particular location has been assigned the correct vegetation class in the vegetation map layer. The process of an AA is based on field observations, and the process of mapping is based on aerial image interpretation; each process has different perspectives of scale and observation. An AA estimates thematic accuracy by map class in the map layer, giving users the information needed to determine suitability of the map layer for a particular application. At the same time, map layer producers are able to learn more about the nature of accuracy, including error, in the map layer. Thus, the two attributes of an AA are "users' accuracy," which is the probability that the map actually represents what was classified on the ground, and "producers' accuracy," which is the probability that an AA site has been mapped correctly. An error in mapping from the users' perspective is one of commission where a map class was mapped as a vegetation type that did not exist at the assessment site. An error in mapping from the producers' perspective is one of omission where a map class was not mapped as the vegetation type that existed at the assessment site. Both users' and producers' accuracies can be obtained from the same set of data by using different analyses. Errors exist when map classes are not the same as the classes observed in the field. A major assumption of an AA is that the application of the classification system is identical between mapping and field assessment. When the application of classification is not applied consistently with the field assessment, a "false error" could result and, therefore, requiring additional review of field data and classification decision.

Sampling Design

A stratified random sampling approach was used to select AA sites for the Appalachian National Scenic Trail (APPA, also referred to as the "AT corridor" for the Appalachian Trail corridor) vegetation mapping project. First, a cost-surface analysis layer of the AT corridor was developed to determine areas that would allow field crews to safely access AA sites in a timely and effective manner. Second, the AA sites were randomly generated for selection by map-class theme within areas deemed accessible from the cost-surface analysis. For each of the APPA project areas, the AA sampling design approached the APPA vegetation map layer as one contiguous study rather than as four independent studies. The AA sites, however, were selected during 2 years; sites were selected the first year in the Southern Blue Ridge (SBR) and Central Appalachian (CAP) project areas and the second year in the Lower New England (LNE) and Northern Appalachian (NAP) project areas. (See Figures 6–9 in the "Introduction and Project Overview" section of this report for detailed locations of the four APPA project areas.)

Cost-Surface Analysis

A cost-surface analysis was developed to extrapolate the amount of field crew effort needed to traverse the landscape to reach an AA site. Typical drivers of cost included topographic slope, land cover type, man-made improvements, and physical obstacles. A geospatial layer showing the cost-surface analysis of APPA was developed using ArcGIS (Version 10.x, Esri). This cost-surface

analysis modeled a continuum from easily accessible to inaccessible lands throughout the AT corridor.

The first step to develop the cost-surface analysis for APPA involved generating slope from a 10-meter digital elevation model. Topographic slope is the fundamental driver of cost when traversing the AT corridor. Separate functions were used to describe on-trail and off-trail costs; however, functions followed the same premise for slope (e.g., as slope increases, travel becomes exponentially more difficult). The next step to develop the cost-surface analysis involved identifying absolute barriers, including slopes greater than 60%; perennial rivers lacking a bridge; lakes, streams, and private property. Absolute barriers were deemed inaccessible in the cost-surface analysis. Corridors created by public trails or roads were identified and used to connect areas of the AT corridor that would otherwise have been isolated by absolute barriers. The last step to develop the cost-surface analysis involved identifying access points to the AT corridor, including trailheads and public roadways.

Portions of the AT corridor more than 8 kilometers from access points were excluded from the initial AA site selection. Final cumulative costs, which represented the scale of difficulty to reach a particular area from an access point, were derived from the cost-surface analysis. For some rare map classes, the cost-surface values were expanded beyond what was considered accessible to retain a sufficient number of AA sites for statistical analysis.

Site Selection

Locations within the APPA vegetation mapping project boundary, except those areas excluded by the cost-surface analysis, were included in the AA sampling design. Map classes representing natural (including ruderal) vegetation associations in the U.S. National Vegetation Classification (USNVC) were included as the individual themes to randomly select sites.

The number of samples needed for each map class (theme) were determined by using National Park Service (NPS) Vegetation Mapping Inventory (VMI) Program recommendations (Lea and Curtis 2010) as suggested in the following scenarios.

- Scenario A—the class is abundant, covering more than 50 hectares (ha) in total area. The map class receives the maximum sample size of 30.
- Scenario B—the class is relatively abundant, covering at least 8.33 ha but no more than 50 ha in total area. The map class receives a sample size of six-tenths of the observations per hectare of the map class (equal to one observation for every 1.67 ha of map-class area). (This ratio allocates observations at a density rate equal to 30 observations per 50 ha).
- Scenario C—the class is relatively rare, covering less than 8.33 ha in total area. The map class receives five observations; the recommended minimum sample size.

For Scenario C, a map class could receive less than five observations if the area was on private land or if the total area was extremely low.

With APPA lands extending approximately 3,525 kilometers from northern Georgia to central Maine, the AA field data collection was staggered across two field seasons to allow for a logistically plausible AA process. Field data from AA sites in the southern two APPA project areas (SBR and CAP) were collected during the 2014 field season, and field data from AA sites in the northern two APPA project areas (LNE and NAP) were collected during the 2015 field season. The AA site selection process for the southern two project areas (SBR and CAP) began prior to the map completion of the northern-most project area (NAP); therefore, the number of AA sites needed to be prorated to select for those map class coexisting in the southern two project areas and the northern two project areas. For map classes used in either of the southern two project areas and in the LNE project area (but not the NAP project area), the number of AA sites were prorated by using the already completed vegetation map layers for each project area. For map classes used in either of the southern two project areas and into the NAP project area (where mapping was not yet complete), the number of AA sites were prorated for the northern two project areas based on the area the mappers expected to map in the NAP project area, plus the calculated area from the already completed map layer of the LNE project area. These prorated estimates were then applied to the southern two and northern two project areas.

Random selection of AA site locations was buffered from the polygon boundaries in the vegetation map layer to ensure that field classification of the observed area (a circular area approximately the size of the minimum mapping unit [MMU]) for each AA site would overlap with vegetation types represented in adjacent polygons.

The required buffer distance was calculated with the following formula:

$$\text{Buffer Distance} = \sqrt{R^2 + F^2 + M^2}$$

where *R* is the radius distance of the observation area, *F* is the expected (e.g., 90th percentile) global positioning system (GPS) error distance, and *M* is the standard requirement (maximum positional error distance in the map) for positional accuracy. The MMUs that were used to map APPA were 0.5 ha, 0.25 ha, and 0.125 ha[12], depending on the map class; map-class MMUs are described in the "Vegetation Mapping" section of this report. Depending on MMU size, values for *R*, *F*, *M* and the polygon buffer distance vary; these values are given in Table 10. The value of *R* is 40 meters for 0.5 ha, 28 meters for 0.25 ha, and 20 meters for 0.125 ha. The values of *F* and *M* are generalized to 15 meters and 12 meters, respectively. Therefore, a buffer distance of either 44 meters for a 0.5-ha MMU map class or 34 meters for a 0.25-ha MMU map class was applied to the interior side of polygon boundaries. Because of the small size, a buffer distance of 10 meters for a 0.125-ha MMU map class was applied to the interior side of polygon boundaries rather than 28 meters as calculated from the buffer-distance formula.

[12]The 0.125-ha MMU was applied to nine map classes representing alpine shrub, herbaceous, and sparse vegetation associations in the USNVC; these nine map classes were used only in the alpine zone of New Hampshire and Maine.

Table 10. Values for calculating buffer distance from map polygon boundaries for the random selection of accuracy assessment sites.*

MMU (ha)	R (m)	F (m)	M (m)	Buffer (m)
0.500	40	15	12	44
0.250	28	15	12	34
0.125	20	15	12	28**

*MMU, minimum mapping unit; ha, hectare; R, radius; m, meter; F, global positioning system error; M, map positional accuracy.

**The calculated buffer is 28 meters by use of the standard buffer-distance formula; however, 10 meters is applied because of the small MMU size of 0.125 ha.

For some map-class themes that were characteristically shaped as narrow and linear in the mapping, the buffer distance needed to be reduced because the target number of AA sites could not otherwise be attained. The buffer distance was reduced on a case-by-case basis and was reduced incrementally until the target number of sites could be selected for a particular theme; this process promoted the maximum distance in buffer while still attaining the targeted number of sites. Multiple AA sites in a polygon were allowed provided that the site extents did not overlap in area, with a maximum of three sites allowed in any single mapped polygon.

Once the number of AA sites was determined and buffers were applied, random sites with associated geographic coordinates were generated for each map class using the Geospatial Modelling Environment suite of tools (Spatial Ecology LLC). The site coordinates were projected in the Universal Transverse Mercator (UTM), Zone 18 North, by using the North American Datum of 1983 (NAD83). The site coordinates then were provided to the field crews to upload into GPS receivers. Staff from the U.S. Geological Survey (USGS) Upper Midwest Environmental Sciences Center (UMESC) provided the field crews with two different sets of 1:16,000-scale hard-copy maps that display the locations of the AA sites; one map set displayed AA sites on digital raster graphics (DRG [from the USGS National Map]) and the other map set displayed AA sites on true-color aerial imagery (from Esri). The AA site locations shown on the hard-copy maps were color coded, based on the MMU of the map class that was assigned to the polygon, to instruct the field crews on the area to classify for the AA site. When map polygons were shaped as narrow and linear, or were classified with a 0.125-ha MMU map class, the hard-copy maps for the field crews included polygon lines to denote the interpreted boundaries between two map classes. Likewise, track files for use with handheld GPS units were provided to the field crews to show these same boundary lines. An example of an AA field-crew map displaying AA site and map information over a USGS DRG backdrop is shown in Figure 26.

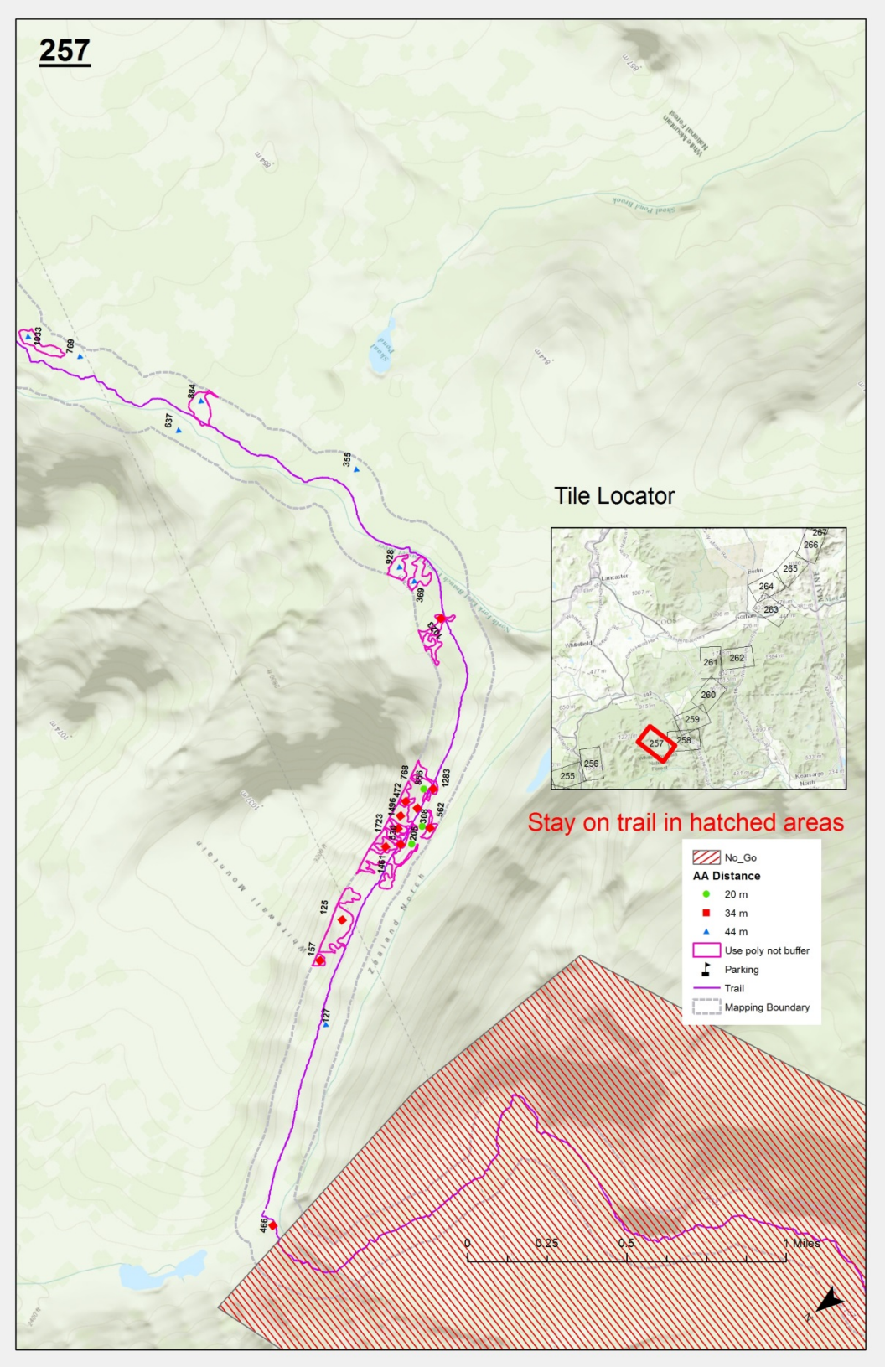


Figure 26. An example of an accuracy assessment map to direct field crews to sites, with site and map information shown over a U.S. Geological Survey digital raster graphic backdrop.

Field Data Collection

Without knowing the map classifications of AA site locations, field observation data were collected by AA field teams (field crews) that consisted of different individuals; each field crew consisted of a lead botanist and field assistant who were trained in AA procedures by ecologists from NatureServe and UMESC. During the two AA field seasons (2014 and 2015), 65 field crews that consisted of 53 individuals completed the AA field data collection. Each field crew navigated to preselected AA sites using GPS and hard-copy maps. The AA sites were distributed geographically to field crews in a method to prevent duplication of effort.

Field crews assessed an area approximately the size of the MMU defined for each AA site. The size of the MMU defined for each AA site is a circle with a 40-meter radius for a MMU of 0.5 ha; a circle with a 28-meter radius for a MMU of 0.25 ha; a circle with a 20-meter radius for a MMU of 0.125 ha; or if the mapped polygon boundaries could not support a circular MMU, an area specified by polygon boundaries that was provided on the hard-copy maps and GPS track files. At each AA site, field crews determined the assessment area size (0.5 ha, 0.25 ha, or 0.125 ha) by looking at the colored symbol shown at each AA site location shown on the hard-copy maps. A blue-triangle AA site indicated a 40-meter analysis radius (0.5-ha analysis area); a red-square AA site indicated 28-meter analysis radius (0.25-ha analysis area); a green-circle AA site indicated a 20-meter analysis radius (0.125-ha analysis area); and any blue, red, or green site with corresponding polygon boundary lines to show the analysis area and boundary location. In these very narrow polygons (as indicated on the DRG and true-color aerial imagery maps with boundary lines), the field crews considered the AA site coordinate location in relation to polygon boundaries and gave more attention to vegetation along the axis of the polygon.

Within the targeted assessment area, the field crew (Figure 27) recorded data on a field form. The data included the GPS coordinate location, dominant and indicator species, environmental data, and pertinent comments. For an example of a field form, see “Appendix I: Accuracy Assessment Form.” A field key to the vegetation associations of APPA (draft versions from 2014 and 2015) guided field crews to the vegetation association that best classifies the AA site. When the association type was uncertain (e.g., a vegetation type that expressed a variation not supported by the vegetation field key or an ecotone between two vegetation types), the crew still made a single “best call” but took extra notes on the circumstance. In numerous instances, an “alternate field call” was recorded, thus providing a second vegetation type to classify a specific site. When two vegetation types were recognized, the crew was instructed to note the vegetation type that contained the most area within the radius of a MMU. For additional field collection details and procedures, see “Appendix J: Accuracy Assessment Field Manual.”



Figure 27. Field classification of an accuracy assessment site for the Appalachian National Scenic Trail vegetation mapping project.

Data Analyses

Field data for 3,265 AA sites were collected and then entered into the NPS PLOTS version 4.0 (National Park Service 2015) database, with subsequent review of data entry. Of the 3,265 AA sites, 34 sites were excluded from the analysis because of unresolvable issues with the field data and another 27 sites were excluded because of a classification change in the U.S. National Vegetation Classification (USNVC) that included moving conifer plantation types from the Natural section to the Cultural section of the USNVC[13] or because no vegetation type was developed to represent a park-special map class[14]. Thus, 3,204 AA sites were used in the analysis of vegetation map layer accuracy. The analysis included the following steps:

[13]In 2015, the USNVC received a significant update and included moving conifer plantation types from the Natural section of the USNVC to the Cutlural section. The AA site selection for the APPA vegetation mapping project was concluded before the 2015 classification update became final. To remain consistent with the original AA study design of including only natural vegetation types, conifer plantation types were excluded in the analysis; however, field data collected of conifer plantation types at AA sites remain in the AA dataset.

[14]The Potomac River Outcrops (XPRO) map class was included in the AA site selection with the assumption that sparse vegetation associations in the USNVC would be identified for the map class prior to the AA field effort. No vegetation associations were developed for the XPRO map class; therefore, the map class was confirmed as a park-special map class and excluded in the anaylsis, which was consistent with the exclusion of other park-special map classes lacking USNVC classification.

- Initial comparative analysis of the field-site and map-polygon data,
- Review of disagreements and correction of false errors as necessary,
- Analysis of individual map classes,
- Final output of results into a contingency (matrix) table, and
- Final output of the analyses and results into a spatial database for use in a geographic information system (GIS).

Initial Comparative Analysis

The AA field-site data and map-polygon data were spatially joined using ArcGIS. Each AA field-site classification call (to a vegetation type) was compared to the corresponding map-polygon classification call (to a map class representing one or more vegetation types). Results from this initial comparison were tabulated either as a "match" (agreement) or a "mismatch" (disagreement). Matches were determined when either the primary or the secondary field-site calls were in agreement with the map-polygon call. Mismatches were determined when the criteria for a match was not met.

Review of Mismatches

Each set of mismatched classification calls were reviewed to ascertain as being a "false error" or a "true error." A false error is defined as a mismatch that was caused by one of the following: (1) spatial accuracy error in the field-site coordinates or map layer, (2) a missing or misapplied field-site classification call, (3) a field-site assessment of an area smaller than a MMU for the map class being assessed (an inclusion), or (4) a significant change in vegetation with time. In contrast, a true error is defined as a mismatch that was caused by the mapping, determined after exploring causes for a false error. This review process involved using ArcGIS to locate and view the AA field site locations and their corresponding polygons on a computer screen by using digital aerial imagery and the software program called "Stereo Analyst for ArcGIS" (ERDAS, Inc.). The field data sheets also were reviewed to gain a fuller sense of the context of the ground data. Anything determined to be a false error was reclassified as a match pending a secondary review during a series of AA reconciliation meetings.

Spatial Accuracy

A spatial error might exist when (1) the GPS device acquired inaccurate field coordinates or (2) a geospatial error existed within the vegetation map layer (called a "map-layer shift"). These spatial errors could displace the newly acquired field coordinate to an adjacent polygon on the map layer. Spatial errors in GPS coordinates were minimized during the random site selection process by selecting AA site coordinates more than 10 meters (for 0.125-ha MMU map classes), 34 meters (for 0.25-ha MMU map classes), and 44 meters (for 0.5-ha MMU map classes) from map polygon edges; however, field-acquired GPS coordinates collected with a poor GPS accuracy could position the coordinates into an adjacent map polygon. Furthermore, during AA site selection, the buffer distance from polygon edges was reduced when the target number of AA sites for a map class could not otherwise be attained and, therefore, increased the likelihood that the field-acquired GPS position was not in the correct map polygon, even with acceptable GPS accuracy.

Questionable Field-Site Classification Call

A field-site classification call might be questioned during the analysis. A likely reason for questioning a field-site call was if the perspective from the ground was limited by impenetrable vegetation or if wet soils prevented the field crew from accessing the entire AA site; i.e., the area of a MMU for the map class being assessed. Another reason for questioning a field-site call was if the AA site was diverse and other vegetation types were omitted or not recognized by the field crew. Questionable field-site calls were reviewed by checking the aerial imagery at the AA site and by inspecting the field data sheets for misapplications. Questionable field-site calls required further, joint analysis by UMESC and NatureServe staff during the series of AA reconciliation meetings.

Inclusion

The actual area assessed in the field might have been below an area of a MMU for the map class being assessed; therefore, the assessed area was termed an inclusion. The AA site in question may have contained vegetation that was merely an inclusion (smaller than a MMU for the map class being assessed) to the entire AA site area. Certain vegetation features are quite distinct from each other when the aerial imagery was viewed three dimensional (3D) (e.g., open woodland or dense forest), which makes for easy determination of site inclusion. An inclusion might also exist when the field assessment was indeed of a proper area (of a MMU for the map class being assessed), but the field-assessed area overlapped into an adjacent map polygon. Determining if the assessed area actually falls within the intended polygon can sometimes be difficult, particularly in the case of smaller map polygons. Along with the questionable field-site classification calls, inclusion errors required further joint analysis by UMESC and NatureServe staff during the series of AA reconciliation meetings.

Vegetation Change With Time

The vegetation map layer represents the ground conditions as presented in the aerial imagery that was acquired for the APPA vegetation mapping project. Sometimes the vegetation landscape changed between the date of imagery and the date of AA field assessment, which was between 4 and 5 years. When this change happens, the assessed area was termed as a change in vegetation with time. Determinations of vegetation change were easily made by a comparison between the aerial imagery and field-site photograph images. Determinations were confirmed during the series of AA reconciliation meetings.

Analysis of Individual Map Classes

A contingency table was generated to present the results of the initial analysis of the AA data to the vegetation map layer. This contingency table provided important information including users' and producers' accuracies of individual map classes and agreements and disagreements of map classes. Individual map-class accuracies that fell below the NPS VMI Program standard were reviewed to determine which map classes were in confusion with each other. If repeated confusion was evident, a decision was made whether to merge the map classes to gain higher accuracy or to leave the map classes separate and accept lower accuracy. A lower accuracy was accepted if the benefits of having that particular class mapped separately outweighed the benefits of a merge with other classes to produce a higher accuracy. These decisions were made with input from UMESC and APPA staff.

To avoid underestimating the role that the NPS, NatureServe, and UMESC staff had in the reconciliation of AA results and the impact that these results had on the final map classification for the APPA vegetation map layer, further understanding of the processes and steps that ultimately produced the final AA results and map classification is needed. The following is an outline of the discussions among APPA, NatureServe, and UMESC staff regarding AA issues, AA results, and eventual merging of map classes.

Review and Reconciliation of Site Specific AA Data

NatureServe and UMESC staff met to review and reconcile site specific AA field data. Because of the large number of AA sites that needed to be reviewed, two meetings took place at the UMESC to review and reconcile the AA site data across all four APPA project areas. The first meeting took place during October 6–8, 2015, to reconcile AA sites in the SBR project area, and the second meeting took place during February 22–26, 2016, to reconcile AA sites in the CAP, LNE, and NAP project areas. Site-specific AA field-site data were reviewed for potential changes to classification assignments and for inclusions or vegetation change with time. Adjustments to the vegetation classification also were addressed. Of the 3,204 analyzed AA sites, 698 were included in the review and reconciliation of AA field data.

Postreconciliation AA Contingency Table

The AA contingency table was updated to reflect adjustments from the review and reconciliation meeting. Individual map classes that fell below the 80% accuracy standard of the NPS VMI Program were studied to determine where confusion was present in the mapping. Detailed proposals were drafted, and the proposals listed the potential merges of map classes that had consistent confusion in mapping. These proposals were sent to NPS staff from APPA and the Northeast Temperate Network Natural Resource Inventory and Monitoring (I&M) Program for their input and decision. Each proposed resolution explained the pros and cons regarding the effect the resolution had on the vegetation map layer. This information helped APPA and Northeast Temperate Network staff to realize the cost-benefit ratio of accepting a map class with lower than standard accuracy to retain map detail or of accepting a merging of map classes to gain higher accuracy yet lose some map detail. These proposals and the associated NPS decisions are outlined in "Appendix H: Accuracy Assessment Reconciliation."

Final AA Contingency Table

The results from the complete analyses, including the reconciliations of AA site data and the consolidation of map classes, were updated into the contingency table. The frequency of agreement and the placement of disagreements are listed in the contingency table. The percentages of users' and producers' accuracies were recalculated for each map class to reflect changes from consolidating map classes.

AA Spatial Database

For use in a GIS, a feature-class layer was produced of the AA site locations, as well as supporting tables; the layer and tables were incorporated into the geodatabase for the APPA vegetation mapping project. The field data for AA also are included in the NPS PLOTS version 4.0 (National Park Service 2015) database for the project.

Results and Discussion

Of the 3,204 sites used in the analysis, the initial comparison determined that only 75.46% of the AA sites matched the corresponding polygons that represented natural (including ruderal) vegetation associations in the USNVC. Through the review process of correcting false errors and of combining some map classes because of low accuracies, the overall accuracy was increased to 80.18 %. A kappa adjustment for chance agreements resulted in an overall accuracy of 79.94%.

The contingency matrix of the AA results for the APPA vegetation mapping project can be accessed from the NPS Integrated Resource Management Applications Portal[15]. The matrix table lists the accuracy of each map class (along with 90% confidence intervals); with the users' accuracy reflecting errors of inclusion (commission errors) and the producers' accuracy reflecting errors of exclusion (omission errors). The width of each confidence interval was affected by the sample size used to derive the point estimate.

The overall accuracy of the map layer for the APPA vegetation mapping project fundamentally met the 80% accuracy requirement established by the NPS VMI Program. The most important factors affecting map accuracy were (1) difficulties by the mappers and field crews in determining the amount of "disturbance" at a site and determining if enough ruderal species were present to indicate whether the site should be mapped or classified to a "ruderal" or to a "natural" type; (2) difficulties by the mappers in overestimating and underestimating the presence of oak and in distinguishing between oak species to determine which oak map class to apply; (3) difficulties by the mappers in determining between upland and wetland hydrology, which was made difficult by the often limited size and patchy distribution of wetlands along the AT corridor; (4) difficulties by the mappers in overestimating and underestimating conifer species in the canopy and distinguishing between different conifer species; (5) difficulties by the mappers and the field crews in splitting low-elevation from high-elevation map classes in the tension zone between the two elevation gradients, even with the use of mapping conventions, modeling, and vegetation descriptions; (6) difficulties for the field crews in assessing a true MMU in field conditions, which were often challenging to access and/or to move about in; and (7) disagreement between mappers and field crews in estimating percent-cover of the strata. In regard to percent-cover estimates, past experience indicates that estimates in the field are generally lower than estimates from an aerial survey; thus, some mismatches resulted from these two different perspectives.

With the analysis complete, some individual map-class accuracies did not meet the 80% requirement (taking into account 90% confidence intervals). In general, errors of commission (users' accuracy) occurred in fewer map classes than did errors of omission (producers' accuracy). The following are map classes for which the mapping project did not meet the required rates of accuracy in terms of either the actual percentage or the confidence intervals.

[15]Go to http://science.nature.nps.gov/im/inventory/veg/project.cfm?ReferenceCode=2177176 to access the AA contingency table from the NPS Integrated Resource Management Applications Portal for the Appalachian National Scenic Trail vegetation mapping project, NPS Vegetation Mapping Inventory Program.

Users' Accuracy (Errors of Commission)

For each map class that has a users' accuracy (errors of commission) below NPS VMI Program standards, the individual errors of commission are reviewed and reported. This section reports on individual map classes with users' accuracy below program standards and the associated map classes with which the errors of commission occur. A low users' accuracy indicates that a map class was mapped too aggressively, which refers to an overapplication of the map class within the AT corridor. At the individual AA site level, the low users' accuracy indicates that the AA site was mapped as the map class being tested, but AA determined that the vegetation at the AA site is represented by a different map class (e.g., the mappers called the polygon the FOTM map class, but the AA recognized a vegetation type at the AA site that is represented by the FSCO map class).

For simplification, the following explanations of map classes with low-users' accuracy provide vegetation classification of AA sites using map classes that represent the classified vegetation associations. Some map classes represent multiple vegetation associations. For the purpose of these explanations, the level of detail by vegetation association is not necessarily needed.

Oak - Tuliptree - Maple Forest (FOTM) Map Class

The users' accuracy for the Oak - Tuliptree - Maple Forest (FOTM) map class was 52%, with a 90% confidence interval of 35–68%. Of the 31 AA sites tested for FOTM, 15 sites contained vegetation types other than FOTM; the following is a list of attributed errors.

- One Lower New England High Slope Chestnut Oak Forest (FSCO) site, two Central Appalachian Oak Forest (FCAO) sites, and six Central & Northern Oak Forest (FCNO) sites were mapped as FOTM because mappers underestimated the coverage of oak (*Quercus* spp.) and overestimated the coverage of tuliptree (*Liriodendron tulipifera*) and sugar maple (*Acer saccharum*).
- One Central Appalachian Hemlock - Chestnut Oak Forest (FCHO) site and one Hemlock - Hardwood - Oak Forest (FHHO) site were mapped as FOTM because mappers underestimated the coverage of oak and eastern hemlock (*Tsuga canadensis*) and overestimated the coverage of tuliptree and sugar maple.
- One Central Appalachian Ruderal Hardwood Forest (FXCH) site and one Ruderal Northern Hardwood Forest (FXNH) site were mapped as FOTM because mappers underestimated the coverage of oak and because the degree of disturbance present was discounted.
- One Northern Appalachian Hardwood Forest (FNAH) site was mapped as FOTM because mappers overestimated the coverage of oak and overestimated the coverage of tuliptree.
- One Acidic Hardwood Swamp Forest (FAHS) site was mapped as FOTM because wetland hydrology was mistaken for upland hydrology and because mappers misidentified the species of hardwood in the canopy.

Hemlock - Hardwood Swamp Forest (FHHS) Map Class

The users' accuracy for the Hemlock - Hardwood Swamp Forest (FHHS) map class was 50%, with a 90% confidence interval of 24–76%. Of the 14 AA sites tested for FHHS, 7 sites contained vegetation types other than FHHS; the following lists the attributed errors.

- One Rich Hardwood Swamp Forest (FRHS) site and six FAHS sites were mapped as FHHS because mappers overestimated the coverage of eastern hemlock and because of senescence and death of eastern hemlock.

Ruderal Central Appalachian Hardwood (FXCH) Map Class

The users' accuracy for the Ruderal Central Appalachian Hardwood (FXCH) map class was 58%, with a 90% confidence interval of 40–76%. Of the 26 AA sites tested for FXCH, 11 sites contained vegetation types other than FXCH; the following is a list of attributed errors.

- One Chestnut Oak - Mixed Oak Forest (FCOM) site, one Central Appalachian Oak - Hickory Forest (FAOH) site, two FSCO sites, and two FCAO sites were mapped as FXCH because the mappers overestimated the coverage of oak and/or hickory (*Carya* spp.) and because the degree of disturbance present was discounted.
- Two Central Appalachian Hardwood Forest & Woodland (FCHW) sites were mapped as FXCH because the degree of disturbance present was discounted.
- One FXNH site was mapped as FXCH because the species of maple (*Acer* spp.) and birch (*Betula* spp.) present at the site were misjudged.
- One Ruderal Tuliptree Forest (FXTT) site was mapped as FXCH because the mappers underestimated the coverage of tuliptree; and
- One Central Appalachian Swamp Forest (FCAS) site was mapped as FXCH because wetland hydrology was mistaken for upland hydrology and because mappers misidentified the species of hardwood in the canopy.

Rich Hardwood Swamp (FRHS) Map Class

The users' accuracy for the Rich Hardwood Swamp (FRHS) map class was 54%, with a 90% confidence interval of 36–71%. Of the 28 AA sites tested for FRHS, 13 sites contained vegetation types other than FRHS; the following is a list of attributed errors.

- Two FXNH sites and three FNAH sites were mapped as FRHS because upland hydrology was mistaken for wetland hydrology.
- One Northeastern Ruderal Oak - Red Maple Forest (FXOM) site was mapped as FRHS because upland hydrology was mistaken for wetland hydrology and because mappers overestimated the coverage of oak.
- One FAHS site was mapped as FRHS because the relative richness of the site was misinterpreted and because the hardwood canopy species were misjudged;
- One FHHS site was mapped as FRHS because the mappers underestimated the coverage of eastern hemlock.

- One Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest (FPHD) site, one White Pine - Hemlock - Red Spruce Forest (FPHS) site, one Successional Mixed Spruce - Fir - Hardwood Forest (FXSF) site, and one Low-Elevation Spruce - Fir Forest (FLSF) site were mapped as FRHS because upland hydrology was mistaken for wetland hydrology, because mappers underestimated the coverage of conifer trees, and because conifer tree species were misjudged.
- One Northern White-cedar Swamp Forest (FNWS) site was mapped as FRHS because mappers underestimated the coverage of conifer trees, and because conifer tree species were misjudged.

Mixed Spruce Swamp Forest & Woodland (FMSS) Map Class

The users' accuracy for the Mixed Spruce Swamp Forest & Woodland (FMSS) map class was 56%, with a 90% confidence interval of 34–78%. Of the 18 AA sites tested for FMSS, 8 sites contained vegetation types other than FMSS; the following is a list of attributed errors.

- Four Low-Elevation Spruce - Fir Forest (FLSF) sites were mapped as FMSS because upland hydrology was mistaken for wetland hydrology.
- Three FNWS sites were mapped as FMSS because mappers underestimated the coverage of northern white-cedar (*Thuja occidentalis*) and overestimated the coverage of red spruce (*Picea rubens*).
- One Red Spruce - Red Maple Acidic Swamp Forest (FCMS) site was mapped as FMSS because the mappers underestimated the coverage of red maple (*Acer rubrum*).

Producers' Accuracy (Errors of Omission)

For map classes that have a producers' accuracy (errors of omission) below programmatic standards, each map class and the individual errors of omission are reviewed. A low producers' accuracy indicates that a map class was mapped too conservatively, which refers to an under-application of the map class within the AT corridor. This section reports on the individual map classes with low producers' accuracy and the map classes that the errors of omission occur with. At the individual AA site level, therefore, the AA determined that the vegetation at the AA site was the map class being reviewed, but that the mappers called it a different map class (e.g. the AA recognized a vegetation type at the AA site that is represented by FAMO, but the mappers called the polygon FROH).

For the same reasons given for the explanations of map classes with low users' accuracy, the following explanations of map classes with low-producers' accuracy provide vegetation classification of AA sites by using the map classes that represent the classified vegetation associations.

High-Elevation Red Oak Forest (FROH) Map Class

The producers' accuracy for the High-Elevation Red Oak Forest (FROH) map class was 61%, with a 90% confidence interval of 49–73%. Of the 51 AA sites classified in the field as FROH, 20 sites fell within polygons that were mapped as other vegetation types; the following is a list of attributed errors.

- Eight sites assessed in polygons mapped as FAMO were determined to be FROH. Mappers modeled the understory composition as low-elevation based on field experience, mapping conventions, and vegetation descriptions; however, the map class was determined to more closely resemble high-elevation.
- Five sites assessed in polygons mapped as Southern Appalachian Hardwood Forest (FSAH) were determined to be FROH. Mappers underestimated the coverage of northern red oak (*Quercus rubra*) in the canopy.
- Three sites assessed in polygons mapped as FCOM were determined to be FROH. Mappers assessed northern red oak as chestnut oak and the elevation model failed to completely address high-elevation FCOM in the tension zone with FROH.
- One site assessed in polygons mapped as Blue Ridge Hemlock - Northern Hardwood Forest (FBHH) was determined to be FROH. Mappers underestimated the coverage of northern red oak.
- Two sites assessed in polygons mapped as Southern Appalachian Catawba Rosebay Heath Bald (SBCH) and one site assessed in a polygon mapped as Southern Appalachian Heath Bald (SBAH) were determined to be FROH. Mappers underestimated the coverage of northern red oak in these areas.

Mixed Shrub Bald and Thicket (SMBT) Map Class

The producers' accuracy for the Mixed Shrub Bald and Thicket (SMBT) map class was 58%, with a 90% confidence interval of 40–77%. Of the 24 AA sites classified in the field as SMBT, 10 sites fell within polygons that were mapped as other vegetation types; the following is a list of attributed errors.

- Two sites assessed in polygons mapped as FROH and one site assessed in a polygon mapped as Appalachian Ruderal Hardwood Forest (FXAH) were determined to be SMBT. Mappers overestimated the tree cover at these sites.
- Four sites assessed in polygons mapped as Ruderal Blackberry - Greenbrier Shrub Thicket (SXBG) were determined to be SMBT. Mappers overemphasized the degree of disturbance and confused shrubs species at these sites.
- Two sites assessed in polygons mapped as SBAH and one site assessed in polygon mapped as SBCH were determined to be SMBT. Mappers assessed the species of Rhododendron incorrectly and the elevation model failed to completely address the tension zone between low- and high-elevation shrublands.

Central Appalachian Oak Forest (FCAO) Map Class

The producers' accuracy for the Central Appalachian Oak Forest (FCAO) map class was 47%, with a 90% confidence interval of 33–60%. Of the 45 AA sites classified in the field as FCAO, 24 sites fell within polygons that were mapped as other vegetation types; the following is a list of attributed errors.

- Six sites assessed in polygons mapped as FSCO, three sites assessed in polygons mapped as FCNO, and two sites assessed in polygons mapped as Chestnut Oak Heath (FCOH) were determined to be FCAO. Mappers underestimated the coverage of chestnut oak at these sites.
- Three sites assessed in polygons mapped as FAOH were determined to be FCAO. Mappers overestimated the coverage of hickory at these sites.
- Two sites assessed in polygons mapped as FOTM and two sites assessed in polygons mapped as FCHW were determined to be FCAO. Mappers overestimated the coverage of tuliptree and other non-oak hardwood tree species at these sites.
- One site assessed in a polygon mapped as FROH was determined to be FCAO. Mappers modeled the understory composition as high-elevation based on field experience, mapping conventions, and vegetation descriptions; however, the map class was determined to more closely resemble low-elevation.
- Two sites assessed in polygons mapped as FXCH and one site assessed in a polygon mapped as FXTT were determined to be FCAO. Mappers overestimated the degree of disturbance and underestimated the coverage of northern red oak at these sites.
- One site assessed in a polygon mapped as Central Appalachian White Pine-Hemlock Forest (FCWH) and one site assessed in a polygon mapped as Central Appalachian Hemlock-Hardwoods (FCHH) were determined to be FCAO. Mappers overestimated the coverage of pine and eastern hemlock at these sites.

Central Appalachian Oak - Hickory Forest (FAOH) Map Class

The producers' accuracy for the Central Appalachian Oak - Hickory Forest (FAOH) map class was 53%, with a 90% confidence interval of 38–67%. Of the 38 AA sites classified in the field as FAOH, 18 sites fell within polygons that were mapped as other vegetation types; the following is a list of attributed errors.

- Five sites assessed in polygons mapped as FCHW were determined to be FAOH. Mappers underestimated the coverage of oak at these sites.
- Three sites assessed in polygons mapped as FCAO, two sites assessed in polygons mapped as FCOH, one site assessed in a polygon mapped as FCOM, and one site assessed in a polygon mapped as FSCO were determined to be FAOH. Mappers overestimated the coverage of chestnut oak and underestimated the coverage of hickory at these sites.
- Two sites assessed in polygons mapped as FXTT and one site assessed in a polygon mapped as FXCH were determined to be FAOH. Mappers overestimated the degree of disturbance and underestimated the coverage of oak and hickory at these sites.

- One site assessed in a polygon mapped as FROH and one site assessed in a polygon mapped as Central Appalachian Northern Red Oak Forest (FCRO) were determined to be FAOH. Mappers modeled the understory composition as high-elevation based on field experience, mapping conventions, and vegetation descriptions; however, the map class was determined to more closely resemble low-elevation.
- One site assessed in a polygon mapped as Central Appalachian Pine - Oak Xeric Shale Woodland (WPOS) was determined to be FAOH. Mappers overestimated the coverage of yellow pine at the site and misinterpreted the bedrock morphology.

Central Appalachian Ruderal Hardwood Forest (FXCH) Map Class

The producers' accuracy for the Central Appalachian Ruderal Hardwood Forest (FXCH) map class was 33%, with a 90% confidence interval of 21–46%. Of the 45 AA sites classified in the field as FXCH, 30 sites fell within polygons that were mapped as other vegetation types; the following is a list of attributed errors.

- Five sites assessed in polygons mapped as FCHW, one site assessed in a polygon mapped as FOTM, and one site assessed in a polygon mapped as FNAH were determined to be FXCH. Mappers underestimated the degree of disturbance at these sites.
- Four sites assessed in polygons mapped as FCAS, two sites assessed in polygons mapped as Silver Maple - Hardwood Floodplain Forest (FMHF), and one site assessed in a polygon mapped as FAHS were determined to be FXCH. Mappers underestimated the degree of disturbance at these sites and assessed the sites as wetlands or floodplains rather than uplands.
- Three sites assessed in polygons mapped as FCNO, one site assessed in a polygon mapped as FSCO, one site assessed in a polygon mapped as FAOH, and one site assessed in a polygon mapped as Sugar Maple - Chinquapin Oak / Sedge Forest (FSMC) were determined to be FXCH. Mappers underestimated the degree of disturbance and overestimated the coverage of oaks at these sites.
- Three sites assessed in polygons mapped as FXOM were determined to be FXCH. Mappers overestimated the coverage of oaks at these disturbed sites.
- Three sites assessed in polygons mapped as FXTT were determined to be FXCH. Mappers overestimated the coverage of tuliptree at these disturbed sites.
- One site assessed in a polygon mapped as Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (WCRS) was determined to be FXCH. Mappers underestimated the degree of disturbance at these sites, misinterpreted the species in the canopy, and overestimated canopy cover at this site.
- One site assessed in a polygon mapped as Central Appalachian Hardwood-White Pine (FCHP) was determined to be FXCH. Mappers underestimated the degree of disturbance and overestimated of the coverage of eastern white pine (*Pinus strobus*) in the canopy at this site.
- One site assessed in a polygon mapped as Pin Oak Small River Floodplain Forest (FPOF) was determined to be FXCH. Mappers underestimated the degree of disturbance and overestimated the coverage of pin oak (*Quercus palustris*) at this site.

- One site assessed in a polygon mapped as Ash - Willow Floodplain Forest (FFAW) was determined to be FXCH. Mappers assessed this site as a disturbed floodplain forest rather than a disturbed upland forest.

Ruderal Northern Hardwood Forest (FXNH) Map Class

The producers' accuracy for the Ruderal Northern Hardwood Forest (FXNH) map class was 61%, with a 90% confidence interval of 49–74%. Of the 49 AA sites classified in the field as FXNH, 19 sites fell within polygons that were mapped as other vegetation types; the following is a list of attributed errors.

- Three sites assessed in polygons mapped as FXOM were determined to be FXNH. Mappers overestimated the coverage of oaks at these disturbed sites.
- Three sites assessed in polygons mapped as FAHS, two sites assessed in polygons mapped as FRHS, and one site assessed in a polygon mapped as FMHF were determined to be FXNH. Mappers underestimated the degree of disturbance at these sites and assessed these sites as wetlands or floodplains rather than uplands.
- Two sites assessed in polygons mapped as FNAH and one site assessed in a polygon mapped as FOTM were determined to be FXNH. Mappers underestimated the degree of disturbance at these sites.
- Two sites assessed in polygons mapped as Successional Heath Shrubland (SXHE) were determined to be FXNH. Mappers underestimated the tree cover at these disturbed sites.
- One site assessed in a polygon mapped as Northeastern Ruderal Red-cedar Forest (FXER) was determined to be FXNH. Mappers overestimated the coverage of eastern redcedar (*Juniperus virginiana*) at this site.
- One site assessed in a polygon mapped as FCNO was determined to be FXNH. Mappers underestimated the degree of disturbance and overestimated the coverage of oaks at this site.
- One site assessed in a polygon mapped as FXCH was determined to be FXNH. Mappers assessed the hardwood tree species composition incorrectly at this disturbed site.
- One site assessed in a polygon mapped as FXSF was determined to be FXNH. Mappers overestimated the coverage of red spruce at this disturbed site.
- One site assessed in a polygon mapped as Hardwood - Oak Talus Woodland (WHOT) was determined to be FXNH. Mappers underestimated the degree of disturbance at this site, misinterpreted the species in the canopy, and overestimated canopy cover at this site.

Northern Appalachian Hardwood Forest (FNAH) Map Class

The producers' accuracy for the Northern Appalachian Hardwood Forest (FNAH) map class was 58%, with a 90% confidence interval of 46–71%. Of the 48 AA sites classified in the field as FNAH, 20 sites fell within polygons that were mapped as other vegetation types; the following is a list of attributed errors.

- Four sites assessed in polygons mapped as FAHS, three sites assessed in polygons mapped as High-gradient Hardwood Floodplain Forest (FFHH), three sites assessed in polygons mapped as FRHS, and one site assessed in a polygon mapped as FMHF were determined to be FNAH. Mappers assessed these sites as wetlands or floodplains rather than uplands.
- Two sites assessed in polygons mapped as FXOM were determined to be FNAH. Mappers overestimated the degree of disturbance and the cover of oaks at these sites.
- Two sites assessed in polygons mapped as FCHH were determined to be FNAH. Mappers overestimated the coverage of eastern hemlock at these sites.
- One site assessed in a polygon mapped as Transitional Northern Hardwood - Red Spruce Forest (FTHS) was determined to be FNAH. Mappers overestimated the coverage of red spruce at this site.
- One site assessed in a polygon mapped as Ruderal Black Locust Forest (FXBL) was determined to be FNAH. Mappers overestimated the degree of disturbance and the coverage of black locust (*Robinia pseudoacacia*) at this site.
- One site assessed in a polygon mapped as FXNH was determined to be FNAH. Mappers overestimated the degree of disturbance at this site.
- One site assessed in a polygon mapped as FHHO was determined to be FNAH. Mappers overestimated the coverage of eastern hemlock and oak at this site.
- One site assessed in a polygon mapped as FFAW was determined to be FNAH. Mappers overestimated the degree of disturbance at this site and assessed this site as a floodplain rather than an upland.

Rich Hardwood Swamp Forest (FRHS) Map Class

The producers' accuracy for the Rich Hardwood Swamp Forest (FRHS) map class was 56%, with a 90% confidence interval of 38–73%. Of the 27 AA sites classified in the field as FRHS, 12 sites fell within polygons that were mapped as other vegetation types; the following is a list of attributed errors.

- Three sites assessed in polygons mapped as Hemlock - Spruce - Hardwood Forest (FHSH) and two sites assessed in polygons mapped as FHHO were determined to be FRHS. Mappers overestimated the coverage of eastern hemlock at these sites and assessed these sites as uplands rather than wetlands.
- Three sites assessed in polygons mapped as FAHS and two sites assessed in polygons mapped as FCMS were determined to be FRHS. Mappers assessed the species composition of these wetland forest sites incorrectly.
- One site assessed in a polygon mapped as FXSF was determined to be FRHS. Mappers incorrectly assessed the canopy species, the hydrology, and the degree of disturbance.

- One site assessed in a polygon mapped as FHHS was determined to be FRHS. Mappers overestimated the coverage of eastern hemlock in the canopy.

Low-Elevation Spruce - Fir Forest (FLSF) Map Class

The producers' accuracy for the FLSF map class was 57%, with a 90% confidence interval of 37–77%. Of the 21 AA sites (this map class was insufficiently sampled during AA) classified in the field as FLSF, 9 sites fell within polygons that were mapped as other vegetation types; the following is a list of attributed errors.

- Four sites assessed in polygons mapped as FMSS were determined to be FLSF. Mappers assessed these sites as wetlands rather than uplands.
- Two sites assessed in polygons mapped as FCMS and one site assessed in a polygon mapped as FRHS were determined to be FLSF. Mappers underestimated the coverage of red spruce and assessed these sites as wetlands rather than uplands.
- One site assessed in a polygon mapped as Montane Balsam Fir - Birch Forest (FMFB) was determined to be FLSF. Mappers overestimated the coverage of balsam fir (*Abies balsamea*) at this site.
- One site assessed in a polygon mapped as FPHS was determined to be FLSF. Mappers overestimated the coverage of eastern hemlock and eastern white pine at this site.

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Appendix A: Vegetation Plot Sampling Form

NPS Appalachian Trail Plot Sampling Form **Page 1**

County: _____ **Plot Code:** _____ **State:** _____ **Location org: NPS**

Provisional community name_____

*Classified community name*_____

Classifier _____ *Date*_____ *NVC ELCODE*_____

Survey date:_____ **time** ____:_____ **Surveyors names:**_____

Directions to plot (including any notes on best access route, and mile marker):

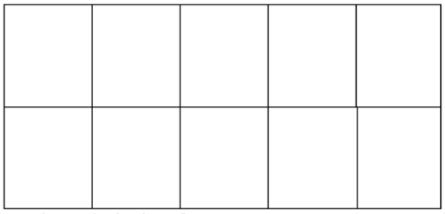
Time taken to walk to plot:

PLOT CONFIGURATION (Depict the plot layout on right with respect to the surrounding area and attempt to draw in points where GPS positions were collected, witness tree, bearing of centerline, locations of pictures taken, and communities near the plot.)

Plot representativeness -Is the surrounding area all the same? ____YES ____ NO - If not, depict below)

PLOT LOCATION (Below show general plot location)

Plot dimensions: _____ m X _____ m



___ degrees = bearing of centerline

Est. Extent of occurrence of community:

<1HA 1-10 HA 10-100HA >100HA

PIC #_____ **Description of pictures (N,E,S & W from GPS point at middle of plot) :**_____

Select one: UTM / Lat/long (If lat/long, then values are _____ N _____ W

GPS Techniques/Equipment: ____Garmin V_____ **Datum(pick one)** WGS84 / NAD83 / NAD27 UTM Zone: _____

GPS Unit ID _____ **GPS file name** ___ ___ ___ ___ ___ ___ (standard = First letter(s) of park + # of plot (e.g. CH04, CL04, MO04)

Field UTM X ___ ___ ___ ___ ___ ___ **m E Y** ___ ___ ___ ___ ___ ___ ___ **m N Elevation** _____ **m / ft**

Averaging performed (at least 120 observations)? _____ **Coordinate accuracy** _____ **m / ft DOP** _____ **# sats** _____

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NPS Appalachian Trail Plot Sampling Form **Page 2**

County: _____ **Plot Code:** _____ **State:** _____ **Location org: NPS**

ENVIRONMENTAL / SITE INFORMATION

Measured Slope _____ ° _____ %

__ Flat	0 °	0 %
__ Gentle	0-5 °	1-9%
__ Moderate	6-14 °	10-25%
__ Somewhat steep	15-25 °	26-49%
__ Steep	27-45 °	50-100%
__ Very steep	45-69 °	101-275%
__ Abrupt	70-100 °	276-300
__ ovrhng/shltrd	>100 °	>300%

Measured Aspect _____ ° (N=0 °)

__ Flat		__ SE	113-157 °
__ Variable		__ S	158-202 °
__ N	338-22 °	__ SW	203-247 °
__ NE	23-67 °	__ W	248-292 °
__ E	68-112 °	__ NW	293-337 °

Topographic Position
__ Interfluve (Ridge/summit/crest) __ Toeslope
__ High Slope (upper/convex slope) __ Low level (terrace)
__ Midslope __ Channel bed
__ Lowslope (lower/footslope) __ Basin Floor

Cowardin System
__ Upland __ Palustrine
__ Estuarine __ Lacustrine __ Riverine

Landform (check most applicable)

__ Alluvial flat	__ Depression	__ Saddle
__ Alluvial terrace	__ Draw	__ Seep
__ Basin floor	__ Floodplain	__ Stream terrace
__ Bank	__ Gorge	__ Talus
__ Bottomlands	__ Gap	__ Valley floor
__ Cliff	__ Interfluve	
__ Colluvial slope	__ Midslope	
__ Cove	__ Ravine	
	__ Ridge	

Rock types present:

Hydrologic Regime:
__ Not a wetland (Upland: XERIC : DRY - MESIC : MESIC)
__ Intermittently flooded __ Permanently flooded __ Semipermanently flooded __ Temporarily Flooded (e.g. floodplains) __ Tidally Flooded
__ Seasonally Flooded (e.g. seasonal ponds) __ Saturated (e.g. bogs, perennial seeps) __ Unknown __ Irregularly flooded __ Irrglrly exposed

QUALITATIVE ASSESSMENT:

A) Environmental comments:

B) Landscape comments:

Soil Texture:
__ Sand __ Peat __ Silt loam __Muck
__ Sandy loam __ Loam __ Clay loam __Clay

Drainage:
__ Rapidly drained __ Moderately well drained __Somewhat poorly drained
__ Well drained __ Poorly drained __ Very poorly drained

Ground cover [Exclusive of living plants; adds to 100%]

_____% Bedrock	_____% Litter. duff	_____% Other _____
_____% Large rocks (cobbles, boulders >10cm)	_____% Wood (> 1 cm)	
_____% Small rocks (gravel, 0.2-10 cm)	_____% Water	
_____% Loose sand (0.1-2 mm)	_____% Bare soil	

Leaf type:
__Broad-leaved __ Succulent
__Needle-leaved __ Mixed
__Microphyllous
__Graminoid
__Broad-leaved herbaceous
__Pteridophyte
__Extremely xeromorphic

Leaf phenology (dominant stratum)
__ Evergreen
__ Cold-deciduous
__ Drought-deciduous
__ Mixed evergreen-cold-deciduous
__ Mixed evergreen drought deciduous
__ Herb - Annual
__ Herb - Perennial

Physiognomic Class
__ Forest (closed tree canopy)
__ Woodland (open tree canopy)
__ Shrubland
__ Dwarf Shrubland
__ Herbaceous (less than 25% woody layers)
__ Nonvascular
__ Sparse Vegetation

Natural and Anthropogenic Disturbance

_ logging	_ fire	_ Hydrologic
_ erosion	_ trails/roads	_ Agriculture
_ grazing/browsing	_ wind/ice damage	_ Old Growth
_ pine bark beetle	_ exotic plants	_ Fire Suppression
_ dogwood anthr	_ ORV	_ Hemlock/Fir Adelgid

Disturbance and animal use comments:

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NPS Appalachian Trail Plot Sampling Form **Page 3**

County: _____ **Plot Code:** _____ **State:** _____ **Location org: NPS**

QUANTITATIVE VEGETATION SAMPLE **"DEFAULT" TAXONOMIC REFERENCE:** _____

STRATA	STRATA HEIGHT (1 only)	%COVER	DOMINANT/DIAGNOSTIC SPECIES	Height scale (use tallest one for strata)	% cover for strata = top of cover class
Emergent – T1				< .5m 1	5%
Tree Canopy T2				.5-1m 2	10%
Subcanopy T3				1-2m 3	20%
Tall shrub S1				2-5m 4	30%
Short shrub S2				5-10m 5	40%
Herbaceous				10-15m 6	50%
Non-vascular				15-20m 7	60%
Vine/liana				20-35m 8	70%
Other notable species (indicators of distinctive conditions, e.g. high pH soil, elevation, geographic region, other particularly abundant species):				35-50m 9	80%
				>50m 10	90%
					100%

***T1**: Emergent \ **T2**: Tree Canopy \ **T3** Subcanopy \ **S1** Tall Shrub (>1m; to 5m) \ **S2** Short Shrub (< 1m) \ **H** Herbaceous \ **N** Nonvascular \ **V** Vines (lianas) \ **E** Epiphytes*

SPECIES COMPOSITION AND COVER/ABUNDANCE CLASS BY STRATUM (enter cover values for each stratum AND for Total cover)

T 1	T 2	T 3	S 1	S 2	H	N	V	E	Total Cover	Name (7 letter code or full name)	Collected? Spec #?	Discarded ?

Cover cls
1 trace
2 0.1-1%
3 1-2%
4 2-5%
5 5-10%
6 10-25%
7 25-50%
8 50-75%
9 75-95%
10 >95%

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NPS Appalachian Trail Plot Sampling Form **Page 4**

County: ____________________ **Plot Code:** ___________ **State:** _______ **Location org: NPS**

SPECIES COMPOSITION AND COVER/ABUNDANCE CLASS BY STRATUM

T 1	T 2	T 3	S 1	S 2	H	N	V	E	Total cover	Name (7 letter acronym or full name)	Collected? Spec #?	Discarded?

Use bottom of this sheet or additional pages for other species in plot

Cover classes
1. trace
2. 0.1-1%
3. 1-2%
4. 2-5%
5. 5-10%
6. 10-25%
7. 25-50%
8. 50-75%
9. 75-95%
10. >95%

T1: Emergent
T2: Tree Can
T3 Subcanopy
S1 Tall Shrub (>1m; to 5m)
S2 Short Shrub (< 1m)
H Herbaceous
N Nonvascular
V Vines (lianas)
E Epiphytes

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Appendix B: Vegetation Classification by U.S. National Vegetation Classification

Explanation of Vegetation-Classification Table

Table B–1 lists the vegetation classification for the Appalachian National Scenic Trail vegetation mapping project for the National Park Service Vegetation Mapping Inventory Program. The vegetation classification is a subset from the U.S. National Vegetation Classification (USNVC) with classification names, codes, and hierarchy that reflects USNVC Database (2016). For a listing of the vegetation classification with the map classification assignments, see "Appendix H: Map Classification by U.S. National Vegetation Classification."

Table B–1. Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
1. FOREST & WOODLAND CLASS
1.B. Temperate & Boreal Forest & Woodland Subclass
1.B.2. Cool Temperate Forest & Woodland Formation
1.B.2.Na. Eastern North American Forest & Woodland Division
M883. Appalachian-Interior-Northeastern Mesic Forest Macrogroup
G742. Appalachian-Allegheny Northern Hardwood - Conifer Forest Group
A3301 *Acer saccharum* - *Fagus grandifolia* - *Tilia americana* Forest Alliance
CEGL006632 *Acer saccharum* - *Fagus grandifolia* - *Fraxinus americana* / *Arisaema triphyllum* Forest Association
CEGL006459 *Acer saccharum* - *Fraxinus americana* / *Carpinus caroliniana* / *Podophyllum peltatum* Forest Association
CEGL006637 *Acer saccharum* - *Tilia americana* / *Acer pensylvanicum* / *Caulophyllum thalictroides* Forest Association
A4126 *Acer saccharum* - *Tilia americana* - *Quercus rubra* Rocky Forest Alliance
CEGL006577 *Acer saccharum* - *Fraxinus americana* - *Juglans cinerea* / *Staphylea trifolia* / *Adlumia fungosa* Forest Association
CEGL006471 *Acer saccharum* - *Tilia americana* / *Staphylea trifolia* / *Dryopteris marginalis* - (*Impatiens pallida*) Forest Association
CEGL008502 *Betula alleghaniensis* - *Quercus rubra* / *Acer spicatum* / *Dryopteris intermedia* - *Oclemena acuminata* Forest Association
CEGL008528 *Tilia americana* - *Fraxinus americana* / *Acer pensylvanicum* / *Parthenocissus quinquefolia* - *Impatiens pallida* Woodland Association
A0266 *Betula alleghaniensis* - *Aesculus flava* Forest Alliance
CEGL008558 *Acer rubrum* var. *rubrum* - *Betula lenta* - *Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Ruderal Forest Association
CEGL004973 *Aesculus flava* - *Betula alleghaniensis* - *Acer saccharum* / *Caulophyllum thalictroides* - *Actaea podocarpa* Forest Association
CEGL007861 *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest Association
CEGL007285 *Betula alleghaniensis* - *Fagus grandifolia* / *Viburnum lantanoides* / *Eurybia chlorolepis* - *Dryopteris intermedia* Forest Association
CEGL004982 *Betula alleghaniensis* - *Tilia americana* var. *heterophylla* / *Acer spicatum* / *Ribes cynosbati* / *Dryopteris marginalis* Forest Association
CEGL006124 *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest Association
CEGL008504 *Betula alleghaniensis* / *Sorbus americana* - *Acer spicatum* / *Polypodium appalachianum* Forest Association
CEGL006130 *Fagus grandifolia* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest Association
A3303 *Quercus rubra* - *Acer saccharum* - *Betula lenta* Forest Alliance
CEGL006046 *Acer saccharum* - *Quercus rubra* / *Hepatica nobilis* var. *obtusa* Forest Association
CEGL006125 *Quercus rubra* - *Acer saccharum* - *Liriodendron tulipifera* Forest Association
CEGL008517 *Quercus rubra* - *Acer saccharum* / *Ostrya virginiana* / *Cardamine concatenata* Forest Association
CEGL006635 *Quercus rubra* - *Acer saccharum* / *Viburnum acerifolium* - *Lindera benzoin* Forest Association
CEGL006000 *Quercus rubra* - *Betula alleghaniensis* / *Osmunda cinnamomea* Forest Association
CEGL006566 *Quercus rubra* - *Tsuga canadensis* - *Liriodendron tulipifera* / *Hamamelis virginiana* Forest Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
A3302 *Tsuga canadensis - Betula lenta - Betula alleghaniensis* Forest Alliance
CEGL006019 *Pinus strobus - Tsuga canadensis* / *Acer pensylvanicum* / *Polystichum acrostichoides* Forest Association
CEGL006328 *Pinus strobus - Tsuga canadensis* Lower New England-Northern Piedmont Forest Association
CEGL006639 *Tsuga canadensis - Acer saccharum - Fagus grandifolia* / *Dryopteris intermedia* Forest Association
CEGL006206 *Tsuga canadensis - Betula alleghaniensis - Prunus serotina* / *Rhododendron maximum* Forest Association
CEGL006088 *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest Association
G020. Appalachian-Central Interior Mesic Forest Group
A2033 *Fagus grandifolia - Liriodendron tulipifera - Carya cordiformis* Forest Alliance
CEGL006296 *Fagus grandifolia - Betula lenta - Liriodendron tulipifera - Acer saccharum* Forest Association
CEGL006186 *Liriodendron tulipifera - Quercus rubra - Fraxinus americana* / *Asimina triloba* / *Actaea racemosa* Forest Association
A0235 *Liriodendron tulipifera - Tilia americana* var. *heterophylla - Aesculus flava* Forest Alliance
CEGL006237 *Acer saccharum - Fraxinus americana - Tilia americana - Liriodendron tulipifera* / *Actaea racemosa* Forest Association
CEGL007695 *Aesculus flava - Acer saccharum* - (*Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense - Solidago flexicaulis* Forest Association
CEGL007710 *Liriodendron tulipifera - Fraxinus americana* - (*Aesculus flava*) / *Actaea racemosa - Laportea canadensis* Forest Association
CEGL007878 *Quercus rubra - Tilia americana* var. *heterophylla* - (*Halesia tetraptera* var. *monticola*) / *Collinsonia canadensis - Prosartes lanuginosa* Forest Association
CEGL006472 *Tilia americana* var. *heterophylla - Aesculus flava - Acer saccharum* / *Cystopteris bulbifera - Asarum canadense* Forest Association
A3304 *Tsuga canadensis - Liriodendron tulipifera* Forest Alliance
CEGL007543 *Liriodendron tulipifera - Betula lenta - Tsuga canadensis* / *Rhododendron maximum* Forest Association
CEGL008405 *Liriodendron tulipifera - Pinus strobus* - (*Tsuga canadensis*) / *Carpinus caroliniana* / *Amphicarpaea bracteata* Forest Association
CEGL006304 *Liriodendron tulipifera - Pinus strobus - Tsuga canadensis - Quercus rubra* / *Polystichum acrostichoides* Forest Association
CEGL007102 *Pinus strobus - Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest Association
CEGL003819 *Rhododendron maximum* Upland Scrub Association
CEGL007693 *Tsuga canadensis - Halesia tetraptera - Magnolia fraseri* / *Rhododendron maximum* / *Dryopteris intermedia* Forest Association
CEGL006923 *Tsuga canadensis - Quercus prinus - Betula lenta* Forest Association
CEGL008512 *Tsuga canadensis - Quercus prinus - Liriodendron tulipifera* / *Kalmia latifolia* - (*Rhododendron catawbiense*) Forest Association
M502. Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland Macrogroup
G015. Appalachian Oak / Chestnut Forest Group
A4128 *Pinus strobus - Quercus alba* Allegheny Forest & Woodland Alliance
CEGL006293 *Pinus strobus - Quercus* (*rubra*, *velutina*) - *Fagus grandifolia* Forest Association
A2080 *Pinus strobus - Quercus prinus* Appalachian Forest Alliance
CEGL007519 *Pinus strobus - Quercus* (*coccinea*, *prinus*) / (*Gaylussacia ursina*, *Vaccinium stamineum*) Forest Association
CEGL007517 *Pinus strobus - Quercus alba* - (*Carya alba*) / *Gaylussacia ursina* Forest Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
CEGL008539 *Pinus strobus* - *Quercus alba* - *Quercus prinus* / *Vaccinium stamineum* Forest Association
CEGL006454 *Quercus* (*rubra*, *velutina*, *alba*) - *Betula lenta* - (*Pinus strobus*) Forest Association
A0248 *Quercus prinus* - *Quercus coccinea* Forest Alliance
CEGL006271 *Quercus* (*prinus*, *coccinea*) / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest Association
CEGL006299 *Quercus prinus* - (*Quercus coccinea*, *Quercus rubra*) / *Kalmia latifolia* / *Vaccinium pallidum* Forest Association
CEGL006282 *Quercus prinus* - *Quercus* (*rubra*, *velutina*) / *Vaccinium* (*angustifolium*, *pallidum*) Forest Association
CEGL008524 *Quercus prinus* / *Rhododendron catawbiense* - *Kalmia latifolia* Forest Association
A0250 *Quercus prinus* - *Quercus rubra* Forest Alliance
CEGL007267 *Quercus prinus* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest Association
CEGL006057 *Quercus prinus* - *Quercus rubra* / *Hamamelis virginiana* Forest Association
CEGL006286 *Quercus prinus* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest Association
CEGL008523 *Quercus prinus* - *Quercus rubra* / *Vaccinium pallidum* - (*Rhododendron periclymenoides*) Forest Association
CEGL004817 *Quercus rubra* - *Quercus prinus* - *Magnolia* (*acuminata*, *fraseri*) / *Acer pensylvanicum* Forest Association
CEGL003890 *Vitis aestivalis* Vine-Scrub Association
A3116 *Quercus rubra* - *Quercus alba* Montane Forest Alliance
CEGL008506 *Quercus rubra* - (*Quercus alba*) / *Ilex montana* / *Dennstaedtia punctilobula* - *Lysimachia quadrifolia* Forest Association
CEGL007299 *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*) / *Galax urceolata* Forest Association
CEGL007300 *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest Association
CEGL007298 *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest Association
A0624 *Quercus rubra* - *Quercus prinus* Woodland Alliance
CEGL006565 *Betula lenta* - *Quercus prinus* / *Parthenocissus quinquefolia* Woodland Association
CEGL006640 *Carya glabra* Woodland Association
CEGL008526 *Quercus prinus* / *Quercus ilicifolia* / *Danthonia spicata* Woodland Association
CEGL006074 *Quercus prinus* / *Rhus* spp. / *Deschampsia flexuosa* Woodland Association
CEGL006134 *Quercus rubra* - (*Quercus prinus*) / *Vaccinium* spp. / *Deschampsia flexuosa* Woodland Association
CEGL006585 *Quercus rubra* - *Betula lenta* / *Polypodium virginianum* Woodland Association
A2048 *Quercus velutina* - *Quercus alba* Eastern Forest Alliance
CEGL006018 *Quercus* (*velutina*, *alba*) / *Vaccinium pallidum* / *Pteridium aquilinum* High Allegheny Plateau, Western Allegheny Plateau Forest Association
CEGL008521 *Quercus alba* - *Quercus* (*coccinea*, *velutina*, *prinus*) / *Gaylussacia baccata* Forest Association
CEGL007691 *Quercus alba* - *Quercus coccinea* - *Quercus falcata* / *Kalmia latifolia* - *Vaccinium pallidum* Forest Association
G016. Northeastern Chinquapin Oak - Red-cedar Alkaline Forest & Woodland Group
A3107 *Juniperus virginiana* - *Fraxinus americana* - *Carya* spp. Woodland Alliance
CEGL006037 *Juniperus virginiana* - *Fraxinus americana* / *Carex pensylvanica* - *Cheilanthes lanosa* Open Woodland Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
CEGL006002 *Juniperus virginiana - Fraxinus americana* / *Danthonia spicata - Poa compressa* Woodland Association
A2047 *Quercus muehlenbergii - Acer saccharum - Tilia americana* Forest Alliance
CEGL006162 *Acer saccharum - Quercus muehlenbergii* / *Carex platyphylla* Forest Association
CEGL006017 *Acer saccharum - Quercus muehlenbergii* / *Cercis canadensis* Forest Association
G650. Northeastern Oak - Hickory Forest & Woodland Group
A2053 *Quercus alba - Carya* spp. - *Fraxinus americana* Forest Alliance
CEGL003683 *Fraxinus americana - Carya glabra* / *Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland Association
CEGL006336 *Quercus* (*alba*, *rubra*, *velutina*) - *Carya* spp. / *Viburnum acerifolium* Forest Association
CEGL008515 *Quercus alba - Quercus prinus - Carya glabra* / *Cornus florida* / *Vaccinium pallidum* Forest Association
CEGL008516 *Quercus prinus - Quercus rubra - Carya ovalis* / *Carex pensylvanica* - (*Calamagrostis porteri*) Forest Association
CEGL006301 *Quercus rubra - Carya* (*glabra*, *ovata*) / *Ostrya virginiana* / *Carex lucorum* Forest Association
CEGL008518 *Quercus rubra - Carya ovata - Fraxinus americana* / *Actaea racemosa - Hydrophyllum virginianum* Forest Association
CEGL008514 *Quercus rubra - Quercus prinus - Carya ovalis* / (*Cercis canadensis*) / *Solidago caesia* Forest Association
G161. Pitch Pine Barrens Group
A0524 *Pinus rigida* Woodland Alliance
CEGL006116 *Pinus rigida* / (*Quercus ilicifolia*) / *Photinia melanocarpa* / *Deschampsia flexuosa* Woodland Association
G162. Virginia Pine - Table Mountain Pine Woodland & Barrens Group
A0677 *Pinus pungens - Pinus rigida* - Quercus prinus Woodland Alliance
CEGL004996 *Pinus* (*pungens*, *rigida*) - *Quercus prinus* / (*Quercus ilicifolia*) / *Gaylussacia baccata* Woodland Association
CEGL007097 *Pinus pungens - Pinus rigida* - (*Quercus prinus*) / *Kalmia latifolia - Vaccinium pallidum* Woodland Association
A3312 *Pinus virginiana - Quercus prinus* Acidic Shale Woodland Alliance
CEGL008525 *Pinus virginiana - Quercus prinus* / *Quercus ilicifolia* / (*Hieracium greenii*, *Viola pedata*) Woodland Association
CEGL003624 *Pinus virginiana* / *Vaccinium pallidum* / *Schizachyrium scoparium - Carex pensylvanica* Woodland Association
CEGL008540 *Quercus prinus - Pinus virginiana* - (*Pinus pungens*) / *Schizachyrium scoparium - Dichanthelium depauperatum* Woodland Association
A0144 *Tsuga caroliniana* Woodland Alliance
CEGL006178 *Tsuga caroliniana - Pinus* (*rigida*, *pungens*, *virginiana*) Forest Association
CEGL007139 *Tsuga caroliniana* / *Kalmia latifolia - Rhododendron catawbiense* Forest Association
M013. Eastern North American Ruderal Forest Macrogroup
G032. Eastern North American Exotic Ruderal Forest Group
A3230 *Acer platanoides - Ailanthus altissima - Pinus* spp. Exotic Ruderal Forest Alliance
CEGL007191 *Ailanthus altissima* Ruderal Forest Association
G030. Eastern North American Native Ruderal Forest Group
A3229 *Acer rubrum - Prunus serotina - Pinus strobus* Ruderal Forest Alliance
CEGL006628 *Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest Association
CEGL008503 *Betula lenta - Acer rubrum* / *Lycopodium annotinum - Dennstaedtia punctilobula* Ruderal Forest Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
CEGL006303 *Populus* (*tremuloides*, *grandidentata*) - *Betula* (*populifolia*, *papyrifera*) Ruderal Woodland Association
CEGL006599 *Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana* - (*Robinia pseudoacacia*) Ruderal Forest Association
CEGL006506 *Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest Association
A3227 *Juniperus virginiana - Pinus virginiana - Pinus echinata* Ruderal Forest Alliance
CEGL006024 *Juniperus virginiana* Ruderal Forest Association
CEGL007944 *Pinus strobus* Ruderal Forest Association
CEGL002591 *Pinus virginiana* Ruderal Forest Association
A3228 *Liriodendron tulipifera - Juglans nigra - Robinia pseudoacacia* Ruderal Forest Alliance
CEGL004184 *Crataegus punctata - Crataegus flabellata* Ruderal Forest Association
CEGL007879 *Juglans nigra* / *Verbesina alternifolia* Ruderal Forest Association
CEGL007219 *Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia* Ruderal Forest Association
CEGL007221 *Liriodendron tulipifera - Quercus* spp. Ruderal Forest Association
CEGL007220 *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Ruderal Forest Association
CEGL007279 *Robinia pseudoacacia* Ruderal Forest Association
M014. Laurentian-Acadian Mesic Hardwood - Conifer Forest Macrogroup
G632. Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest Group
A0136 *Picea rubens - Abies fraseri* Forest Alliance
CEGL006308 *Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest Association
CEGL006049 *Abies fraseri* / *Viburnum lantanoides* / *Dryopteris campyloptera* - Oxalis montana / *Hylocomium splendens* Forest Association
CEGL007130 *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest Association
CEGL007131 *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Dryopteris campyloptera* / *Hylocomium splendens* Forest Association
A0138 *Picea rubens - Betula alleghaniensis - Aesculus flava* Forest Alliance
CEGL004983 *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron* (*maximum*, *catawbiense*) Forest Association
CEGL006256 *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Solidago glomerata* Forest Association
CEGL006152 *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest Association
G743. Laurentian-Acadian Hardwood Forest Group
A3224 *Acer saccharum - Fagus grandifolia - Betula alleghaniensis* Forest Alliance
CEGL006631 *Acer saccharum - Betula alleghaniensis - Fagus grandifolia* / *Viburnum lantanoides* Forest Association
A3240 *Acer saccharum - Tilia americana - Fraxinus americana* Forest Alliance
CEGL006211 *Acer saccharum* - (*Fraxinus americana*) / *Arisaema triphyllum* Forest Association
CEGL006636 *Acer saccharum - Fraxinus americana* / *Acer spicatum* / *Caulophyllum thalictroides* Forest Association
A3297 *Acer saccharum - Tilia americana* Limestone Woodland Alliance
CEGL005058 *Acer saccharum - Tilia americana - Fraxinus americana* / *Ostrya virginiana* / *Geranium robertianum* Woodland Association
A3241 *Quercus rubra - Acer saccharum* Forest Alliance
CEGL006584 *Betula alleghaniensis - Quercus rubra* / *Polypodium virginianum* Woodland Association
CEGL006633 *Quercus rubra - Acer saccharum - Fagus grandifolia* / *Viburnum acerifolium* Forest Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
G741. Laurentian-Acadian Hemlock - White Pine - Hardwood Forest Group
A3251 *Pinus strobus* - *Tsuga canadensis* Forest Alliance
CEGL006324 *Pinus strobus* - *Tsuga canadensis* - *Picea rubens* Forest Association
A4072 *Tsuga canadensis* - *Betula alleghaniensis* - *Acer saccharum* Forest Alliance
CEGL005005 *Acer saccharum* - *Pinus strobus* / *Acer pensylvanicum* Forest Association
CEGL006129 *Tsuga canadensis* - (*Betula alleghaniensis*) - *Picea rubens* / *Cornus canadensis* Forest Association
CEGL006638 *Tsuga canadensis* - *Betula alleghaniensis* - *Acer saccharum* / *Dryopteris intermedia* Forest Association
G744. Northern Appalachian-Acadian Red Spruce - Fir - Hardwood Forest Group
A0150 *Picea rubens* - *Abies balsamea* Forest Alliance
CEGL006112 *Abies balsamea* - (*Betula papyrifera* var. *cordifolia*) Forest Association
CEGL006267 *Betula alleghaniensis* - *Picea rubens* / *Dryopteris campyloptera* Forest Association
CEGL006273 *Picea rubens* - *Abies balsamea* - *Betula papyrifera* Forest Association
CEGL006505 *Picea rubens* - *Abies balsamea* - *Betula* spp. - *Acer rubrum* Forest Association
CEGL006128 *Picea rubens* - *Abies balsamea* / *Sorbus americana* Forest Association
CEGL006250 *Picea rubens* / *Ribes glandulosum* Woodland Association
A3314 *Picea rubens* / *Vaccinium angustifolium* Northern Rocky Woodland Alliance
CEGL006053 *Picea rubens* / *Vaccinium angustifolium* / *Sibbaldiopsis tridentata* Woodland Association
M159. Laurentian-Acadian Pine - Hardwood Forest & Woodland Macrogroup
G025. Laurentian-Acadian Pine - Oak Forest & Woodland Group
A3238 *Pinus banksiana* - *Pinus resinosa* - *Quercus ellipsoidalis* Forest & Woodland Alliance
CEGL006041 *Pinus banksiana* / *Kalmia angustifolia* - *Vaccinium* spp. Woodland Association
A4127 *Pinus strobus* - *Pinus resinosa* - *Quercus rubra* Forest & Woodland Alliance
CEGL006253 *Pinus strobus* - *Pinus resinosa* / *Cornus canadensis* Forest Association
M016. Southern & South-Central Oak - Pine Forest & Woodland Macrogroup
G601. Chinquapin Oak - Shumard Oak - Blue Ash Alkaline Forest & Woodland Group
A3274 *Fraxinus americana* - *Carya glabra* - *Juniperus virginiana* Piedmont-Appalachian Woodland Alliance
CEGL003752 *Carya* (*glabra*, *alba*) - *Fraxinus americana* - (*Juniperus virginiana* var. *virginiana*) Woodland Association
G165. Piedmont-Central Atlantic Coastal Plain Oak Forest Group
A3293 *Quercus rubra* - *Quercus alba* - *Carya* spp. Piedmont Forest Alliance
CEGL007230 *Quercus alba* - *Quercus* (*rubra*, *prinus*) / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest Association
CEGL007233 *Quercus alba* - *Quercus rubra* - *Carya ovalis* / *Acer saccharum* / *Polystichum acrostichoides* Forest Association
CEGL007692 *Quercus alba* - *Quercus rubra* - *Quercus prinus* / *Collinsonia canadensis* - *Podophyllum peltatum* Forest Association
CEGL006192 *Quercus rubra* - *Acer rubrum* / *Pyrularia pubera* / *Thelypteris noveboracensis* Forest Association
G012. Shortleaf Pine - Oak Forest & Woodland Group
A3269 *Pinus echinata* - *Pinus pungens* - *Quercus prinus* Appalachian Woodland Alliance
CEGL008500 *Pinus virginiana* - (*Pinus rigida*, *Pinus pungens*) / *Schizachyrium scoparium* Forest Association
CEGL007119 *Pinus virginiana* - *Pinus* (*rigida*, *echinata*) - (*Quercus prinus*) / *Vaccinium pallidum* Forest Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
G159. South-Central Interior Oak Forest & Woodland Group
A3289 *Quercus prinus* - *Quercus falcata* Forest Alliance
CEGL007720 *Quercus prinus* - *Juniperus virginiana* - (*Pinus virginiana*) / *Philadelphus hirsutus* - *Celtis occidentalis* Woodland Association
1.B.3. Temperate Flooded & Swamp Forest Formation
1.B.3.Na. Eastern North American-Great Plains Flooded & Swamp Forest Division
M029. Central Hardwood Floodplain Forest Macrogroup
G652. Silver Maple - Green Ash - Sycamore Floodplain Forest Group
A3710 *Acer saccharinum* - *Populus deltoides* Floodplain Forest Alliance
CEGL006147 *Acer saccharinum* - (*Populus deltoides*) / *Matteuccia struthiopteris* - *Laportea canadensis* Floodplain Forest Association
CEGL002586 *Acer saccharinum* - *Fraxinus pennsylvanica* - *Ulmus americana* Floodplain Forest Association
CEGL006629 *Salix nigra* - (*Populus deltoides*) Floodplain Forest Association
G673. Silver Maple - Sugarberry - Sweetgum Floodplain Forest Group
A3697 *Acer saccharinum* - *Acer negundo* Appalachian-Piedmont Floodplain Forest Alliance
CEGL006217 *Acer saccharinum* - *Acer negundo* / *Ageratina altissima* - *Laportea canadensis* - (*Elymus virginicus*) Floodplain Forest Association
A3699 *Betula nigra* - *Platanus occidentalis* Appalachian-Piedmont Floodplain Forest Alliance
CEGL003896 *Platanus occidentalis* - *Betula nigra* - *Salix* (*caroliniana*, *nigra*) Floodplain Forest Association
A3701 *Platanus occidentalis* - *Fraxinus pennsylvanica* - *Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance
CEGL006575 *Fraxinus pennsylvanica* - (*Juglans nigra*, *Platanus occidentalis*) Floodplain Forest Association
CEGL006255 *Liriodendron tulipifera* - *Platanus occidentalis* - *Betula lenta* / *Lindera benzoin* / *Circaea lutetiana* ssp. *canadensis* Floodplain Forest Association
CEGL004073 *Platanus occidentalis* - *Acer negundo* - *Juglans nigra* / *Asimina triloba* / *Mertensia virginica* Floodplain Forest Association
A3702 *Platanus occidentalis* - *Liquidambar styraciflua* - *Liriodendron tulipifera* Southern Appalachian Floodplain Forest Alliance
CEGL004691 *Platanus occidentalis* - *Liriodendron tulipifera* - (*Betula alleghaniensis*) / *Alnus serrulata* - *Leucothoe fontanesiana* Floodplain Forest Association
M503. Central Hardwood Swamp Forest Macrogroup
G597. Central Hardwood Flatwoods & Swamp Forest Group
A3408 *Quercus palustris* - *Quercus bicolor* Flooded & Swamp Forest Alliance
CEGL006185 *Quercus palustris* - *Acer rubrum* / *Carex grayi* - *Geum canadense* Wet Forest Association
G044. Central Interior-Appalachian Seepage Swamp Group
A3358 *Acer rubrum* / *Alnus serrulata* - *Ilex verticillata* Appalachian-Piedmont Seepage Forest Alliance
CEGL007853 *Acer rubrum* - *Nyssa sylvatica* / *Ilex verticillata* - *Vaccinium fuscatum* / *Osmunda cinnamomea* Seep Forest Association
CEGL007443 *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Osmunda cinnamomea* - *Carex intumescens* / *Sphagnum lescurii* Seep Forest Association
CEGL007565 *Tsuga canadensis* - *Acer rubrum* - (*Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Seep Forest Association
G667. Northeastern Forest Vernal Pool Group
A3686 Eastern North American Vernal Pool Alliance
CEGL006453 Eastern Woodland Vernal Pool Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
M504. Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest Macrogroup
G045. Laurentian-Acadian-Appalachian Acidic Swamp Group
A3706 *Acer rubrum - Fraxinus pennsylvanica* Northeastern Swamp Forest Alliance
CEGL006406 *Acer rubrum - Fraxinus* (*pennsylvanica*, *americana*) / *Lindera benzoin* / *Symplocarpus foetidus* Swamp Forest Association
CEGL008416 *Acer rubrum - Fraxinus nigra - Betula alleghaniensis* / *Veratrum viride - Carex bromoides* Seep Forest Association
CEGL006220 *Acer rubrum* / *Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest Association
A2058 *Acer rubrum - Nyssa sylvatica* Swamp Forest Alliance
CEGL006014 *Acer rubrum - Nyssa sylvatica - Betula alleghaniensis* / *Sphagnum* spp. Swamp Forest Association
A0653 *Acer rubrum* Swamp Woodland Alliance
CEGL006119 *Acer rubrum* / *Carex stricta - Onoclea sensibilis* Wet Woodland Association
A3416 *Betula alleghaniensis - Tsuga canadensis* Swamp Forest Alliance
CEGL006380 *Betula alleghaniensis - Acer rubrum* - (*Tsuga canadensis*, *Abies balsamea*) / *Osmunda cinnamomea* Swamp Forest Association
CEGL006226 *Tsuga canadensis - Betula alleghaniensis* / *Ilex verticillata* / *Sphagnum* spp. Swamp Forest Association
CEGL006279 *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. Swamp Forest Association
A3418 *Picea rubens* Northern Appalachian Swamp Forest Alliance
CEGL006361 *Picea mariana - Picea rubens* / *Pleurozium schreberi* Swamp Forest Association
CEGL006098 *Picea mariana* / (*Vaccinium corymbosum*, *Gaylussacia baccata*) / *Sphagnum* sp. Swamp Woodland Association
CEGL006312 *Picea rubens - Abies balsamea* / *Gaultheria hispidula* / *Osmunda cinnamomea* / *Sphagnum* spp. Swamp Forest Association
CEGL006198 *Picea rubens - Acer rubrum* / *Nemopanthus mucronatus* Swamp Forest Association
G046. Laurentian-Acadian-Appalachian Alkaline Swamp Group
A0347 *Fraxinus nigra - Acer rubrum* Swamp Forest Alliance
CEGL006009 *Acer rubrum - Fraxinus nigra* - (*Larix laricina*) / *Rhamnus alnifolia* Swamp Forest Association
CEGL006502 *Acer rubrum - Fraxinus nigra* - (*Tsuga canadensis*) / *Tiarella cordifolia* Swamp Forest Association
CEGL006395 *Acer rubrum* / *Alnus incana - Ilex verticillata* / *Osmunda regalis* Woodland Association
A3720 *Thuja occidentalis - Acer rubrum - Larix laricina* Swamp Forest Alliance
CEGL006175 *Thuja occidentalis* - (*Picea rubens*) / *Tiarella cordifolia* Swamp Forest Association
CEGL006507 *Thuja occidentalis - Abies balsamea* / *Ledum groenlandicum* / *Carex trisperma* Swamp Woodland Association
CEGL006007 *Thuja occidentalis* / *Sphagnum* (*girgensohnii*, *warnstorfii*) Swamp Forest Association
G039. Northern Atlantic Coastal Hardwood - Conifer Swamp Group
A3400 *Chamaecyparis thyoides* Northern Peat Swamp Forest Alliance
CEGL006189 *Chamaecyparis thyoides* - (*Tsuga canadensis*, *Betula alleghaniensis*) / *Clethra alnifolia* Swamp Forest Association
G653. Silver Maple - Green Ash - Black Ash Floodplain Forest Group
A3715 *Acer saccharinum - Acer rubrum - Ulmus americana* Floodplain Forest Alliance
CEGL006001 *Acer saccharinum - Ulmus americana* / *Onoclea sensibilis* Floodplain Forest Association
CEGL006176 *Acer saccharinum* / *Onoclea sensibilis - Boehmeria cylindrica* Floodplain Forest Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name

A3714 *Acer saccharum* - *Tilia americana* Mesic Floodplain Forest Alliance
CEGL006114 *Acer saccharum* - *Fraxinus* spp. - *Tilia americana* / *Matteuccia struthiopteris* - *Ageratina altissima* Floodplain Forest Association
CEGL006504 *Acer saccharum* / *Ostrya virginiana* / *Brachyelytrum erectum* Floodplain Forest Association

2. SHRUB & HERB VEGETATION CLASS

2.B. Temperate & Boreal Grassland & Shrubland Subclass

2.B.2. Temperate Grassland & Shrubland Formation

2.B.2.Nc. Eastern North American Grassland & Shrubland Division

M506. Appalachian Rocky Felsic & Mafic Scrub & Grassland Macrogroup

G180. Appalachian Mafic Glade Group

A2074 *Fraxinus americana* - *Quercus stellata* / *Carex pensylvanica* Appalachian Mafic-Circumneutral Scrub Alliance
CEGL008529 *Fraxinus americana* / *Physocarpus opulifolius* / *Carex pensylvanica* - *Allium cernuum* - (*Phacelia dubia*) Wooded Grassland Association

A3470 Southern Appalachian Mafic Shrubland Alliance
CEGL008536 *Diervilla lonicera* - *Solidago simplex* var. *randii* - *Deschampsia flexuosa* - *Hylotelephium telephioides* - *Saxifraga michauxii* Grassland Association
CEGL008508 *Photinia melanocarpa* - *Gaylussacia baccata* / *Carex pensylvanica* Shrubland Association

G670. Central & Southern Appalachian Rocky Outcrop Group

A1621 *Saxifraga michauxii* - *Carex misera* - *Schizachyrium scoparium* Rocky Grassland Alliance
CEGL004279 *Saxifraga michauxii* - *Carex misera* - *Danthonia spicata* - *Krigia montana* Grassland Association
CEGL004277 *Saxifraga michauxii* - *Carex misera* - *Oclemena acuminata* - *Solidago glomerata* Grassland Association

A3961 *Selaginella rupestris* - *Selaginella tortipila* - *Schizachyrium scoparium* Rocky Grassland Alliance
CEGL007690 *Selaginella rupestris* - *Schizachyrium scoparium* - *Hypericum gentianoides* - *Bulbostylis capillaris* Rocky Grassland Association

G789. North-Central Appalachian Acidic Scrub & Grassland Group

A3910 *Danthonia spicata* - *Deschampsia flexuosa* - *Deschampsia caespitosa* Bedrock Grassland Alliance
CEGL006544 *Schizachyrium scoparium* - *Danthonia spicata* - *Carex pensylvanica* / *Cladonia* spp. Grassland Association

A3909 *Quercus ilicifolia* - *Photinia melanocarpa* Bedrock Shrubland Alliance
CEGL006121 *Quercus ilicifolia* - *Prunus pumila* Shrubland Association

A4111 *Vaccinium angustifolium* - *Vaccinium pallidum* Rocky Heath Alliance
CEGL003939 *Kalmia latifolia* - *Gaylussacia baccata* - *Vaccinium* (*angustifolium*, *pallidum*) - *Menziesia pilosa* Shrubland Association
CEGL003958 *Vaccinium* (*angustifolium*, *myrtilloides*, *pallidum*) Central Appalachian Dwarf-shrubland Association

A3913 *Vaccinium angustifolium* - *Vaccinium pallidum* Sandy Heath Alliance
CEGL006622 *Gaylussacia baccata* - *Vaccinium pallidum* - *Vaccinium corymbosum* Shrubland Association

G657. Southern Appalachian Grass Bald Group

A2026 *Carex pensylvanica* - *Danthonia compressa* - *Hypericum mitchellianum* Grass Bald Alliance
CEGL004094 *Carex pensylvanica* Grassland Association
CEGL004242 *Danthonia compressa* - (*Sibbaldiopsis tridentata*) Grassland Association

A0930 *Rubus allegheniensis* - *Rubus canadensis* Shrubland Alliance
CEGL003892 *Rubus allegheniensis* - *Rubus canadensis* / *Carex pensylvanica* Shrubland Association
CEGL003893 *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
G658. Southern Appalachian Shrub Bald Group
A0929 *Alnus viridis* ssp. *crispa* Shrub Bald Alliance
CEGL003891 *Alnus viridis* ssp. *crispa* / *Carex pensylvanica* Shrubland Association
A0744 *Rhododendron catawbiense - Rhododendron carolinianum - Kalmia latifolia* Shrub Bald Alliance
CEGL003814 *Kalmia latifolia - Rhododendron catawbiense* - (*Gaylussacia baccata*, *Pieris floribunda*, *Vaccinium corymbosum*) Shrubland Association
CEGL004819 *Menziesia pilosa - Vaccinium* (*erythrocarpum*, *simulatum*, *corymbosum*) - *Sorbus americana* Shrubland Association
CEGL007876 *Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium* Shrubland Association
CEGL003818 *Rhododendron catawbiense* Shrubland Association
M123. Eastern North American Ruderal Grassland & Shrubland Macrogroup
G059. Eastern North American Ruderal Meadow & Shrubland Group
A1190 *Dactylis glomerata - Festuca* spp. - *Solidago canadensis* Ruderal Mesic Meadow Alliance
CEGL006107 *Dactylis glomerata - Phleum pratense - Festuca* spp. - *Solidago* spp. Ruderal Meadow Association
CEGL004018 *Phleum pratense - Bromus pubescens - Helenium autumnale* Ruderal Meadow Association
A3934 *Poa compressa - Solidago nemoralis - Centaurea biebersteinii* Ruderal Dry Meadow & Shrubland Alliance
CEGL006333 *Schizachyrium scoparium* - (*Andropogon virginicus*) - *Solidago* spp. Ruderal Meadow Association
A3935 *Rhamnus cathartica - Rosa multiflora - Elaeagnus umbellata* Ruderal Mesic Shrubland Alliance
CEGL006451 *Elaeagnus umbellata - Cornus racemosa - Rosa multiflora - Juniperus virginiana* Ruderal Shrubland Association
M505. Laurentian-Acadian Acidic Rocky Scrub & Grassland Macrogroup
G788. Laurentian-Acadian Acidic Scrub & Grassland Group
A4110 *Vaccinium angustifolium - Vaccinium myrtilloides* Rocky Heath Alliance
CEGL005094 *Vaccinium angustifolium - Sorbus americana* / *Sibbaldiopsis tridentata* Dwarf-shrubland Association
2.B.2.Ne. Southeastern North American Grassland & Shrubland Division
M307. Southeastern Ruderal Grassland & Shrubland Macrogroup
G583. Southeastern Ruderal Grassland & Shrubland Group
A3321 *Andropogon virginicus - Ambrosia artemisiifolia - Conyza canadensis* Eastern Ruderal Grassland Alliance
CEGL004044 *Andropogon virginicus* var. *virginicus* Ruderal Grassland Association
CEGL004048 *Lolium* (*arundinaceum*, *pratense*) Ruderal Grassland Association
A4082 *Pueraria montana - Wisteria sinensis* Exotic Ruderal Vine-Shrubland Alliance
CEGL003882 *Pueraria montana* var. *lobata* Ruderal Vine-Shrubland Association
A3322 *Rubus* spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance
CEGL004732 *Rubus* (*argutus*, *trivialis*) - *Smilax* (*glauca*, *rotundifolia*) Ruderal Shrubland Association
2.C. Shrub & Herb Wetland Subclass
2.C.2. Temperate to Polar Bog & Fen Formation
2.C.2.Na. North American Bog & Fen Division
M877. North American Boreal & Sub-boreal Alkaline Fen Macrogroup
G185. Eastern North American Sub-boreal Alkaline Fen Group
A3477 *Betula pumila - Chamaedaphne calyculata - Myrica gale* Shrub Fen Alliance
CEGL006302 *Myrica gale - Chamaedaphne calyculata* / *Carex* (*lasiocarpa*, *utriculata*) - *Utricularia* spp. Fen Association
CEGL006512 *Myrica* gale - *Spiraea alba - Chamaedaphne calyculata* Fen Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name

G805. North-Central Interior & Appalachian Alkaline Fen Group
A3703 *Dasiphora fruticosa* ssp. *floribunda* - *Carex sterilis* - *Carex flava* Alkaline Shrub Fen Alliance
CEGL006326 *Dasiphora fruticosa* ssp. *floribunda* / *Carex* (*sterilis*, *hystericina*, *flava*) Fen Association
CEGL006357 *Juniperus virginiana* / *Dasiphora fruticosa* ssp. *floribunda* / *Carex flava* - *Carex tetanica* Fen Association
M876. North American Boreal & Sub-boreal Bog & Acidic Fen Macrogroup
G748. Eastern North American Boreal Bog & Acidic Fen Group
A3836 *Picea mariana* / *Sphagnum* spp. Eastern Boreal Treed Bog Alliance
CEGL002485 *Picea mariana* / *Ledum groenlandicum* / *Carex trisperma* / *Sphagnum* spp. Open Bog Woodland Association
G745. Eastern North American Sub-boreal Bog & Acidic Fen Group
A3450 *Chamaedaphne calyculata* / *Carex lasiocarpa* Sub-boreal Acidic Shrub Bog & Fen Alliance
CEGL006008 *Chamaedaphne calyculata* - (*Gaylussacia dumosa*) - *Decodon verticillatus* / *Woodwardia virginica* Acidic Peatland Association
CEGL006513 *Chamaedaphne calyculata* / *Eriophorum virginicum* / *Sphagnum rubellum* Acidic Peatland Association
CEGL006225 *Kalmia angustifolia* - *Chamaedaphne calyculata* - (*Picea mariana*) / *Cladina* spp. Acidic Peatland Association
CEGL006514 *Rhododendron canadense* - *Chamaedaphne calyculata* Acidic Peatland Association
A3452 *Dulichium arundinaceum* - *Carex canescens* Sub-boreal Acidic Graminoid Fen Alliance
CEGL006131 *Dulichium arundinaceum* / *Sphagnum* spp. Fen Association
A1018 *Vaccinium corymbosum* Peat Shrubland Alliance
CEGL006158 *Alnus incana* ssp. *rugosa* - *Nemopanthus mucronatus* / *Sphagnum* spp. Acidic Peatland Association
CEGL006371 *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Acidic Peatland Association
CEGL006190 *Vaccinium corymbosum* / *Sphagnum* spp. Acidic Peatland Association

2.C.4. Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland Formation

2.C.4.Nd. Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland Division

M061. Eastern North American Cool Temperate Seep Macrogroup
G184. Central & Southern Appalachian Seep Group
A3381 *Carex atlantica* - *Solidago patula* - *Parnassia asarifolia* Seep Alliance
CEGL003909 *Alnus serrulata* - *Lindera benzoin* / *Scutellaria lateriflora* - *Thelypteris noveboracensis* Seepage Shrubland Association
CEGL003913 *Rhododendron* (*maximum*, *catawbiense*) - *Ilex collina* - *Salix sericea* / *Eriophorum virginicum* Seepage Shrubland Association
CEGL003849 *Rhododendron maximum* / *Sphagnum* spp. Seepage Shrubland Association
A3382 *Carex gynandra* - *Glyceria melicaria* - *Glyceria striata* Seep Alliance
CEGL007697 *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* / *Sphagnum* spp. Herbaceous Seep Association
CEGL008438 *Glyceria striata* - *Carex gynandra* - *Chelone glabra* - *Symphyotrichum puniceum* / *Sphagnum* spp. Herbaceous Seep Association
CEGL004293 *Impatiens* (*capensis*, *pallida*) - *Monarda didyma* - *Rudbeckia laciniata* var. *humilis* Herbaceous Seep Association
A1688 *Diphylleia cymosa* - *Saxifraga micranthidifolia* Seep Alliance
CEGL004296 *Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Forested Herbaceous Seep Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name

G189. North-Central & Northeastern Seep Group
A1685 *Carex scabrata* - *Chrysosplenium americanum* Seep Alliance
CEGL006193 *Chrysosplenium americanum* Seepage Meadow Association
A3373 *Eriophorum virginicum* - *Dulichium arundinaceum* - *Carex echinata* Seep Alliance
CEGL006552 *Dulichium arundinaceum* - *Carex folliculata* - *Juncus* spp. Seepage Meadow Association
A3374 *Impatiens capensis* - *Symplocarpus foetidus* - *Caltha palustris* Seep Alliance
CEGL006567 *Symplocarpus foetidus* - *Impatiens capensis* Seepage Meadow Association
CEGL006448 *Vernonia noveboracensis* - *Thelypteris palustris* - *Symplocarpus foetidus* Seepage Meadow Association
A3372 *Prunus virginiana* - *Acer spicatum* - *Cornus sericea* Seep Alliance
CEGL006583 *Prunus virginiana* - *Acer spicatum* - *Ribes triste* / *Angelica atropurpurea* - *Heracleum maximum* Seepage Shrubland Association
M069. Eastern North American Marsh, Wet Meadow & Shrubland Macrogroup
G125. Eastern North American Freshwater Marsh Group
A3669 *Peltandra virginica* - *Pontederia cordata* - *Sagittaria* spp. Marsh Alliance
CEGL006446 *Bidens cernua* - *Verbena hastata* - *Polygonum* spp. Marsh Association
CEGL006191 *Pontederia cordata* - *Peltandra virginica* - *Sagittaria latifolia* Marsh Association
A1436 *Typha angustifolia* - *Typha latifolia* - *Schoenoplectus* spp. Deep Marsh Alliance
CEGL006153 *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Eastern Marsh Association
G167. Eastern North American Shrub Swamp Group
A3684 *Alnus incana* - *Cornus amomum* Alluvial & Tidal Shrub Swamp Alliance
CEGL006062 *Alnus incana* - *Cornus* (*amomum*, *sericea*) / *Clematis virginiana* Shrub Swamp Association
A3685 *Alnus* spp. - *Salix* spp. Lakeshore & Depression Shrub Swamp Alliance
CEGL002381 *Alnus incana* Shrub Swamp Association
A3670 *Cephalanthus occidentalis* - *Decodon verticillatus* Shrub Swamp Alliance
CEGL006069 *Cephalanthus occidentalis* - *Decodon verticillatus* Shrub Swamp Association
CEGL005089 *Decodon verticillatus* Shrub Swamp Association
A3656 *Cornus sericea* - *Salix* spp. Shrub Swamp Alliance
CEGL006576 *Cornus* (*amomum*, *sericea*) - *Viburnum dentatum* - *Rosa multiflora* Ruderal Shrub Swamp Association
G771. Laurentian-Northeastern Wet Meadow Group
A4107 *Carex* spp. - *Calamagrostis canadensis* Eastern Wet Meadow Alliance
CEGL005448 *Calamagrostis canadensis* - *Carex* spp. Laurentian & Northeast Wet Meadow Association
CEGL006519 *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow Association
CEGL006412 *Carex stricta* - *Carex vesicaria* Wet Meadow Association
CEGL002257 *Carex utriculata* - *Carex lacustris* - (*Carex vesicaria*, *Carex stricta*) Wet Meadow Association
M881. Eastern North American Riverscour Vegetation Macrogroup
G792. Laurentian-Acadian Riverscour Vegetation Group
A3830 *Alnus incana* / *Dasiphora fruticosa* ssp. *floribunda* Riverscour Alliance
CEGL006142 *Triantha glutinosa* - *Carex garberi* Riverscour Wet Meadow Association
G754. Northeastern Riverscour Barrens & Prairie Group
A3826 *Andropogon gerardii* - *Anemone virginiana* var. *alba* Riverscour Alliance
CEGL006284 *Andropogon gerardii* - *Campanula rotundifolia* - *Solidago simplex* Riverscour Sparse Vegetation Association
CEGL006518 *Prunus pumila* / *Andropogon gerardii* - *Sorghastrum nutans* Riverscour Wet Meadow Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
M880. Eastern North American Wet Shoreline Vegetation Macrogroup
G755. Eastern North American Riverine Wetland Vegetation Group
A0943 *Alnus serrulata* Riverscour Shrubland Alliance
CEGL003895 *Alnus serrulata* - *Xanthorhiza simplicissima* Wet Shrubland Association
A3647 *Carex torta* Riverbed Alliance
CEGL006536 *Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. Riverbed Vegetation Association
CEGL004103 *Carex torta* Riverbed Vegetation Association
A2078 *Eupatorium serotinum* - *Verbesina alternifolia* Depositional Bar Alliance
CEGL006481 *Eupatorium serotinum* - *Polygonum* (*lapathifolium*, *punctatum*, *pensylvanicum*) Riverbar Wet Meadow Association
CEGL006480 *Verbesina alternifolia* - *Elymus riparius* - *Solidago gigantea* - (*Teucrium canadense*) Riverbar Wet Meadow Association
A1657 *Justicia americana* Riverbed Alliance
CEGL004286 *Justicia americana* Riverbed Vegetation Association
A0948 *Salix nigra* Riverscour Scrub Alliance
CEGL006065 *Salix nigra* / *Phalaris arundinacea* - *Apocynum cannabinum* Wet Shrubland Association
A4152 Mid-Atlantic Piedmont & Mountain Riverscour Annual Vegetation Alliance
CEGL006483 *Eragrostis hypnoides* - *Ludwigia palustris* - *Lindernia dubia* - *Cyperus squarrosus* Riverbar Wet Meadow Association
M303. Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland Macrogroup
G556. Eastern Ruderal Wet Meadow & Marsh Group
A1381 *Phalaris arundinacea* Eastern Ruderal Marsh Alliance
CEGL006044 *Phalaris arundinacea* Eastern Ruderal Marsh Association
A1431 *Phragmites australis* ssp. *australis* Ruderal Marsh Alliance
CEGL004141 *Phragmites australis* ssp. *australis* Eastern Ruderal Marsh Association
A4106 *Spiraea tomentosa* - *Rubus* spp. Ruderal Wet Shrubland Alliance
CEGL006571 *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland Association
G557. Southeastern Ruderal Marsh, Wet Meadow & Shrubland Group
A3412 *Juncus effusus* - *Andropogon glomeratus* var. *pumilus* - *Saccharum giganteum* Ruderal Marsh Alliance
CEGL004112 *Juncus effusus* Marsh Association
4. POLAR & HIGH MONTANE SCRUB, GRASSLAND & BARRENS CLASS
4.B. Temperate to Polar Alpine & Tundra Vegetation Subclass
4.B.1. Temperate & Boreal Alpine Tundra Formation
4.B.1.Na. Eastern North American Alpine Tundra Division
M131. Eastern North American Alpine Tundra Macrogroup
G108. Eastern Alpine Cliff, Scree & Rock Vegetation Group
A4003 *Rhizocarpon geographicum* - *Umbilicaria hyperborea* Eastern Alpine Fell-field Alliance
CEGL006420 *Arctoparmelia centrifuga* - *Rhizocarpon geographicum* Nonvascular Vegetation Association
G104. Eastern Alpine Tundra Group
A3285 *Betula papyrifera* var. *cordifolia* - *Betula glandulosa* - *Alnus viridis* Alpine Shrubland Alliance
CEGL006064 *Alnus viridis* ssp. *crispa* - *Spiraea alba* / *Solidago macrophylla* Shrubland Association
A1295 *Carex bigelowii* Alpine Meadow Alliance
CEGL006081 *Carex bigelowii* Alpine Meadow Association
A1120 *Diapensia lapponica* - Mixed Alpine Dwarf-shrubland Alliance
CEGL006322 *Diapensia lapponica* Dwarf-shrubland Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
A3286 *Ledum groenlandicum* / *Trichophorum caespitosum* / *Sphagnum* spp. Alpine Bog & Fen Alliance
CEGL006140 *Empetrum nigrum* - *Vaccinium uliginosum* - *Vaccinium oxycoccos* / *Rubus chamaemorus* Dwarf-shrubland Association
A3360 *Picea mariana* Krummholz Alliance
CEGL006031 (*Picea mariana*, *Abies balsamea*) / *Kalmia angustifolia* - *Ledum groenlandicum* Dwarf-shrubland Association
CEGL006038 *Picea mariana* - *Abies balsamea* / *Sibbaldiopsis tridentata* Shrubland Association
CEGL006268 *Picea mariana* / *Ledum groenlandicum* - *Empetrum nigrum* / *Cladina* spp. Dwarf-shrubland Association
A3287 *Salix herbacea* / *Trichophorum caespitosum* - *Carex bigelowii* Alpine Snowbed Alliance
CEGL006423 *Trichophorum caespitosum* - *Calamagrostis pickeringii* Alpine Snowbed Association
CEGL006424 *Trichophorum caespitosum* - *Carex scirpoidea* - *Carex bigelowii* Alpine Snowbed Association
A1116 *Vaccinium uliginosum* - Mixed Alpine Heath Alliance
CEGL006425 *Kalmia angustifolia* - *Chamaedaphne calyculata* / *Rubus chamaemorus* / *Cladina* spp. Dwarf-shrubland Association
CEGL006155 *Vaccinium uliginosum* - *Harrimanella hypnoides* - *Loiseleuria procumbens* Dwarf-shrubland Association
CEGL006298 *Vaccinium uliginosum* - *Rhododendron lapponicum* / *Juncus trifidus* Dwarf-shrubland Association
CEGL006533 *Vaccinium uliginosum* / *Sibbaldiopsis tridentata* Sparse Vegetation Association
5. AQUATIC VEGETATION CLASS
5.B. Freshwater Aquatic Vegetation Subclass
5.B.2. Temperate to Polar Freshwater Aquatic Vegetation Formation
5.B.2.Na. North American Freshwater Aquatic Vegetation Division
M108. Eastern North American Freshwater Aquatic Vegetation Macrogroup
G114. Eastern North American Freshwater Aquatic Vegetation Group
A4147 *Lemna* spp. - *Wolffia* spp. - *Spirodela polyrrhiza* Aquatic Vegetation Alliance
CEGL005451 *Lemna* spp. Eastern North American Aquatic Vegetation Association
A4064 *Nymphaea odorata* - *Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance
CEGL002386 *Nuphar advena* - *Nymphaea odorata* Aquatic Vegetation Association
A4066 *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Aquatic Vegetation Alliance
CEGL006431 *Elodea canadensis* - *Potamogeton* spp. Eastern Aquatic Vegetation Association
6. OPEN ROCK VEGETATION CLASS
6.B. Temperate & Boreal Open Rock Vegetation Subclass
6.B.1. Temperate & Boreal Cliff, Scree & Other Rock Vegetation Formation
6.B.1.Na. Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation Division
M111. Eastern North American Cliff & Rock Vegetation Macrogroup
G840. Appalachian Cliff & Rock Vegetation Group
A2071 Appalachian Acidic Cliff Alliance
CEGL004980 *Asplenium montanum* - *Heuchera villosa* Felsic Cliff Sparse Vegetation Association
A3991 Appalachian Lichen Boulderfield Alliance
CEGL004142 *Lasallia* (*papulosa*, *pensylvanica*) - *Dimelaena oreina* - (*Melanelia culbersonii*) Nonvascular Vegetation Association
CEGL004143 *Lasallia papulosa* - *Stereocaulon glaucescens* - *Chrysothrix chlorina* Nonvascular Vegetation Association
A4229 Appalachian-Northeastern Acidic Talus Alliance
CEGL006422 *Juniperus virginiana* / *Corydalis sempervirens* Cliff Sparse Vegetation Association
CEGL006534 *Polypodium* (*virginianum*, *appalachianum*) / Lichens Nonvascular Vegetation Association

Table B–1 (continued). Vegetation classification for the Appalachian National Scenic Trail vegetation mapping project, organized hierarchically by the U.S. National Vegetation Classification (USNVC).

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name
G839. Laurentian-Acadian-Great Lakes Cliff & Rock Vegetation Group
A4007 Laurentian-Acadian-Great Lakes Acidic Cliff Alliance
CEGL006429 *Drosera rotundifolia* - *Viola* spp. Cliff Sparse Vegetation Association
CEGL006528 *Polypodium* (*virginianum*, *appalachianum*) Cliff Sparse Vegetation Association
A4006 Laurentian-Acadian-Great Lakes Alkaline Cliff Alliance
CEGL006526 *Carex scirpoidea* Alkaline Cliff Sparse Vegetation Association
7. AGRICULTURAL & DEVELOPED VEGETATION CULTURAL CLASS
7.A. Woody Agricultural Vegetation Cultural Subclass
7.A.1. Woody Horticultural Crop Cultural Formation
7.A.1.1. Tree Orchard Cultural Subformation
CGR001. Fruit Orchard Cultural Group
CSG001. Tropical & Temperate Fruit Orchard Cultural Subgroup
7.A.1.2. Vineyard Cultural Subformation
CGR003. Grape Vineyard Cultural Group
CSG002. Tropical & Temperate Grape Vineyard Cultural Subgroup
7.A.2. Forest Plantation & Agroforestry Cultural Formation
7.A.2.1. Forest Plantation Cultural Subformation
CGR007. Temperate & Boreal Plantation Cultural Group
CSG005. Eastern North American Temperate Forest Plantation Cultural Subgroup
CTY016 Native Northern Hardwood Plantation Cultural Type
CTY010 Native Northern Spruce-Fir Plantation Cultural Type
CTY011 Eastern North American Temperate Forest Plantation Cultural Type
CTY014 Exotic Northern Conifer Plantation Cultural Type
CST007167 *Picea abies* Forest Plantation Cultural Subtype
CST006313 *Pinus* spp. Forest Plantation Cultural Subtype
CTY009 Native Northern Pine Plantation Cultural Type
CST007177 *Pinus resinosa* Forest Plantation Cultural Subtype
CST007178 *Pinus strobus* Forest Plantation Cultural Subtype
7.B. Herbaceous Agricultural Vegetation Cultural Subclass
7.C. Herbaceous & Woody Developed Vegetation Cultural Subclass

Appendix C: Descriptions of Vegetation Associations

U.S. NATIONAL VEGETATION CLASSIFICATION

ASSOCIATIONS OF THE APPALACHIAN NATIONAL SCENIC TRAIL

7 October 2016

by

NatureServe

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This subset of the International Ecological Classification Standard covers associations attributed to the Appalachian National Scenic Trail. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to Mary J. Russo, Central Ecology Data Manager, Durham, NC <mary_russo@natureserve.org> and Lesley Sneddon, National Ecologist, Boston, MA <Lesley_sneddon@natureserve.org>.

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[1] NatureServe is an international organization including NatureServe regional offices, a NatureServe central office, U.S. State Natural Heritage Programs, and Conservation Data Centres (CDC) in Canada and Latin America and the Caribbean. Ecologists from the following organizations have contributed the development of the ecological systems classification:

United States
Central NatureServe Office, Arlington, VA; Eastern Regional Office, Boston, MA; Midwestern Regional Office, Minneapolis, MN; Southeastern Regional Office, Durham, NC; Western Regional Office, Boulder, CO; Alabama Natural Heritage Program, Montgomery AL; Alaska Natural Heritage Program, Anchorage, AK; Arizona Heritage Data Management Center, Phoenix AZ; Arkansas Natural Heritage Commission Little Rock, AR; Blue Ridge Parkway, Asheville, NC; California Natural Heritage Program, Sacramento, CA; Colorado Natural Heritage Program, Fort Collins, CO; Connecticut Natural Diversity Database, Hartford, CT; Delaware Natural Heritage Program, Smyrna, DE; District of Columbia Natural Heritage Program/National Capital Region Conservation Data Center, Washington DC; Florida Natural Areas Inventory, Tallahassee, FL; Georgia Natural Heritage Program, Social Circle, GA; Great Smoky Mountains National Park, Gatlinburg, TN; Gulf Islands National Seashore, Gulf Breeze, FL; Hawaii Natural Heritage Program, Honolulu, Hawaii; Idaho Conservation Data Center, Boise, ID; Illinois Natural Heritage Division/Illinois Natural Heritage Database Program, Springfield, IL; Indiana Natural Heritage Data Center, Indianapolis, IN; Iowa Natural Areas Inventory, Des Moines, IA; Kansas Natural Heritage Inventory, Lawrence, KS; Kentucky Natural Heritage Program, Frankfort, KY; Louisiana Natural Heritage Program, Baton Rouge, LA; Maine Natural Areas Program, Augusta, ME; Mammoth Cave National Park, Mammoth Cave, KY; Maryland Wildlife & Heritage Division, Annapolis, MD; Massachusetts Natural Heritage & Endangered Species Program, Westborough, MA; Michigan Natural Features Inventory, Lansing, MI; Minnesota Natural Heritage & Nongame Research and Minnesota County Biological Survey, St. Paul, MN; Mississippi Natural Heritage Program, Jackson, MI; Missouri Natural Heritage Database, Jefferson City, MO; Montana Natural Heritage Program, Helena, MT; National Forest in North Carolina, Asheville, NC; National Forests in Florida, Tallahassee, FL; National Park Service, Southeastern Regional Office, Atlanta, GA; Navajo Natural Heritage Program, Window Rock, AZ; Nebraska Natural Heritage Program, Lincoln, NE; Nevada Natural Heritage Program, Carson City, NV; New Hampshire Natural Heritage Inventory, Concord, NH; New Jersey Natural Heritage Program, Trenton, NJ; New Mexico Natural Heritage Program, Albuquerque , NM; New York Natural Heritage Program, Latham, NY; North Carolina Natural Heritage Program, Raleigh, NC; North Dakota Natural Heritage Inventory, Bismarck, ND; Ohio Natural Heritage Database, Columbus, OH; Oklahoma Natural Heritage Inventory, Norman, OK; Oregon Natural Heritage Program, Portland, OR; Pennsylvania Natural Diversity Inventory, PA; Rhode Island Natural Heritage Program, Providence, RI; South Carolina Heritage Trust, Columbia, SC; South Dakota Natural Heritage Data Base, Pierre, SD; Tennessee Division of Natural Heritage, Nashville, TN; Tennessee Valley Authority Heritage Program, Norris, TN; Texas Conservation Data Center, San Antonio, TX; Utah Natural Heritage Program, Salt Lake City, UT; Vermont Nongame & Natural Heritage Program, Waterbury, VT; Virginia Division of Natural Heritage, Richmond, VA; Washington Natural Heritage Program, Olympia, WA; West Virginia Natural Heritage Program, Elkins, WV; Wisconsin Natural Heritage Program, Madison, WI; Wyoming Natural Diversity Database, Laramie, WY

Canada
Alberta Natural Heritage Information Centre, Edmonton, AB, Canada; Atlantic Canada Conservation Data Centre, Sackville, New Brunswick, Canada; British Columbia Conservation Data Centre, Victoria, BC, Canada; Manitoba Conservation Data Centre. Winnipeg, MB, Canada; Ontario Natural Heritage Information Centre, Peterborough, ON, Canada; Quebec Conservation Data Centre, Quebec, QC, Canada; Saskatchewan Conservation Data Centre, Regina, SK, Canada; Yukon Conservation Data Centre, Yukon, Canada

Latin American and Caribbean
Centro de Datos para la Conservacion de Bolivia, La Paz , Bolivia; Centro de Datos para la Conservacion de Colombia, Cali,Valle, Columbia; Centro de Datos para la Conservacion de Ecuador, Quito, Ecuador; Centro de Datos para la Conservacion de Guatemala, Ciudad de Guatemala , Guatemala; Centro de Datos para la Conservacion de Panama, Querry Heights , Panama; Centro de Datos para la Conservacion de Paraguay, San Lorenzo , Paraguay; Centro de Datos para la Conservacion de Peru, Lima, Peru; Centro de Datos para la Conservacion de Sonora, Hermosillo, Sonora , Mexico; Netherlands Antilles Natural Heritage Program, Curacao , Netherlands Antilles; Puerto Rico-Departmento De Recursos Naturales Y Ambientales, Puerto Rico; Virgin Islands Conservation Data Center, St. Thomas, Virgin Islands.

NatureServe also has partnered with many International and United States Federal and State organizations, which have also contributed significantly to the development of the International Classification. Partners include the following The Nature Conservancy; Provincial Forest Ecosystem Classification Groups in Canada; Canadian Forest Service; Parks Canada; United States Forest Service; National GAP Analysis Program; United States National Park Service; United States Fish and Wildlife Service; United States Geological Survey; United States Department of Defense; Ecological Society of America; Environmental Protection Agency; Natural Resource Conservation Services; United States Department of Energy; and the Tennessee Valley Authority. Many individual state organizations and people from academic institutions have also contributed to the development of this classification.

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1. Forest & Woodland

1.B.2. Cool Temperate Forest & Woodland

1.B.2.Na. Eastern North American Forest & Woodland

M883. Appalachian-Interior-Northeastern Mesic Forest

G742. Appalachian-Allegheny Northern Hardwood - Conifer Forest

Group Summary Description: This forest group occurs in the central and northeastern U.S., ranging from extreme southern Ontario, north-central New York and lower New England west to Lake Erie and south to the higher elevations of the Carolinas, on relatively cool, mesic sites. Northern hardwoods such as *Acer rubrum, Acer saccharum, Betula alleghaniensis, Betula lenta, Fagus grandifolia, Fraxinus americana, Quercus rubra*, and *Tilia americana* are characteristic, either forming a deciduous canopy or mixed with *Tsuga canadensis* (or in some cases *Pinus strobus*). Other common and sometimes dominant trees include *Quercus* spp. (most commonly *Quercus rubra*, but also *Quercus alba, Quercus prinus*), *Aesculus flava, Liriodendron tulipifera*, and *Prunus serotina*. It is of more limited extent and more ecologically constrained in the southern part of its range, in higher elevations of the northern parts of Virginia and West Virginia. This type is one of the matrix forest types in the northern part of the Central Interior and Appalachian Division. In general, this group is dominated by long-lived, mesic species that form multi-layered uneven-aged forests. Canopy dynamics are dominated by single and multiple disturbances, encouraging gap phase regeneration. Larger disturbances include windthrow, insect attack and ice storms. Although stand-replacing wind events are rare, small to medium blowdown events are more common.

A3301 *Acer saccharum - Fagus grandifolia - Tilia americana* Forest Alliance

Alliance Summary Description: This forested alliance is dominated by hardwoods, such as *Acer saccharum, Acer rubrum, Fagus grandifolia, Fraxinus americana*, and *Tilia americana*, with common associates of *Betula alleghaniensis, Betula lenta, Liriodendron tulipifera, Prunus serotina*, and *Quercus* spp. (most commonly *Quercus rubra*). The shrub layer is characterized by *Acer pensylvanicum, Amelanchier* spp., *Cornus florida* (most common in the southern part of range), *Hamamelis virginiana, Lindera benzoin, Sambucus racemosa (= Sambucus pubens), Staphylea trifolia*, and *Viburnum* spp. This community is characterized by a fairly diverse herbaceous flora. Typical herbs include *Allium tricoccum, Anemone quinquefolia, Asarum canadense, Caulophyllum thalictroides, Cystopteris bulbifera, Dicentra cucullaria, Sanguinaria canadensis*, among others. Characteristic graminoids include *Brachyelytrum erectum, Carex platyphylla, Carex sprengelii, Elymus hystrix (= Hystrix patula)*, and *Piptatherum racemosum (= Oryzopsis racemosa)*. This alliance occurs in the northeastern U.S., ranging from central New England west to the Lake Erie-Lake Ontario ecoregion in southern Ontario and south to the higher elevations of Virginia and West Virginia. It Stands occur on both glaciated and unglaciated till, on deep, typically circumneutral to somewhat alkaline, mesic soils. This type is one of the matrix forest types in the region.

[CEGL006632] *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest

Translated Name: **Sugar Maple - American Beech - White Ash / Jack-in-the-Pulpit Forest**
Common Name: **Transitional Northern Hardwood Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Acer saccharum - Fagus grandifolia - Tilia americana* Forest Alliance (A3301)

ELEMENT CONCEPT

Global Summary: This association, known commonly as "northern hardwood forest," is a widespread matrix forest in the Allegheny Plateau of Pennsylvania and New York, the adjacent Lake Ontario and Lake Erie plains and in Lower New England to northern New Jersey. This forest occurs most commonly on moderately acidic (pH 5.5-7), moderate to well-drained tills at elevations generally below 762 m (2500 feet). Slope and rolling topographic settings are common. The closed-canopy forest has sparse to moderate shrub and herb cover and may have local carpets of tree seedlings in the ground vegetation. Bryoids are a minor component of the forest floor. The closed-canopy forest has sparse to moderate shrub and herb cover and may have local carpets of tree seedlings in the ground vegetation. Bryoids are a minor component of the forest floor. The canopy is dominated by *Acer saccharum* mixed with variable amounts of *Fagus grandifolia* and/or *Fraxinus americana* Associated hardwood species include *Acer rubrum, Betula papyrifera*, and *Betula alleghaniensis*, and *Tilia americana*. *Betula lenta* may be present. Conifers are usually present at low abundance. Characteristic species include *Pinus strobus* and *Tsuga canadensis*. Oaks are generally not present, although *Quercus rubra* and *Quercus alba* are sometimes present in low numbers. The shrub layer is often dominated by saplings of canopy tree species Characteristic understory shrubs or small trees include *Acer pensylvanicum, Amelanchier laevis, Ostrya virginiana, Viburnum acerifolium* and, occasionally, *Lindera benzoin*. The patchy herbaceous layer is a mix of ferns, rhizomatous herbs and clubmosses. Characteristic species include *Dryopteris intermedia, Dryopteris carthusiana, Polystichum acrostichoides, Huperzia lucidula, Maianthemum canadense, Clintonia borealis, Trientalis borealis, Oclemena acuminata (= Aster acuminatus)*, and *Uvularia sessilifolia*. Occasional species include *Aralia nudicaulis, Trillium erectum, Trillium grandiflorum, Dryopteris campyloptera, Streptopus lanceolatus (= Streptopus roseus), Cinna latifolia, Thelypteris noveboracensis, Mitchella repens, Solidago macrophylla*, and *Medeola virginiana*. The bryophyte layer may include *Dicranum* spp. and *Leucobryum glaucum*. Sugar maple leaf litter is high in nitrogen relative to lignin and thus decomposes rapidly, increasing the nutrient pool in the soil organic layer. Structure and composition of the forest are maintained primarily by single small tree-fall gaps. Yellow birch is maintained in the system by mineral soils on "tip-up mounds."

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This northern hardwood forest is a widespread matrix forest in central New England and upstate New York. This widespread community was sampled at sites ranging from gentle to somewhat steep slopes and ridges of any aspect. Soils are typically mesic moderately well- to well-drained sandy loam, silt loam, and loam. The unvegetated surface consists of leaf litter, with lesser amounts of exposed bedrock, large/small rocks, bare soil and/or downed wood. Evidence of disturbance includes past logging or clearing, beaver activity, windthrow, wind/ice damage, beech bark disease, possible past fire, and the minor presence of exotic plants.

Global Environment: This association, known commonly as "northern hardwood forest," is a widespread matrix forest in central New England. This forest occurs most commonly on acidic (pH 5-6), moderate to well-drained tills at elevations generally below 760 m (2500 feet).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This matrix "Northern Hardwood Forest" is characterized by a combination of *Acer saccharum, Fagus grandifolia*, and/or *Betula alleghaniensis*. Conifers include *Pinus strobus, Tsuga canadensis*, and in the northern portion of the range, *Picea rubens* and/or *Abies balsamea* may be present but not abundant (<25% cover). Tall shrubs include *Acer pensylvanicum, Acer spicatum*, and *Viburnum lantanoides*. The herb layer is patchy and most often a mix of *Dryopteris intermedia* and other ferns, clubmosses (Lycopodiaceae), *Trillium erectum, Maianthemum racemosum, Trientalis borealis, Arisaema triphyllum*, and other herbs. Two variants are recognized along the Appalachian Trail. One variant is dominated by *Fagus grandifolia* (>30% cover); *Acer saccharum, Fagus grandifolia*, and/or *Betula alleghaniensis* also occur in the canopy. *Dennstaedtia punctilobula* and *Dryopteris intermedia* are common ferns. An early-successional variant arises from cutting and is dominated by some combination of young, small-diameter *Acer saccharum, Fraxinus americana, Prunus serotina, Betula alleghaniensis*, and/or *Betula papyrifera*. A shrub layer, when present, is often disturbed containing exotic species. The herb layer is patchy and most often a mix of ferns, clubmosses (Lycopodiaceae), and other herbs. This community also supports MA state-imperiled *Carex aestivalis* and *Solidago macrophylla*.

Global Vegetation: The closed-canopy forest has sparse to moderate shrub and herb cover and may have local carpets of tree seedlings in the ground vegetation. Bryoids are a minor component of the forest floor. On some rocky, higher-elevation sites, dense ferns and other herbs may form a lush understory (the "fern-glade variant"). The canopy is dominated by *Acer saccharum* mixed with variable amounts of *Fagus grandifolia* and/or *Fraxinus*

americana. Associated hardwood species include *Acer rubrum, Betula papyrifera, Betula alleghaniensis*, and *Tilia americana*. *Betula lenta* may be present. Conifers are usually present at low abundance. Characteristic species include *Pinus strobus* and *Tsuga canadensis*. Oaks are generally not present, although *Quercus rubra* and *Quercus alba* are sometimes present in low numbers. The shrub layer is often dominated by saplings of canopy tree species. Characteristic understory shrubs or small trees include *Acer pensylvanicum, Amelanchier laevis, Ostrya virginiana, Viburnum acerifolium* and, occasionally, *Lindera benzoin*. The patchy herbaceous layer is a mix of ferns, rhizomatous herbs and clubmosses. Characteristic species include *Dryopteris intermedia, Dryopteris carthusiana, Polystichum acrostichoides, Huperzia lucidula, Maianthemum canadense, Clintonia borealis, Trientalis borealis, Oclemena acuminata (= Aster acuminatus)*, and *Uvularia sessilifolia*. Occasional species include *Aralia nudicaulis, Trillium erectum, Trillium grandiflorum, Dryopteris campyloptera, Streptopus lanceolatus (= Streptopus roseus), Cinna latifolia, Thelypteris noveboracensis, Mitchella repens, Solidago macrophylla*, and *Medeola virginiana*. The bryophyte layer may include *Dicranum* spp. and *Leucobryum glaucum*. In the southern portion of the range, exotic species, including *Berberis thunbergii* and *Microstegium vimineum*, may be common in the shrub and herb layers.
Global Dynamics: Sugar maple leaf litter is high in nitrogen relative to lignin and thus decomposes rapidly, increasing the nutrient pool in the soil organic layer. Structure and composition of the forest are maintained primarily by single small tree-fall gaps. Yellow birch is maintained in the system by mineral soils on "tip-up mounds."

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Fagus grandifolia*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Fagus grandifolia*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fagus grandifolia*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Tall shrub/sapling	Broad-leaved deciduous tree	*Ostrya virginiana*
Short shrub/sapling	Broad-leaved deciduous tree	*Acer saccharum*, *Fagus grandifolia*
Herb (field)	Fern (Spore-bearing forb)	*Polystichum acrostichoides*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer pensylvanicum*, *Acer saccharum*, *Betula alleghaniensis*, *Dennstaedtia punctilobula*, *Dryopteris intermedia*, *Fagus grandifolia*, *Oclemena acuminata*, *Viburnum lantanoides*
Global: *Acer pensylvanicum*, *Acer saccharum*, *Betula alleghaniensis*, *Dryopteris intermedia*, *Fagus grandifolia*, *Ostrya virginiana*, *Pinus strobus*, *Polystichum acrostichoides*, *Tsuga canadensis*, *Viburnum lantanoides*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Carex aestivalis* (G4, MA state-imperiled), *Solidago macrophylla* (G5, MA state-imperiled); **Invasive/Exotic Plants**: *Picea abies*
Global: Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium), *Microstegium vimineum* (High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (2-Dec-2014). This association is a widespread matrix forest in the Allegheny Plateau, Lake Ontario and Lake Erie plains and Lower New England.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - (Fraxinus americana) / Arisaema triphyllum* Forest (CEGL006211)
- *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631)
- *Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest (CEGL006628)
- *Acer saccharum - Fagus grandifolia - Betula* spp. / *Maianthemum canadense* Forest (CEGL005004)
- *Acer saccharum - Pinus strobus / Acer pensylvanicum* Forest (CEGL005005)
- *Acer saccharum - Tilia americana / Acer pensylvanicum / Caulophyllum thalictroides* Forest (CEGL006637)

- *Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest (CEGL006267)
- *Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest (CEGL006635)
- *Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest (CEGL006129)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Includes high-elevation (968 m) "elfin" stunted, multi-trunked montane northern hardwood forests sampled at Saddle Ball in Massachusetts and at Bromley and Styles Peak, Vermont. At Bromley in Vermont, it is a typical montane northern hardwood forest of northern New England with the canopy wind-pruned at higher elevation (>2,500 feet). *Dryopteris campyloptera* and northern forest herbs such as *Clintonia borealis* and *Oclemena acuminata* dominate the ground cover. Uneven-aged classes and pit-and-mound topography is typical in older stands of this community.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: In Vermont, there is a heavy infestation of beech bark disease reported at Maple Hill in Bennington and Bromley.
Global Classification Comments: This type was formerly included in CEGL006252. It is the Allegheny-Lower New England counterpart to *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631), from which it was separated to reflect the transitional northern - central hardwoods character of the vegetation.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Massachusetts at Becket Mountain, Cady Brook Natural Heritage Site, Clarksburg State Forest, Mt. Williams-Mt. Fitch Natural Heritage Site, October Mountain State Forest, Saddle Ball, and Tully Mountain, and in Vermont at Bridgewater Heights, Bromley Mountain, Coolidge Range, Harmon Hill, Kent Brook Falls, Kent Pond, Maple Hill, Middle Pinnacle, Mt. Tabor South, Quimby Mountain vicinity, Sherburne Pass, Shrewsbury, Stamford, Stratton Pond vicinity, Styles Peak, Sunderland, Thistle Hill, Wallingford Pond West, and Winhall.
Global Range: This association is a widespread matrix forest in the Allegheny Plateau of New York and Pennsylvania, on the Lake Ontario and Lake Erie plains and in Lower New England, with a more limited distribution to northern New Jersey.
Nations: CA, US
States/Provinces: CT?, MA, NJ, NY, ON, PA
TNC Ecoregions: 48:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap, Upper Delaware); USFS (Finger Lakes); USFWS (Aroostook, Moosehorn, Nulhegan Basin, Pondicherry)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FNAH
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (16 plots; 32 observation points; 14 accuracy assessment points): APPA.0034, APPA.0041, APPA.0043, APPA.0049, APPA.0800, APPA.0801, APPA.0807, APPA.0811, APPA.0817, APPA.0819, APPA.0824, APPA.0952, APPA.0956, APPA.0957, APPA.0966, APPA.1454, APPA.1468, APPA.1469, APPA.1470, APPA.1472, APPA.1476, APPA.1477, APPA.1487, APPA.1496, APPA.1497, APPA.1507, APPA.1508, APPA.1514, APPA.1515, APPA.1516, APPA.1517, APPA.1523, APPA.1555, APPA.1556, APPA.1691, APPA.1696, APPA.1697, APPA.1701, APPA.1702, APPA.1703, APPA.1705, APPA.1706, APPA.1709, APPA.1711, APPA.1714, APPA.1717, APPA.1726, APPA.1727, APPA_AA_1635, APPA_AA_1812, APPA_AA_1993, APPA_AA_2073, APPA_AA_2090, APPA_AA_2320, APPA_AA_2480, APPA_AA_2509, APPA_AA_2554, APPA_AA_2584, APPA_AA_2873, APPA_AA_3044, APPA_AA_3120, APPA_AA_3251.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler and D. Faber-Langendoen
References: Bormann et al. 1970, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Flaccus 1972, Gawler 2002, Gordon 1937b, Kern 1985, Küchler 1964, Little 1974, McIntosh 1972, Metzler and Barrett 1996, Metzler and Barrett 2001, Metzler and Barrett 2006, NAP pers. comm. 1998, Niering 1953, Ohmann and

Buell 1968, Perles et al. 2007, Perles et al. 2008, Rawinski 1984a, Simko 1987, Swain and Kearsley 2001, Thompson 1996, Woods 1987

[CEGL006459] *Acer saccharum - Fraxinus americana / Carpinus caroliniana / Podophyllum peltatum* Forest

Translated Name: **Sugar Maple - White Ash / American Hornbeam / Mayapple Forest**
Common Name: **Mid-Atlantic Hardwood High Terrace Floodplain Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Acer saccharum - Fagus grandifolia - Tilia americana* Forest Alliance (A3301)

Element Concept

Global Summary: These rich floodplain forests are found on slightly elevated alluvial terraces and active floodplains of larger rivers in the mid-Atlantic states, interior to the Coastal Plain. The setting is a raised river terrace; however, this forest may occur very close to the riverbank if the water channel is well-entrenched. The alluvial soils are slightly acidic to alkaline and less regularly inundated than the soils supporting floodplain forests dominated by silver maple or sycamore. Stands on lower terraces may flood occasionally, but the period of inundation is short. The canopy is closed to somewhat open, and a subcanopy is often present. Shrubs are typically sparse but may range up to about 30% cover. The herb layer is well-developed, fairly diverse, and seasonally variable, with spring ephemerals giving way to taller ferns, graminoids and forbs. Bryoids are very minor. The canopy dominants are usually some combination of *Acer saccharum, Fraxinus americana*, and sometimes *Carya cordiformis*. Canopy associates include *Quercus rubra, Juglans nigra, Prunus serotina, Fraxinus nigra, Liriodendron tulipifera, Ulmus americana, Tilia americana*, and *Fagus grandifolia*. *Carpinus caroliniana* is often present as a small tree, along with *Acer saccharum*. *Lindera benzoin* is the most common shrub; *Asimina triloba* is characteristic in the southern portion of this type's range. Vines such as *Toxicodendron radicans* and *Parthenocissus quinquefolia* are frequent but usually at low cover. The herb layer usually features spring ephemerals, including *Claytonia virginica, Dicentra canadensis*, and *Erythronium americanum*, followed by a mixture of ferns, forbs and graminoids. Characteristic species include *Arisaema triphyllum, Caulophyllum thalictroides, Carex laxiculmis, Deparia acrostichoides, Elymus virginicus, Elymus riparius, Onoclea sensibilis*, and *Podophyllum peltatum*. Exotic species, such as *Microstegium vimineum, Glechoma hederacea*, and *Alliaria petiolata*, may be abundant, especially in disturbed areas. These terrace forests are related to lower floodplain forests, e.g. *Platanus occidentalis - Acer negundo - Juglans nigra / Asimina triloba / Mertensia virginica* Floodplain Forest (CEGL004073), but distinguished by the reduced importance of *Acer saccharinum* and *Platanus occidentalis*; they differ from enriched upland hardwood forests, e.g., *Acer saccharum - Tilia americana / Asimina triloba / Jeffersonia diphylla - Caulophyllum thalictroides* Forest (CEGL008412), in their alluvial soils and flooding regime.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This hardwood terrace floodplain forest of the mid-Atlantic states occurs on slightly elevated alluvial terraces and active floodplains of larger rivers from Pennsylvania and New Jersey south. One sampled site is a temporarily flooded floodplain with poorly drained clay soil and another is a saturated alluvial flat with poorly drained clay loam soil. The unvegetated surface consists of leaf litter, with lesser amounts of downed wood and bare soil; one site has a dense cover of bryophytes. Evidence of disturbance includes alterations to hydrology, periodic flooding, erosion, grazing/browsing, and the presence of trails/roads and exotic plants.

Global Environment: These rich floodplain forests are found on slightly elevated alluvial terraces of mid-sized to larger rivers. The setting is a raised river terrace; however, this forest may occur very close to the riverbank if the water channel is well-entrenched. The alluvial soils are slightly acidic to alkaline. Stands on lower terraces may flood occasionally, but the period of inundation is short. Along the Potomac River west of Washington, DC, this community occupies alluvial fill overlying terraces interpreted as the Penholoway and Wicomico. It is often the higher of paired alluvial benches downstream of defending bedrock outcrops on major islands, with *Platanus occidentalis - Acer negundo - Juglans nigra / Asimina triloba / Mertensia virginica* Floodplain Forest (CEGL004073) occupying the lower bench. Soils are generally deep sandy loams, loamy sands or sands and are likely Inceptisols. The mean flooding recurrence interval along the Potomac is 15 to 30 years.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: Canopy dominants can include *Acer saccharum, Fraxinus americana*, and sometimes *Carya cordiformis*; other canopy associates include *Quercus rubra, Juglans nigra, Prunus serotina, Fraxinus nigra, Liriodendron tulipifera, Ulmus americana, Tilia americana, Acer negundo*, and *Fagus grandifolia*. *Carpinus caroliniana* is often present as a small tree, along with *Acer saccharum*. *Lindera benzoin* is the most common shrub. *Asimina triloba* is characteristic in the southern portion of this type's range; other characteristic herbaceous species include *Arisaema triphyllum, Caulophyllum thalictroides, Carex laxiculmis, Deparia acrostichoides, Elymus virginicus, Elymus riparius, Onoclea sensibilis*, and *Podophyllum peltatum*. Typical of many floodplain situations, the herb layer of the sampled plots is heavily invaded by the exotic *Microstegium vimineum*, almost to the exclusion of any other herbs.
Global Vegetation: The canopy is closed to somewhat open, and a subcanopy is often present. Shrubs are typically sparse but may range up to about 30% cover. The herb layer is well-developed, fairly diverse, and seasonally variable, with spring ephemerals giving way to taller ferns, graminoids and forbs. Bryoids are very minor. The canopy dominants are usually some combination of *Acer saccharum, Fraxinus americana*, and sometimes *Carya cordiformis*. Canopy associates include *Quercus rubra, Juglans nigra, Prunus serotina, Fraxinus nigra, Liriodendron tulipifera, Ulmus americana, Tilia americana, Celtis occidentalis*, and *Fagus grandifolia*. *Carpinus caroliniana* is often present as a small tree, along with *Acer saccharum* and *Acer negundo*. *Lindera benzoin* is the most common shrub; *Asimina triloba* is characteristic in the southern portion of this type's range. Vines such as *Toxicodendron radicans* and *Parthenocissus quinquefolia* are frequent but usually at low cover. The herb layer usually features spring ephemerals, including *Claytonia virginica, Dicentra canadensis*, and *Erythronium americanum*, followed by a mixture of ferns, forbs and graminoids. Characteristic species include *Arisaema triphyllum, Caulophyllum thalictroides, Carex laxiculmis, Deparia acrostichoides, Elymus virginicus, Elymus riparius, Onoclea sensibilis*, and *Podophyllum peltatum*. *Matteuccia struthiopteris* may form local dominance patches in this type along the Potomac River in Maryland and Virginia. Exotic species, such as *Microstegium vimineum, Glechoma hederacea*, and *Alliaria petiolata*, may be abundant, especially in disturbed areas.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree subcanopy	Broad-leaved deciduous tree	*Ulmus americana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Graminoid	*Microstegium vimineum*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin*
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer saccharum*
Herb (field)	Graminoid	*Microstegium vimineum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer saccharum*, *Lindera benzoin*
Global: *Acer saccharum*, *Arisaema triphyllum*, *Fraxinus americana*, *Lindera benzoin*, *Onoclea sensibilis*, *Podophyllum peltatum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Lysimachia nummularia* (Medium/Low), *Microstegium vimineum* (High/Medium), *Rosa multiflora* (Medium/Low)
Global: Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Glechoma hederacea* (Low), *Microstegium vimineum* (High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (5-Oct-2006). This type is fairly widely distributed in the mid-Atlantic states, but it occurs in small patches in restricted environmental settings that are typically cleared for agriculture, and intact examples are not well-documented.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Fraxinus* spp. - *Tilia americana / Matteuccia struthiopteris - Ageratina altissima* Floodplain Forest (CEGL006114)
- *Acer saccharum - Juglans cinerea / Carpinus caroliniana / Matteuccia struthiopteris* Forest (CEGL006430)
- *Acer saccharum - Tilia americana / Asimina triloba / Jeffersonia diphylla - Caulophyllum thalictroides* Forest (CEGL008412)
- *Liriodendron tulipifera - Fraxinus* spp. / *Lindera benzoin - Viburnum prunifolium / Podophyllum peltatum* Floodplain Forest (CEGL006314)
- *Tilia americana - Acer saccharum - Acer nigrum / Laportea canadensis* Floodplain Forest (CEGL006405)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Similar floodplain vegetation and setting to the north of New Jersey and New York is classified as Terrace Hardwood Floodplain Forest (CEGL006114).
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This community has been drastically reduced from its original extent, as it makes excellent fertile farmland. Originally it was probably a large-patch type.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Pochuck Creek in New Jersey and Wallkill River in New York.
Global Range: This association is known from the mid-Atlantic states from New York south to the James River in Virginia.
Nations: US
States/Provinces: MD, NJ:S2S3, NY, PA, VA:S1
TNC Ecoregions: 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Bd:CCC, 221Da:CCP, 221Db:CCP
Federal Lands: NPS (Appalachian Trail [Lower New England], C&O Canal, Delaware Water Gap, George Washington Parkway, Monocacy, Upper Delaware); USFS (Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FMHF
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 1 observation point): APPA.0912, APPA.0920, APPA.1444.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler and G.P. Fleming
References: Cowardin et al. 1979, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Fleming 2007, Fleming and Coulling 2001, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2006, Harrison 2004, Harrison and Stango 2003, Lea 2000, Perles et al. 2007, Perles et al. 2008, Rawinski et al. 1996, Thomson et al. 1999

[CEGL006637] *Acer saccharum - Tilia americana / Acer pensylvanicum / Caulophyllum thalictroides* Forest

Translated Name: **Sugar Maple - American Basswood / Striped Maple / Blue Cohosh Forest**
Common Name: **Transitional Northern Sugar Maple - Ash Rich Mesic Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Acer saccharum - Fagus grandifolia - Tilia americana* Forest Alliance (A3301)

ELEMENT CONCEPT

Global Summary: This rich sugar maple - white ash - basswood forest is found from the Allegheny Plateau of Pennsylvania and New York, the Lake Ontario and Lake Erie plains and Lower New England, south to the Central Appalachian region of western Virginia and eastern West Virginia. Stands occur on nutrient-rich, mesic or wet-mesic settings on sloped to rolling terrain. Slope bottoms, where colluvium collects, are a common landscape position. The surface soils are deep sand, loamy sand, or loam and may be underlain by sandy clay loam to clay loam. The sites are somewhat poorly drained to well-drained and can have a water table 0.4-2 m below the surface. Small (<1 ha) seep areas that may occur within these forests have soils that are usually saturated. This forest community has a well-developed tree canopy composed of deciduous species. Shrubs are scattered, but the herbaceous stratum is generally extensive. Bryoids are only a minor component of the ground layer, which is predominantly nitrogen-rich sugar maple leaves. *Acer saccharum* and *Tilia americana* are the dominant trees; *Fraxinus americana* is frequent but not necessarily abundant. *Ostrya virginiana* is very common as a small tree. *Acer rubrum, Fagus grandifolia*, and *Prunus serotina* are typical associates, in small amounts. *Ulmus rubra* and *Juglans cinerea* are occasional, *Magnolia acuminata* infrequent. Shrubs that may be found in this community include *Cornus alternifolia, Hamamelis virginiana*, and *Lonicera canadensis*. The ground flora, including many spring ephemerals, is diverse and consists primarily of nutrient- and light-requiring species. Many of these flower and fruit early in the spring before the tree canopy has fully leafed out. Fern richness is often high. Various sedges are present (particularly the Laxiflorae). These forests are differentiated from less-rich northern hardwood forests, e.g., *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632), primarily by their abundant and diverse herbaceous layer, as well as by the greater prominence of sugar maple, basswood and ash in the canopy and reduced importance of beech.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This rich sugar maple - white ash - basswood forest ranges from Ontario and New England west to Michigan and south to New Jersey and New York. Elevation of sampled plots ranges from 186-796 m (610-2,611 feet). Sites are mesic moderate to somewhat steep mid to upper slopes and coves with mostly western and eastern aspects. Soils are moderately well- to well-drained sandy loam, silt loam and loam. The unvegetated surface is strongly dominated by leaf litter, with only occasional large/small rocks, bare soil and/or downed wood. Evidence of disturbance includes past logging, erosion, and the presence of exotic plants.

Global Environment: In Virginia, stands occur on nutrient-rich, mesic or, sometimes, wet-mesic situations on flat to rolling terrain. The surface soils are deep sand, loamy sand, or loam and underlain by sandy clay loam to clay loam. The sites are somewhat poorly drained to well-drained and can have a water table 0.4-2 m below the surface. The elevation of known examples ranges from 115-830 m (380-2700 feet). Ground cover is deciduous litter, predominantly of nitrogen-rich sugar maple leaves.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This enriched deciduous forest is dominated by *Acer saccharum* and *Fraxinus americana* with *Tilia americana* frequent. *Ostrya virginiana* is very common as a small tree. The shrub layer is sparse and often made up of canopy tree saplings. Strong-enrichment indicator herbs such as *Caulophyllum thalictroides, Adiantum pedatum, Asarum canadense*, and *Panax quinquefolius* are present, often with abundant spring ephemerals. In addition, this community supports CT state-critically imperiled *Uvularia grandiflora*.

Global Vegetation: This forest community has a well-developed tree canopy composed of deciduous species. Shrubs are scattered, but the herbaceous stratum is well-represented. *Acer saccharum* and *Tilia americana* are the dominant trees; *Fraxinus americana* is frequent but not necessarily abundant. *Ostrya virginiana* is very common as a small tree. *Acer rubrum, Fagus grandifolia*, and *Prunus serotina* are typical associates, in small amounts. *Ulmus rubra* and *Juglans cinerea* are occasional, *Magnolia acuminata* infrequent. Shrubs that may be found in this community include *Cornus alternifolia, , Hamamelis virginiana*, and *Lonicera canadensis*. The ground flora, much of which is spring ephemerals, is diverse and consists primarily of nutrient- and light-requiring species. Many of these flower and fruit early in the spring before the tree canopy has fully leafed out; *Dicentra cucullaria, Dicentra canadensis, Hepatica* spp., *Asarum canadense, Caulophyllum thalictroides, Viola canadensis, Viola rotundifolia, Actaea pachypoda, Osmorhiza claytonii, Panax quinquefolius, Sanguinaria canadensis*, and *Erythronium americanum* are typical. Fern richness is often high, with characteristic species including *Adiantum pedatum, Cystopteris bulbifera, Deparia acrostichoides (= Athyrium thelypterioides), Dryopteris goldiana, Dryopteris filix-mas, Dryopteris marginalis, Botrychium virginianum, Athyrium filix-femina, Phegopteris hexagonoptera (= Thelypteris hexagonoptera)*, and, especially in seepy spots, *Matteuccia struthiopteris*. Various sedges are present

(particularly the Laxiflorae group) such as *Carex laxiflora, Carex platyphylla, Carex plantaginea, Carex leptonervia, Carex hitchcockiana, Carex aestivalis, Carex davisii, Carex bebbii*, and others. The herbaceous flora in seeps often contains *Carex scabrata, Ageratina altissima (= Eupatorium rugosum), Impatiens capensis* (sometimes *Impatiens pallida* as well), and *Solidago flexicaulis*. One state-rare plant species, *Cuscuta rostrata*, is associated with this vegetation type.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*
Herb (field)	Flowering forb	*Caulophyllum thalictroides*, *Laportea canadensis*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*
Tree subcanopy	Broad-leaved deciduous tree	*Ostrya virginiana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Cornus alternifolia*, *Dirca palustris*, *Hamamelis virginiana*, *Lonicera canadensis*, *Viburnum lantanoides*
Herb (field)	Graminoid	*Carex* spp.
Herb (field)	Fern (Spore-bearing forb)	*Adiantum pedatum*, *Botrychium virginianum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer saccharum*, *Adiantum pedatum*, *Allium tricoccum*, *Arisaema triphyllum*, *Caulophyllum thalictroides*, *Deparia acrostichoides*, *Dryopteris goldiana*, *Dryopteris intermedia*, *Fraxinus americana*, *Laportea canadensis*, *Polystichum acrostichoides*, *Solidago flexicaulis*, *Tiarella cordifolia*

Global: *Acer saccharum*, *Adiantum pedatum*, *Allium tricoccum*, *Botrychium virginianum*, *Cardamine diphylla*, *Carex* spp., *Caulophyllum thalictroides*, *Claytonia caroliniana*, *Dryopteris goldiana*, *Fraxinus americana*, *Milium effusum*, *Phlox stolonifera*, *Tiarella cordifolia*, *Tilia americana*, *Viola blanda*, *Viola canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Uvularia grandiflora* (G5, CT state-critically imperiled); **Invasive/Exotic Plants**: *Berberis thunbergii* (High/Medium), *Epipactis helleborine* (Medium/Low), *Lonicera morrowii* (High/Medium), *Rosa multiflora* (Medium/Low), *Taraxacum officinale*

Global: Vulnerable Plants: *Cuscuta rostrata* (G4, VA state-rare), *Panax quinquefolius* (G3G4, under collection pressure)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (3-Dec-2014). This community has a wide geographic distribution, but is locally distributed within its range due to specific requirements for mesic sites with fertile soils. In gentler topographic regions, many examples of this community have probably been destroyed for agriculture, and most remaining examples elsewhere have been altered by past logging. Consequently much of the remaining acreage is of variable quality.

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharum - (Fraxinus americana) / Arisaema triphyllum* Forest (CEGL006211)
- *Acer saccharum - Betula alleghaniensis - Tilia americana* Forest (CEGL002457)
- *Acer saccharum - Fagus grandifolia - Betula* spp. / *Maianthemum canadense* Forest (CEGL005004)
- *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632)
- *Acer saccharum - Fraxinus americana / Acer spicatum / Caulophyllum thalictroides* Forest (CEGL006636)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: *Allium tricoccum, Osmorhiza claytonii, Solidago flexicaulis, Caulophyllum thalictroides, Dicentra canadensis, Arisaema triphyllum*, and *Deparia acrostichoides* are all rich-site indicators at Styles Peak in Bennington, Vermont. The Shrewsbury, Vermont, site has large-diameter (>75 cm) sugar maples that may be remnants of primary forest.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: The attribution of this type to the Ridge and Valley subsection is based on the location of a single stand on the westernmost scarp slope of the Ridge Valley (east slope of Middle Mountain) at the Allegheny Front. The status of this association in Maryland is uncertain. This type was formerly included in CEGL005008. It is separated from *Acer saccharum - Fraxinus americana / Acer spicatum / Caulophyllum thalictroides* Forest (CEGL006636) to better highlight the transitional character of these rich hardwoods in the Allegheny Plateau and adjacent regions, as compared to the rich mesic northern hardwoods in the Laurentian-Acadian region.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut (Dalton-Gulf Road Natural Heritage Site, Warren Turnpike Hillocks), Massachusetts (Shaker Campsite Natural Heritage Site), and Vermont (Bridgewater Heights, Coolidge Range, Mt. Tabor South, Prosper NW Hills, Sherburne Pass, Shrewsbury, Thistle Hill, Winhall).
Global Range: This forest association ranges generally from the Allegheny Plateau of Pennsylvania and New York to the Lake Ontario and Lake Erie plains and Lower New England to the Central Appalachian region of western Virginia and eastern West Virginia.
Nations: CA, US
States/Provinces: CT, MA, MD?, NJ:S2?, NY, ON, PA, RI, VA:S1, WV:S2S3
TNC Ecoregions: 48:C, 59:C, 60:C, 61:C, 62:P, 64:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212Hl:CCP, 212Hn:CCP, 212Ho:CCC, 212Hw:CCC, 212Hx:CCP, 212Hy:CCP, 212Ja:CPP, 212Jb:CPP, 212Jc:CPP, 212Jl:CPP, 212Jn:CPP, 212Jo:CPP, 221Ae:CCC, 221Af:CCC, 221Ag:CCP, 221Ah:CCP, 221Ai:CCP, 221Al:CCP, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 222Ia:CCP, 222Ib:CCP, 222Ic:CCP, 222Id:CCP, 222Ie:CCP
Federal Lands: NPS (Appalachian Trail [Lower New England], Upper Delaware); USFS (Finger Lakes, George Washington, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FNAH
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (7 plots; 7 observation points; 2 accuracy assessment points): APPA.0030, APPA.0054, APPA.0814, APPA.0818, APPA.0953, APPA.0955, APPA.0965, APPA.1522, APPA.1568, APPA.1569, APPA.1715, APPA.1728, APPA.1729, APPA.1730, APPA_AA_2287, APPA_AA_2618.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo
Global Description Author(s): D. Faber-Langendoen, L. Sneddon, G. Fleming and S.C. Gawler
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Enser 1999, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Harrison 2004, Harrison 2011, Lee et al. 1998, Metzler and Barrett 2001, Metzler and Barrett 2004, Metzler and Barrett 2006, Perles et al. 2008, Rawinski 1984a, Swain and Kearsley 2001, WVNHP unpubl. data b

A4126 *Acer saccharum - Tilia americana - Quercus rubra* Rocky Forest Alliance

Alliance Summary Description: Canopy dominants of this semi-rich to rich rocky forest are *Acer saccharum, Fraxinus americana*, and *Tilia americana*. Canopy associates include *Carya ovata, Juglans cinerea, Ostrya virginiana, Quercus rubra*, and, less commonly, *Betula alleghaniensis* or *Thuja occidentalis*. The open shrub layer is characterized by *Acer pensylvanicum, Rubus odoratus, Sambucus racemosa (= Sambucus pubens), Staphylea trifolia*, and, more rarely, *Cornus rugosa*. This community is characterized by a fairly diverse herbaceous flora. Typical herbs include *Adiantum pedatum, Allium tricoccum, Anemone quinquefolia, Aralia racemosa, Asarum*

canadense, Caulophyllum thalictroides, Cystopteris bulbifera, Dicentra cucullaria, Dryopteris goldiana, Sanguinaria canadensis, and others. Characteristic graminoids include *Carex platyphylla, Carex sprengelii, Elymus hystrix (= Hystrix patula)*, and *Piptatherum racemosum (= Oryzopsis racemosa)*. This association can grade into open talus woodland. This alliance occurs from southern New England to the Lake Erie-Lake Ontario ecoregion of southern Ontario south to the Allegheny and central Appalachian Mountains on circumneutral to calcareous talus slopes or shallow rocky soils.

[CEGL006577] *Acer saccharum - Fraxinus americana - Juglans cinerea / Staphylea trifolia / Adlumia fungosa* Forest

Translated Name: **Sugar Maple - White Ash - Butternut / American Bladdernut / Allegheny-vine Forest**
Common Name: **Northern Calcareous Talus Slope Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Acer saccharum - Tilia americana - Quercus rubra* Rocky Forest Alliance (A4126)

Element Concept

Global Summary: This semi-rich to rich forest of southern New England to the central Appalachian Mountains in Pennsylvania occurs on talus slopes or shallow rocky soils overlying calcareous or circumneutral bedrock. Canopy dominants are *Acer saccharum* with *Fraxinus americana*. Canopy associates include *Juglans cinerea, Quercus rubra, Tilia americana, Ostrya virginiana*, and *Betula alleghaniensis*. The open shrub layer is characterized by *Staphylea trifolia, Rubus odoratus*, and *Cornus rugosa*. A characteristic vine is *Adlumia fungosa* in the northern portion of the range. This community is characterized by a fairly diverse herbaceous flora. Typical herbs include *Adiantum pedatum, Allium tricoccum, Anemone quinquefolia, Aralia racemosa, Asarum canadense, Caulophyllum thalictroides, Cystopteris bulbifera, Dicentra cucullaria, Dryopteris goldiana, Sanguinaria canadensis*, and others. Characteristic graminoids include *Carex platyphylla, Carex sprengelii, Elymus hystrix (= Hystrix patula)*, and *Piptatherum racemosum (= Oryzopsis racemosa)*. This association grades into open woodland [see related woodland type *Acer saccharum - Tilia americana - Fraxinus americana / Ostrya virginiana / Geranium robertianum* Woodland (CEGL005058)] and bedrock upslope.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This enriched, dry-mesic to mesic sugar maple - ash forest occurs on talus or shallow, very rocky soils overlying calcareous or circumneutral bedrock. It ranges from Virginia northward with limited occurrences in New England.
Global Environment: Sites include talus slopes or shallow rocky soils weathered from calcareous or circumneutral bedrock. Slopes are steep, usually with north to east aspects. Bedrock outcrops are frequent. Exposed rock (boulder and outcrop) cover can be up to 50%, which reduces both species richness and herbaceous cover.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This canopy is codominated by *Acer saccharum* and *Fraxinus americana* along with many canopy associates including *Tilia americana, Quercus rubra, Ostrya virginiana*, and *Betula alleghaniensis*. The shrub layer is characterized by *Staphylea trifolia*. The herb layer is characterized by *Cystopteris* spp., *Woodsia* spp., *Asarum canadense*, and others. This community tends to have more southern species that drop out at the northern edge of the range.
Global Vegetation: Canopy dominants are *Acer saccharum* with *Fraxinus americana*. Canopy associates are *Juglans cinerea, Quercus rubra, Tilia americana, Ostrya virginiana*, and *Betula alleghaniensis*. The open shrub layer is characterized by *Staphylea trifolia, Rubus odoratus*, and *Cornus rugosa*. A characteristic vine is *Adlumia fungosa* in the northern portion of the range. This community is characterized by a fairly diverse herbaceous flora. Typical herbs include *Adiantum pedatum, Allium tricoccum, Anemone quinquefolia, Aralia racemosa, Asarum canadense, Caulophyllum thalictroides, Cystopteris bulbifera, Dicentra cucullaria, Dryopteris goldiana, Sanguinaria canadensis*, and others. Characteristic graminoids include *Carex platyphylla, Carex sprengelii, Elymus hystrix (= Hystrix patula)*, and *Piptatherum racemosum (= Oryzopsis racemosa)*.
Global Dynamics: Exposed rock (boulder and outcrop) cover can be up to 50%, which reduces both species richness and herbaceous cover. However, due to the relatively rapid weathering of carbonate materials and extremely fertile soils, these habitats are typically well-vegetated with herbaceous plants. High cover of mosses

provides a foothold for many species, while organic mats and soil pockets are also numerous. Invasive exotic weeds do not appear to be particularly troublesome, but windthrow, slumping or landsliding of unstable colluvium, and other erosional disturbances appear to be relatively frequent in the habitats of this type.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Tilia americana*
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fraxinus americana*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer saccharum*, *Asarum canadense*, *Cystopteris bulbifera*, *Fraxinus americana*, *Ostrya virginiana*, *Staphylea trifolia*
Global: *Acer saccharum*, *Asarum canadense*, *Cystopteris bulbifera*, *Ostrya virginiana*, *Sanguinaria canadensis*, *Staphylea trifolia*, *Tilia americana*

OTHER NOTEWORTHY SPECIES

Global: Other Plants: *Juglans cinerea* (G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Jun-2007).

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Liriodendron tulipifera - Fraxinus americana / Staphylea trifolia* Forest (CEGL006201)
- *Acer saccharum - Quercus muehlenbergii / Carex platyphylla* Forest (CEGL006162)
- *Acer saccharum - Tilia americana - Fraxinus americana / Ostrya virginiana / Geranium robertianum* Woodland (CEGL005058)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was possibly observed at the New Jersey / New York line by the mapping reconnaissance team in the summer of 2012. Keeping this community in through accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Prominent distinguishing features of this community are its extremely steep, bouldery/gravelly mesic habitats, the infrequency of *Quercus* spp., the presence of *Juglans cinerea*, and the general abundance of *Staphylea trifolia* and *Adlumia fungosa*. It intergrades with both dry, open forests and other mesophytic forests along environmental continua defined by slope position and interrelated degrees of rock substrate and mineral soil development. As a result, transitional or intermediate stands that are difficult to classify may be encountered.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was possibly observed at the New Jersey / New York line by the mapping reconnaissance team in the summer of 2012.
Global Range: This community is known to occur in the Northern and Central Appalachian regions, from Vermont and New Hampshire south to Pennsylvania.
Nations: CA, US
States/Provinces: CT, MA, NH, NJ:S2, NY, PA:S2?, QC?, VT
TNC Ecoregions: 59:C, 60:C, 61:C, 64:C
USFS Ecoregions (1994/95): 212Fc:CCC, 212G:C?, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCP, 221Al:CCP, 221Ba:CCP, 221Bd:CCC, 221Dc:CPP, M212Bb:PPP, M212Bc:PPP, M212Bd:PPP, M212Cb:PPP, M212Cc:PPP, M221Aa:CCC, M221B:C?, M221Da:C??
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WCNH
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was possibly observed at the New Jersey / New York line by the mapping reconnaissance team in the summer of 2012 and was sampled during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 accuracy assessment points): APPA_AA_1806, APPA_AA_2704, APPA_AA_3166.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): L.A. Sneddon
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Fike 1999, Lundgren 2000, Metzler and Barrett 1996, Metzler and Barrett 2001, Metzler and Barrett 2004, Metzler and Barrett 2006, Perles et al. 2007, Rawinski 1984a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006471] *Acer saccharum - Tilia americana / Staphylea trifolia / Dryopteris marginalis - (Impatiens pallida)* Forest

Translated Name: **Sugar Maple - American Basswood / American Bladdernut / Marginal Woodfern - (Pale Touch-me-not) Forest**
Common Name: **Central Appalachian-Piedmont Rich Boulderfield Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Acer saccharum - Tilia americana - Quercus rubra* Rocky Forest Alliance (A4126)

ELEMENT CONCEPT

Global Summary: This association occurs in the Central Appalachians of Pennsylvania, Maryland, northern Virginia, and probably northeastern West Virginia, extending eastward locally in the Piedmont. It is associated with steep, usually stream- or river-fronting slopes covered by rocky colluvium weathered from various calcium-bearing sedimentary, metasedimentary, and igneous bedrock, including the Sykesville metasedimentary melange, hornblende tonalite, metapyroxenite, metabasalt, mica schists, phyllite, calcareous shale, limestone, and dolomite. Substrates vary from stable, large-block boulderfields to fine talus and unstable, loose scree. Surface substrate in 16 plots averaged 15% bedrock cover and 42% cover of boulders and large rocks. North and east aspects prevail among these plots. Colluvial soils are strongly calcareous and frequently restricted to interstices among rocks but may form deeper deposits where microtopography permits. Vegetation is a rich mesophytic forest with the overstory consisting largely of *Tilia americana* (mostly *var. americana* but occasionally *var. heterophylla*), *Fraxinus americana*, and *Acer saccharum*. *Acer nigrum* is also codominant in a few localities. Minor overstory associates include *Carya cordiformis, Ulmus rubra, Celtis occidentalis, Quercus rubra, Liriodendron tulipifera, Quercus prinus*, and *Quercus muehlenbergii*. Because of frequent blowdowns and canopy gaps induced by the continuous, often unstable substrates, stands tend to be somewhat open to very open. *Staphylea trifolia* is constant and abundant in the shrub layer. Other characteristic small trees, shrubs, and vines that may achieve high cover are *Asimina triloba, Ostrya virginiana, Toxicodendron radicans, Parthenocissus quinquefolia*, and *Hydrangea arborescens*. Density of herbs varies seasonally, as well as with rock cover and available microhabitats. Spring ephemerals, especially *Cardamine concatenata* and *Dicentra canadensis*, are fairly common in most stands, while dense colonies of *Impatiens pallida* overwhelmingly dominate the late-season aspect of some stands. Other herbs that occurred in half or more of plot samples are, in descending order of constancy, *Dryopteris marginalis, Eurybia divaricata (= Aster divaricatus), Arisaema triphyllum, Asarum canadense, Polystichum acrostichoides, Solidago flexicaulis, Maianthemum racemosum ssp. racemosum, Hydrophyllum virginianum*, and *Actaea racemosa (= Cimicifuga racemosa)*. Less constant herbs that may be important locally include *Arabis laevigata, Cystopteris bulbifera, Pilea pumila, Polymnia canadensis, Sanguinaria canadensis, Symphyotrichum cordifolium (= Aster cordifolius)*, and *Thalictrum dioicum*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This rich boulderfield forest occupies stream- or river-fronting boulder- and talus-strewn slopes weathered from a variety of calcium-bearing sedimentary, metasedimentary and igneous rocks. It was sampled twice in central Pennsylvania in the Central Appalachian project area. One site is a steep, northeast-facing upper slope with rapidly drained, submesic

soil. The other site is a gentle, north-facing lower slope with well-drained sandy loam soil. The unvegetated surface of one site is dominated by large rocks (covered with lichens and mosses) with some leaf litter and downed wood. The other site has an equal mix of leaf litter and bare soil. Evidence of disturbance includes trails, erosion and the presence of exotic plant species.

Global Environment: This community is associated with steep, usually stream- or river-fronting slopes covered by rocky colluvium weathered from various calcium-bearing sedimentary, metasedimentary, and igneous bedrock. Substrates vary from stable, large-block boulderfields to fine talus and unstable, loose scree. Habitats developed on the Sykesville metasedimentary melange, hornblende tonalite, metapyroxenite, and metabasalt tend to have more stable boulder deposits, while habitats formed by weathering of mica schists, phyllite, calcareous shale, limestone, and dolomite tend to have finer and looser debris. The habitats usually include sections of outcrops that are often extensive above the talus deposits. Surface substrate in 16 plots averaged 15% bedrock cover and 42% cover of boulders and large rocks. North and east aspects prevail among these plots. Soils are colluvial and frequently restricted to interstices among rocks but may form deeper deposits where microtopography permits. Samples extracted from plots varied from strongly acidic to circumneutral but had consistently high to very high calcium levels, high magnesium, and moderately low iron and aluminum.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This forest is characterized by a mixed canopy with *Tilia americana, Fraxinus americana*, and *Acer saccharum*. *Acer saccharum* is often dominant in Pennsylvania stands. Minor overstory associates include *Carya cordiformis, Ulmus rubra, Celtis occidentalis, Quercus rubra, Liriodendron tulipifera*, and/or *Quercus prinus*. *Staphylea trifolia* is usually abundant in the shrub layer, and *Sambucus canadensis* and/or *Lindera benzoin* may be common. *Toxicodendron radicans* is a common vine. *Collinsonia canadensis, Impatiens pallida, Dryopteris marginalis, Dryopteris intermedia, Polygonatum biflorum, Eurybia divaricata, Arisaema triphyllum, Maianthemum racemosum*, and *Polystichum acrostichoides* are common herbs. One stand is heavily invaded by exotic species including *Acer platanoides, Lonicera japonica*, and *Microstegium vimineum*.

Global Vegetation: Vegetation of this type is a rich mesophytic forest with the overstory consisting largely of *Tilia americana* (mostly *var. americana* but occasionally *var. heterophylla*), *Fraxinus americana*, and *Acer saccharum*. *Acer nigrum* is also codominant in a few localities. Minor overstory associates include *Carya cordiformis, Ulmus rubra, Celtis occidentalis, Quercus rubra, Liriodendron tulipifera, Quercus prinus*, and *Quercus muehlenbergii*. Because of frequent blowdowns and canopy gaps induced by the continuous, often unstable substrates, stands tend to be somewhat open to very open. *Staphylea trifolia* is constant and abundant in the shrub layer. Other characteristic small trees, shrubs, and vines that may achieve high cover are *Asimina triloba, Ostrya virginiana, Toxicodendron radicans, Parthenocissus quinquefolia*, and *Hydrangea arborescens*. Density of herbs varies seasonally, as well as with rock cover and available microhabitats. Spring ephemerals, especially *Cardamine concatenata* and *Dicentra canadensis*, are fairly common in most stands, while dense colonies of *Impatiens pallida* overwhelmingly dominate the late-season aspect of some stands. Other herbs that occurred in half or more of plot samples are, in descending order of constancy, *Dryopteris marginalis, Eurybia divaricata (= Aster divaricatus), Arisaema triphyllum, Asarum canadense, Polystichum acrostichoides, Solidago flexicaulis, Maianthemum racemosum ssp. racemosum, Hydrophyllum virginianum*, and *Actaea racemosa (= Cimicifuga racemosa)*. Less constant herbs that may be important more locally include *Arabis laevigata, Cystopteris bulbifera, Pilea pumila, Polymnia canadensis, Sanguinaria canadensis, Symphyotrichum cordifolium (= Aster cordifolius)*, and *Thalictrum dioicum*. Many additional species occur at low constancy and cover. Mean species richness of 16 plot samples was 42 taxa per 400 square meters. Despite the very rocky substrate, the exotic weed *Alliaria petiolata* is capable of becoming established or even rampant in this community. This species was present in 94% of plot samples, occasionally achieving 5 to 10% cover. Several other exotics were present at low cover and constancy.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fraxinus americana*, *Tilia americana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Staphylea trifolia*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris marginalis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fraxinus americana*, *Tilia americana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Staphylea trifolia*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris marginalis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer saccharum*, *Dryopteris marginalis*, *Eurybia divaricata*, *Fraxinus americana*, *Staphylea trifolia*, *Tilia americana*, *Toxicodendron radicans*
Global: *Acer saccharum*, *Dryopteris marginalis*, *Staphylea trifolia*, *Tilia americana*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Acer platanoides* (High/Medium), *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Prunus avium* (High/Low)
Global: Vulnerable Plants: *Scutellaria saxatilis* (G3); **Invasive/Exotic Plants**: *Alliaria petiolata* (High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (29-Sep-2006). This community is somewhat geographically restricted and often occurs in small patches (varying to large patch in carbonate rock districts). However, it occurs in rugged habitats that are less prone to anthropogenic disturbances than many other habitats.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Tilia americana / Asimina triloba / Jeffersonia diphylla - Caulophyllum thalictroides* Forest (CEGL008412) a Central Appalachian and Piedmont forest of fertile, stream- and river-fronting slopes with less rock cover and greater soil development.
- *Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Cystopteris bulbifera - Asarum canadense* Forest (CEGL006472)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: In central Pennsylvania stands, *Acer saccharum* dominates the canopy. Examples support a number of exotics.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: The classification is supported by analysis of data from 16 plots during the National Capital Region Parks project.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs in the Central Appalachians of Pennsylvania, Maryland, northern Virginia, and probably northeastern West Virginia. It was sampled in Perry County in central Pennsylvania.
Global Range: This association is found in the Central Appalachians of Pennsylvania, Maryland, northern Virginia, and probably northeastern West Virginia, extending eastward locally on river bluffs of the Piedmont.
Nations: US
States/Provinces: MD, PA, VA:S2S3, WV?
TNC Ecoregions: 52:C, 59:C, 60:?, 61:C
Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal, George Washington Parkway, Harpers Ferry); USFS (George Washington)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 observation points): APPA.1194, APPA.1231.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d.*, Fike 1999, Fleming 1999, Fleming 2007, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Harrison 2004, Lea 2003, Southeastern Ecology Working Group n.d., Southworth and Denenny 2006

[CEGL008502] *Betula alleghaniensis - Quercus rubra / Acer spicatum / Dryopteris intermedia - Oclemena acuminata* Forest

Translated Name: **Yellow Birch - Northern Red Oak / Mountain Maple / Intermediate Woodfern - Whorled Wood Aster Forest**
Common Name: **Central Appalachian Northern Hardwood Forest (Yellow Birch - Northern Red Oak Type)**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Acer saccharum - Tilia americana - Quercus rubra* Rocky Forest Alliance (A4126)

Element Concept

Global Summary: The global range of this community is poorly known but probably includes high-elevation areas of the Central Appalachians in Virginia, West Virginia, Maryland, and Pennsylvania. In Virginia, this association is almost exclusively associated with cool, rocky, northwest- to northeast-facing slopes at elevations from about 975 m (3000 feet) to more than 1300 m (4300 feet). Habitats occur on various geologic substrates, including sandstone, metabasalt (greenstone), amphibolite, and granitic formations. *Betula alleghaniensis* and *Quercus rubra* are constant, high-cover, usually codominant canopy trees. Minor canopy associates can include *Acer saccharum, Betula lenta, Tsuga canadensis, Tilia americana*, and *Fraxinus americana*. *Acer pensylvanicum* and *Acer spicatum* are the most abundant and characteristic understory trees, although *Ilex montana* may be locally abundant. More-or-less frequent shrubs include *Hamamelis virginiana, Sambucus racemosa (= Sambucus pubens)*, and *Hydrangea arborescens*. *Rhododendron maximum* is a frequent shrub at the four southernmost sites in Virginia but is absent elsewhere. The herb layer varies from moderately sparse to very dense.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This yellow birch - oak forest is found on rocky, northwest- to northeast-facing slopes at elevations from about 975 m to more than 1,300 m (3,000-4,300 feet). It was sampled at seven locations in the Central Appalachian project area. Sites range from gentle to steep mid and upper slopes with northerly aspects. Soils are rapidly to well-drained silt loam, loam and clay loam. The unvegetated surface is dominated by leaf litter or large rocks with some downed wood and occasional exposed bedrock or small rocks. Evidence of disturbance includes wind/ice damage, fire, gypsy moth damage, and the presence of exotic plant species.
Global Environment: In Virginia, this association is almost exclusively associated with cool, rocky, northwest- to northeast-facing slopes at elevations from about 975 m (3000 feet) to more than 1300 m (4300 feet). Habitats occur on various geologic substrates, including sandstone, metabasalt (greenstone), amphibolite, and granitic formations. With one exception, soils collected at plot-sampling sites are very strongly to extremely acidic (mean pH = 4.2), with low base status. Sites are mesic to submesic and are often exposed to severe winter temperatures, wind, and ice. Bedrock and boulders typically cover more than 30% of the ground surface. Surface cover of bryophytes and lichens is usually greater than 10%.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Betula alleghaniensis* and *Quercus rubra* are constant, high-cover, usually codominant canopy trees. *Acer pensylvanicum* and *Acer spicatum* are the most abundant and characteristic understory trees, although *Ilex montana* may be locally abundant. *Hamamelis virginiana, Sambucus racemosa var. racemosa*, and *Kalmia latifolia* are common shrubs. Herbs can include *Arisaema triphyllum, Carex aestivalis, Maianthemum canadense, Oclemena acuminata, Dennstaedtia punctilobula*, and *Deschampsia flexuosa var. flexuosa* and ferns such as *Athyrium filix-femina ssp. asplenioides, Dennstaedtia punctilobula*, and *Dryopteris intermedia*. In addition, this community supports VA-state critically imperiled *Abies balsamea* and VA-state imperiled *Sibbaldiopsis tridentata*.

Global Vegetation: In stands of this association, *Betula alleghaniensis* and *Quercus rubra* are constant, high-cover, usually codominant canopy trees. Minor canopy associates can include *Acer saccharum, Betula lenta, Tsuga canadensis, Tilia americana*, and *Fraxinus americana*. *Acer pensylvanicum* and *Acer spicatum* are the most abundant and characteristic understory trees, although *Ilex montana* may be locally abundant. More-or-less frequent shrubs include *Hamamelis virginiana, Sambucus racemosa (= Sambucus pubens)*, and *Hydrangea arborescens*. *Rhododendron maximum* is a frequent shrub at the four southernmost sites in Virginia but is absent elsewhere. The herb layer varies from moderately sparse to very dense. *Dryopteris intermedia, Oclemena acuminata (= Aster acuminatus), Angelica triquinata, Athyrium filix-femina ssp. asplenioides, Maianthemum canadense, Arisaema triphyllum*, and *Eurybia divaricata (= Aster divaricatus)* are the most constant and/or abundant herbaceous species. A large number of low-cover and/or low-constancy herbs also occur in the type. A few of the most characteristic include *Dryopteris marginalis, Viola blanda, Dennstaedtia punctilobula, Solidago curtisii, Impatiens pallida, Clintonia borealis, Ageratina altissima, Trillium undulatum, Circaea alpina, Carex aestivalis*, and *Carex debilis var. rudgei*. Species richness of plot-sampled stands ranges from 16 to 61 taxa per 400 square meters (mean = 35). One globally rare plant species, *Aconitum reclinatum* and one state-rare plant species, *Poa saltuensis* have been recorded in plots of this community type.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Acer spicatum*
Herb (field)	Flowering forb	*Angelica triquinata*, *Eurybia divaricata*, *Maianthemum canadense*, *Oclemena acuminata*
Herb (field)	Fern (Spore-bearing forb)	*Athyrium filix-femina* ssp. *asplenioides*, *Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*, *Quercus rubra*
Herb (field)	Flowering forb	*Arisaema triphyllum*, *Eurybia divaricata*, *Maianthemum canadense*, *Oclemena acuminata*
Herb (field)	Fern (Spore-bearing forb)	*Athyrium filix-femina* ssp. *asplenioides*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer pensylvanicum*, *Acer spicatum*, *Arisaema triphyllum*, *Betula alleghaniensis*, *Dryopteris intermedia*, *Hamamelis virginiana*, *Oclemena acuminata*, *Quercus rubra*, *Sambucus racemosa*

Global: *Acer pensylvanicum*, *Acer spicatum*, *Angelica triquinata*, *Athyrium filix-femina* ssp. *asplenioides*, *Betula alleghaniensis*, *Dryopteris intermedia*, *Hamamelis virginiana*, *Oclemena acuminata*, *Quercus rubra*, *Sambucus racemosa*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Abies balsamea* (G5, VA state-critically imperiled), *Sibbaldiopsis tridentata* (G5, VA state-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (High/Medium)

Global: Vulnerable Plants: *Aconitum reclinatum* (G3), *Gymnocarpium appalachianum* (G3), *Poa saltuensis* (G5, VA state-rare), *Scutellaria saxatilis* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (20-Jun-2001). Rank is based on potential range of this community which could include throughout the Central Appalachians.

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharum - Betula alleghaniensis - Prunus serotina* Forest (CEGL006045) the prevalent northern hardwoods forest in the Alleghany Plateau and Allegheny Mountain regions.
- *Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides / Eurybia chlorolepis - Dryopteris intermedia* Forest (CEGL007285) the prevalent northern hardwoods forest in the Southern Appalachians.

- *Betula alleghaniensis / Sorbus americana - Acer spicatum / Polypodium appalachianum* Forest (CEGL008504) is a high-elevation boulderfield woodland with low species richness (range from 12 to 24; mean = 18) and a very open canopy dominated by stunted and gnarled *Betula alleghaniensis*, typically with no other species in the canopy.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community type is one of the two major northern hardwood forests of the Central Appalachians. It typically occurs in small to moderate patches on steep, sheltered, bouldery slopes in matrices of montane oak-hickory and northern red oak forests.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: This association is somewhat intermediate between high-elevation *Quercus rubra*-dominated forests and "classic" (beech - birch - maple) northern hardwood forests. It can be readily distinguished from similar associations (CEGL006045 and CEGL007285) by the complete absence of *Fagus grandifolia* and the infrequency of *Acer saccharum* and *Prunus serotina*.

On the Northern Blue Ridge and higher ridges of the Ridge and Valley province, *Betula alleghaniensis - Quercus rubra / Acer spicatum / Dryopteris intermedia - Oclemena acuminata* Forest (CEGL008502) is the main "northern hardwood" forest in Virginia. This community appears to be absent from Allegheny Mountain in Highland County and the Mount Rogers - Whitetop Mountain area of the Southern Blue Ridge, where *Acer saccharum - Betula alleghaniensis - Prunus serotina* Forest (CEGL006045) and *Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides / Eurybia chlorolepis - Dryopteris intermedia* Forest (CEGL007285) are prevalent, respectively.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs in high-elevation areas of the Central Appalachians in Virginia, West Virginia, Maryland, and Pennsylvania. It was sampled in Virginia at Apple Orchard Mountain, Big Mountain, Crescent Rock, Garden Mountain, Mount Marshall, and The Pinnacle.
Global Range: The global range of this community is poorly known but probably includes high-elevation areas of the Central Appalachians in Virginia, West Virginia, Maryland, and Pennsylvania. In Virginia, this vegetation type is widely but locally distributed at higher elevations of the Northern Blue Ridge, Ridge and Valley, and Allegheny Mountains. It is rare and local on the Blue Ridge south of Roanoke Gap, and in the Cumberland Mountains of southwestern Virginia.
Nations: US
States/Provinces: MD?, PA?, VA:S3, WV?
TNC Ecoregions: 50:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ba:CCP, M221Bd:CCC, M221Cc:CC?, M221Ce:CCC, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Shenandoah); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (7 plots; 20 accuracy assessment points): APPA.0201, APPA.0221, APPA.0226, APPA.0237, APPA.0342, APPA.0380, APPA.0499, APPA_AA_0062, APPA_AA_0122, APPA_AA_0460, APPA_AA_0472, APPA_AA_0505, APPA_AA_0687, APPA_AA_0816, APPA_AA_0820, APPA_AA_0864, APPA_AA_0892, APPA_AA_0958, APPA_AA_1081, APPA_AA_1101, APPA_AA_1177, APPA_AA_1255, APPA_AA_1300, APPA_AA_1388, APPA_AA_1430, APPA_AA_1461, APPA_AA_1598.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Eyre 1980, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Johnson and Ware 1982, Rawinski et al. 1996, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL008528] *Tilia americana - Fraxinus americana / Acer pensylvanicum / Parthenocissus quinquefolia - Impatiens pallida* Woodland

Translated Name: **American Basswood - White Ash / Striped Maple / Virginia Creeper - Pale Touch-me-not Woodland**

Common Name: **Central Appalachian Basic Boulderfield Forest (Montane Basswood - White Ash Type)**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Acer saccharum - Tilia americana - Quercus rubra* Rocky Forest Alliance (A4126)

Element Concept

Global Summary: This community type occurs throughout the northern Blue Ridge in Virginia, Maryland, and West Virginia, and more locally in the western Virginia Ridge and Valley region. Sites include steep, boulder and stone slides below cliffs; boulder-filled slope concavities and hollow-heads; and other very rocky, submesic to mesic habitats at middle elevations between 760 and 1030 m (2500-3400 feet). This is an open to closed, mixed hardwood forest, with tall, well-formed trees. Because of somewhat unstable substrates and occasional exposure to severe wind and ice storms, downfalls and crown damage may be frequent in some stands. *Tilia americana* (including both *var. americana* and *var. heterophylla*), *Fraxinus americana*, and *Quercus rubra* are the most abundant, variably dominant or codominant canopy trees. *Carya cordiformis, Robinia pseudoacacia*, and *Carya ovata* are minor but constant canopy associates. Understory layers tend to be open, with *Acer pensylvanicum, Ostrya virginiana, Sambucus racemosa (= Sambucus pubens)*, and *Ribes rotundifolium* the most characteristic species. The usually patchy herb layer varies greatly in richness and density with substrate conditions.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This basic boulderfield forest occurs on steep, boulder and stone slides below cliffs, boulder-filled slope concavities, and other very rocky, submesic to mesic habitats between 760 and 1,030 m (2,500-3,400 feet) elevation. It was sampled at eight locations in the Central Appalachian project area. Sites are somewhat steep mid and upper slopes with mostly western aspects. Soils are rapidly to well-drained loam, silt loam and sandy loam. The unvegetated surface is dominated by either large/small rocks or leaf litter or a mix of both along with some downed wood. Evidence of disturbance includes past logging/clearing, trails, grazing/browsing, wind/ice damage, chestnut blight and hemlock adelgid damage, and the presence of exotic plant species.

Global Environment: Sites include steep, boulder and stone slides below cliffs; boulder-filled slope concavities and hollow-heads; and other very rocky, submesic to mesic habitats at middle elevations. Most plot-sampled stands are situated between 760 and 1030 m (2500-3400 feet) elevation, but stands occasionally occur as low as 450 m (1500 feet). The community is most frequent and characteristic of sites underlain by Catoctin metabasalt (greenstone) but also occurs locally on base-rich granitic rocks of the Blue Ridge basement complex, e.g., layered pyroxene granulite, charnockite, and porphyritic leucocharnockite. Scattered boulderfield habitats for this community in the Ridge and Valley province are derived from calcareous shales and siltstones. Stands occur at lower, middle, and upper slope topographic positions. Mean slope in plots is 23°. Rock cover (bedrock, boulders, and/or stones) is essentially continuous, but surficial exposure of rocks averages 50%, with leaf litter (47%) and decaying wood (3%) comprising the remainder of the substrate. Soils are mostly interstitial, have high organic content (mean = 23%), and are generally difficult to extract. Samples collected from plots are very strongly acidic (mean pH = 4.7) but have moderately high calcium, magnesium, and manganese levels (up to 4628 ppm, 372 ppm, and 269 ppm, respectively).

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Fraxinus americana* and *Tilia americana* codominate the canopy. *Quercus rubra, Carya ovata*, and *Betula lenta* are also common and sometimes codominant. *Ostrya virginiana* and *Acer pensylvanicum* are common in the subcanopy. Shrubs can include *Sambucus racemosa var. racemosa, Prunus virginiana*, and/or *Hamamelis virginiana*. *Parthenocissus quinquefolia* is a constant vine. The herb layer is diverse with *Laportea canadensis, Impatiens pallida, Hydrophyllum virginianum, Dryopteris marginalis, Asarum canadense, Actaea racemosa (= Cimicifuga racemosa), Arisaema triphyllum*, and others.

Global Vegetation: Stand physiognomy is an open to closed, mixed hardwood forest, with tall, well-formed trees. Because of somewhat unstable substrates and occasional exposure to severe wind and ice storms, downfalls and crown damage may be frequent in some stands. *Tilia americana* (including both *var. americana* and *var. heterophylla*), *Fraxinus americana*, and *Quercus rubra* are the most abundant, variably dominant or codominant canopy trees. More locally, *Betula lenta* and *Acer saccharum* are codominants in the mixtures, although the latter is absent from the majority of plot-sampled stands. *Carya cordiformis, Robinia pseudoacacia*, and *Carya ovata* are minor but constant canopy associates. Understory layers tend to be open, with *Acer pensylvanicum, Ostrya virginiana, Sambucus racemosa (= Sambucus pubens)*, and *Ribes rotundifolium* the most characteristic species. The usually patchy herb layer varies greatly in richness and density with substrate conditions. Scrambling vines of *Parthenocissus quinquefolia*, along with the forbs *Impatiens pallida, Laportea canadensis*, and *Ageratina altissima*, constitute much of the herb-layer cover. Additional more-or-less constant herbs include *Actaea racemosa (= Cimicifuga racemosa), Arisaema triphyllum, Asarum canadense, Dryopteris marginalis, Eurybia divaricata (= Aster divaricatus), Galium triflorum, Hydrophyllum virginianum, Osmorhiza claytonii*, and *Polymnia canadensis*, all of which are well-adapted to the interstices and moss mats of very bouldery/rocky habitats. On sites with slightly better development of mineral soils, a larger variety of nutrient-demanding herbs (e.g., *Caulophyllum thalictroides, Trillium grandiflorum, Viola canadensis*) may be present. Species richness of plot-sampled stands ranges from 14 to 59 taxa per 400 square meters (mean = 40).
Global Dynamics: *Juglans cinerea* was formerly a frequent associate of this community but has been nearly eliminated in recent decades by a canker dieback caused by the fungus *Melanconis juglandis*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*, *Tilia americana*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Ostrya virginiana*
Herb (field)	Liana	*Parthenocissus quinquefolia*
Herb (field)	Flowering forb	*Hydrophyllum virginianum*, *Impatiens pallida*, *Laportea canadensis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*, *Tilia americana*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Ostrya virginiana*
Herb (field)	Liana	*Parthenocissus quinquefolia*
Herb (field)	Flowering forb	*Hydrophyllum virginianum*, *Impatiens pallida*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer pensylvanicum*, *Dryopteris marginalis*, *Fraxinus americana*, *Hydrophyllum virginianum*, *Impatiens pallida*, *Laportea canadensis*, *Ostrya virginiana*, *Parthenocissus quinquefolia*, *Prunus virginiana*, *Quercus rubra*, *Tilia americana*
Global: *Acer pensylvanicum*, *Ageratina altissima*, *Fraxinus americana*, *Impatiens pallida*, *Laportea canadensis*, *Ostrya virginiana*, *Polymnia canadensis*, *Prunus virginiana*, *Quercus rubra*, *Ribes rotundifolium*, *Sambucus racemosa*, *Tilia americana*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Polygonum persicaria*, *Prunus avium* (High/Low)
Global: Vulnerable Plants: *Gymnocarpium appalachianum* (G3), *Panax quinquefolius* (G3G4, under collection pressure)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (1-Oct-2001). Based on current documentation, there are probably fewer than 100 occurrences of this community rangewide. Patch sizes are not large, and the type appears to be associated with a narrow range of ecological conditions, including base-rich substrates and intermediate elevations. The Blue Ridge of Maryland and the Ridge and Valley of Virginia and West Virginia support additional occurrences, but these are unlikely to be numerous due to a general lack of suitable substrates within the critical elevation range.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: *Betula lenta* and *Acer saccharum* are codominants in some canopy mixtures, although the latter is absent from the majority of plot-sampled stands.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Classification of this unit is supported by 20 plots from Alleghany, Amherst, Botetourt, Greene, Madison, Page, Rappahannock, Rockbridge, and Rockingham counties, Virginia (G. Fleming pers. comm.). Boulderfield forests and woodlands have not been thoroughly inventoried in Virginia and elsewhere. The global ranges and ecological relationships of this and other units are not well known and require additional study. In particular, the distribution and status of this association (CEGL008528) in the Ridge and Valley province needs clarification. The distribution of this community type in the northern Blue Ridge appears to be centered above 760 m (2500 feet) elevation, where *Liriodendron tulipifera* begins to reach its upper elevational limits. Above 1000 to 1060 m (3300-3500 feet) (depending on aspect) elevation, this type is replaced by *Betula alleghaniensis / Sorbus americana - Acer spicatum / Polypodium appalachianum* Forest (CEGL008504).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs in the Northern Blue Ridge in Virginia, Maryland, and West Virginia, and more locally in the western Virginia Ridge and Valley region. It was sampled in Washington County, Maryland, and in Virginia at Angels Rest, Bearfence Mountain, Front Royal, Hightop Mountain, Pass Mountain, Pearis Mountain near the New River, and Saddleback Mountain.
Global Range: This community type occurs in suitable habitats throughout the northern Blue Ridge in Virginia, Maryland, and West Virginia, and more locally in the western Virginia Ridge and Valley region. Stands assigned to this type but somewhat transitional to northern hardwood forest, *Betula alleghaniensis - Quercus rubra / Acer spicatum / Dryopteris intermedia - Oclemena acuminata* Forest (CEGL008502), also occur on the northwest flank of Peters Mountain in Alleghany County, Virginia. Similar forests have been observed in a few other sites of the western Virginia Ridge and Valley region.
Nations: US
States/Provinces: MD, VA:S3, WV
TNC Ecoregions: 59:C
USFS Ecoregions (1994/95): M221Aa:CCP, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Shenandoah); USFS (George Washington, Jefferson, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (6 plots; 2 observation points; 14 accuracy assessment points): APPA.0219, APPA.0223, APPA.0224, APPA.0225, APPA.0228, APPA.0523, APPA.1159, APPA.1213, APPA_AA_0114, APPA_AA_0251, APPA_AA_0337, APPA_AA_0455, APPA_AA_0499, APPA_AA_0527, APPA_AA_0813, APPA_AA_0972, APPA_AA_0986, APPA_AA_1142, APPA_AA_1175, APPA_AA_1248, APPA_AA_1335, APPA_AA_1337.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and P.P. Coulling
References: Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 2000, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Harrison 2004, Harrison 2011, Rawinski et al. 1996, Young et al. 2006, Young et al. 2009

A0266 *Betula alleghaniensis - Aesculus flava* Forest Alliance

Alliance Summary Description: This alliance includes montane forests, mainly of the Southern and Central Appalachians, dominated by *Fagus grandifolia, Betula alleghaniensis*, and *Aesculus flava*, occurring in combination or with strong dominance by one of these species. Other species that may form a typically minor canopy component include *Acer saccharum, Betula lenta, Halesia tetraptera var. monticola, Picea rubens, Prunus serotina var. serotina, Quercus rubra*, and *Tilia americana var. heterophylla*. Subcanopy species can include small stems of canopy species as well as *Acer spicatum, Acer pensylvanicum, Amelanchier laevis*, and *Sorbus americana*. Shrub density varies among associations, ranging from very high to entirely lacking. Common species in the shrub and sapling strata include *Acer pensylvanicum, Acer spicatum, Amelanchier arborea var. austromontana, Aristolochia macrophylla, Cornus alternifolia, Crataegus punctata, Hydrangea arborescens, Ilex montana, Ribes cynosbati, Ribes rotundifolium, Ribes glandulosum, Rubus allegheniensis, Rubus canadensis, Vaccinium erythrocarpum*, and *Viburnum lantanoides*. The composition of herbaceous strata varies among associations. Variability in the herbaceous stratum may be related to aspect, elevation, and soil-nutrient status. These forests occur in a cool, humid climate, typically at high elevations (1066-1828 m [3500-6000 feet]) on a variety of sites, from upper concave slopes and steep, periglacial boulderfields and talus slopes, to flat ridgetops and saddles between ridges. Associations will vary with elevation, latitude, and geology and occur as small to large patches surrounded by other forest types, montane grasslands, or shrublands.

[CEGL008558] *Acer rubrum var. rubrum - Betula lenta - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Ruderal Forest

Translated Name: **Red Maple - Sweet Birch - Mountain Magnolia / (Great Laurel, Mountain Laurel) Ruderal Forest**

Common Name: **Southern Appalachian Ruderal Acidic Mixed Hardwood Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Betula alleghaniensis - Aesculus flava* Forest Alliance (A0266)

Element Concept

Global Summary: This association includes submesic, potentially fire-exposed or heavily logged, mid and upper slopes in the Southern Appalachians north to the Cumberlands. Canopy dominance may be shared by a number of species, including *Acer rubrum var. rubrum, Carya glabra, Magnolia fraseri, Halesia tetraptera var. monticola, Nyssa sylvatica, Betula alleghaniensis var. alleghaniensis, Betula lenta, Oxydendrum arboreum*, and *Tsuga canadensis*, but the community's most distinctive character is the relative lack of dominance by any one species and the lack of oak species in the canopy. This community may occasionally be dominated by *Betula lenta* and/or *Betula alleghaniensis* with an extremely dense understory of *Rhododendron maximum*; it may intergrade with acidic cove forests farther downslope. The understory shrub layer is composed of a combination of *Kalmia latifolia* and *Rhododendron maximum*, though the cover is not consistently 100%. The proportion of *Kalmia* to *Rhododendron* varies widely through this association, with more xeric sites having a higher concentration of *Kalmia latifolia* than *Rhododendron maximum*. In addition, drier versions of this association tend to contain abundant *Sassafras albidum* in the understory, whereas the more mesic versions have lower densities of *Sassafras albidum*. The herb layer is generally sparse but may sometimes be dominated by a dense cover of ferns such as *Dennstaedtia punctilobula* or *Dryopteris marginalis*.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This maple-birch forest occurs primarily on midslopes and saddles of various aspects and of varying topographic complexity at lower elevations (760-1,400 m [2,500-4,600 feet]). These stands are thought to have originated from episodes of logging and/or fire, but not severe soil disturbance such as cultivation or grading.

Global Environment: This is a submesic forest found on moderate to steep terrain on upper slopes of many different aspects and positions in the Great Smoky Mountains National Park area at 760 to 1440 m (2500-4600 feet) in elevation and extending up the Blue Ridge into southern Virginia at the same altitude. Although tree sizes can be very large, this community is usually a late-successional community that developed in mid-elevation areas that were historically dominated by *Castanea dentata*. As the *Castanea dentata* senesced and logging proceeded in remote

sections of the park, the tree species now seen in the canopy began to be released from the understory to the canopy. This may explain why the community is so variable in its slope position, moisture regime, and elevation. The areas were probably historically fire-exposed sites before the suppression of landscape-scale fires. Soils are usually very deep.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This acidic, successional, mixed hardwood forest canopy is dominated by some combination of *Acer rubrum, Betula lenta, Magnolia fraseri, Nyssa sylvatica, Oxydendrum arboreum*, and/or *Betula alleghaniensis*, but not strongly dominated by *Betula alleghaniensis*. Shrub species are typically primarily evergreen, *Kalmia latifolia* and *Rhododendron maximum* can be very dense. The herb layer is very poorly developed or dominated by acid-loving species, especially ferns.
Global Vegetation: The canopy of this association is typically shared by a wide range of species including *Acer rubrum var. rubrum, Betula alleghaniensis var. alleghaniensis, Betula lenta, Magnolia fraseri, Oxydendrum arboreum, Nyssa sylvatica*, and *Tsuga canadensis*. The understory includes some subcanopy trees such as *Ilex opaca var. opaca* or *Ilex montana*, and shrub species such as *Kalmia latifolia* and *Rhododendron maximum* can be very dense. The proportion of *Kalmia* to *Rhododendron* varies widely through this association, with more xeric sites having a higher concentration of *Kalmia latifolia* than *Rhododendron maximum*. In addition, drier versions of this association tend to contain abundant *Sassafras albidum* in the understory, whereas the more mesic versions have lower densities of *Sassafras albidum*. Although the herb layer is comprised mostly of small shrubs, seedlings, and evergreens, *Trillium undulatum, Goodyera pubescens*, and other acid-loving species can occasionally be found in this association.
Global Dynamics: It is assumed that these communities may have burned in the past. The lack of oak trees in this association is poorly understood. Some examples of this association occur in virgin forest areas, though there are areas where large chestnut stumps are present; these stands may represent a post-chestnut-blight or post-chestnut-blight logging replacement forest. Other stands occur in areas with a previous logging history, and may reflect stands developing after logging.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula lenta*, *Magnolia fraseri*, *Nyssa sylvatica*, *Oxydendrum arboreum*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia latifolia*, *Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* var. *rubrum*, *Betula alleghaniensis* var. *alleghaniensis*, *Betula lenta*, *Halesia tetraptera* var. *monticola*, *Magnolia fraseri*, *Nyssa sylvatica*, *Oxydendrum arboreum*
Shrub/sapling (tall & short)	Broad-leaved evergreen tree	*Rhododendron maximum*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia latifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer rubrum*, *Betula lenta*, *Kalmia latifolia*, *Magnolia fraseri*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Rhododendron maximum*
Global: *Acer rubrum* var. *rubrum*, *Betula alleghaniensis* var. *alleghaniensis*, *Betula lenta*, *Kalmia latifolia*, *Magnolia fraseri*, *Rhododendron maximum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (9-Oct-2001). Ranked as modified due to the heavy effects logging had on most of these stands over the past 100 years. Stands of this type appear to have been modified by a combination of logging, chestnut death, and fire suppression. These are mature stands in the Great Smoky Mountains National Park.

RELATED CONCEPTS

Global Similar Types:

- *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861) is a more natural association, with a more reliable species composition, sometimes containing *Tsuga canadensis*.
- *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543)
- *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271) oak-dominated.
- *Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest (CEGL007230)
- *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267) oak-dominated.
- *Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest (CEGL006286)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This is not terribly common but occurs in areas that were disturbed at some point in the past and have grown back into a mix of a number of hardwood species. Usually there is not one dominant species, but instead a mix of *Acer rubrum, Betula lenta, Magnolia fraseri, Nyssa sylvatica*, and others.
Appalachian Ruderal Hardwood Forest (CEGL007219) and Southern Appalachian Ruderal Acidic Mixed Hardwood Forest (CEGL008558) can both have high cover of *Acer rubrum, Magnolia fraseri*, and *Oxydendrum arboreum*, but this association (CEGL008558) typically does **not** have a large component of *Liriodendron tulipifera* or *Betula alleghaniensis*. The trees in stands of this association are older (greater than 70 years), larger, and more mature than in CEGL007219.

To distinguish between Blue Ridge Hemlock - Northern Hardwood Forest (CEGL007861) and this association (CEGL008558): there is no *Tsuga canadensis* in CEGL008558 and it is usually found on more concave upper slopes and not so much on steep sideslopes, whereas CEGL007861 can be on either.

These stands are thought to have originated from episodes of logging and/or fire, but not severe soil disturbance such as cultivation or site clearing. This community may have originally been dominated by *Castanea dentata* until its decline due to chestnut blight. This released the other hardwood species in the understory, resulting in this composition. In higher elevation examples, this community may be a long-term post-disturbance example of Southern Appalachian Northern Hardwood Forest (Typic Type) (CEGL007285).
Global Classification Comments: None of the communities listed as similar associations are very close to this association in canopy composition, but the understory of all of these associations is similar. Some examples of this community may resemble and even intergrade with acidic cove forest (CEGL007543) but usually occur high up on south- and even some north-facing slopes far from the concave cove areas. This community may begin to pick up species such as *Picea rubens* and *Prunus pensylvanica* at the highest parts of its elevational range in the Southern Appalachians. In the Cumberlands, it definitely can intergrade with acidic coves, and the line between these communities is often hard to draw.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was observed and is mapped within the AT corridor from Max Patch north to Fox Creek (Grayson Highlands area).
Global Range: This association is documented only from the Great Smoky Mountains National Park and Cumberland Gap National Historical Park, but it may occur throughout the mid- to higher elevation exposed slopes of eastern Tennessee and western North Carolina, and possibly also into adjacent parts of Virginia and West Virginia.
Nations: US
States/Provinces: KY, NC, TN, VA?
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Cc:CCC, M221Ce:CCC, M221Dc:CC?, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Cumberland Gap, Great Smoky Mountains); USFS (Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXAH
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (26 accuracy assessment points): APPA_AA_0052, APPA_AA_0060, APPA_AA_0105, APPA_AA_0202, APPA_AA_0218, APPA_AA_0336, APPA_AA_0451, APPA_AA_0551, APPA_AA_0633, APPA_AA_0730, APPA_AA_0764, APPA_AA_0885, APPA_AA_0953, APPA_AA_1071, APPA_AA_1135, APPA_AA_1179, APPA_AA_1239, APPA_AA_1243, APPA_AA_1282, APPA_AA_1293, APPA_AA_1436, APPA_AA_1465, APPA_AA_1466, APPA_AA_1511, APPA_AA_1593.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay
Global Description Author(s): R. White
References: NatureServe Ecology - Southeastern U.S. unpubl. data, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, White 2006

[CEGL004973] *Aesculus flava - Betula alleghaniensis - Acer saccharum / Caulophyllum thalictroides - Actaea podocarpa* Forest

Translated Name: **Yellow Buckeye - Yellow Birch - Sugar Maple / Blue Cohosh - Mountain Bugbane Forest**
Common Name: **Southern Appalachian Northern Hardwood Forest (Rich Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Betula alleghaniensis - Aesculus flava* Forest Alliance (A0266)

ELEMENT CONCEPT

Global Summary: This association includes forests on high but sheltered slopes in the Southern Appalachians, with canopies dominated by species typically known as northern hardwoods (*Aesculus flava, Fagus grandifolia, Betula alleghaniensis, Acer saccharum*), but with a rich herbaceous flora dominated by forbs and more typical of lower elevation "cove" forests. This forest occurs on deep, rocky soils on the upper slopes of coves, and on other protected landforms, at elevations of 1070-1525 m (3500-5000 feet), and can be associated with mafic substrates. Other canopy species can include *Fraxinus americana, Tilia americana var. heterophylla*, and *Quercus rubra*. In the Great Smoky Mountains and in the Nantahala Mountains (Standing Indian), *Halesia tetraptera var. monticola* can be an important canopy component. The shrub stratum is typically open, but small trees such as *Acer spicatum, Acer pensylvanicum*, and *Amelanchier laevis* are frequent. Herbaceous cover can be lush, quite diverse, and is typically dominated and characterized by large forbs such as *Caulophyllum thalictroides, Actaea podocarpa (= Cimicifuga americana), Actaea racemosa (= Cimicifuga racemosa), Collinsonia canadensis, Ageratina altissima var. roanensis, Laportea canadensis, Campanulastrum americanum*, and *Tiarella cordifolia*. Other species typical of northern hardwood forests such as *Dryopteris intermedia* and *Eurybia chlorolepis* are also common. The canopy of these forests always has a component of *Betula alleghaniensis* and/or *Fagus grandifolia*, occurring with *Acer saccharum*, over a lush and diverse herbaceous stratum.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This northern hardwood forest is usually found at elevations greater than 1,100 m (3,600 feet), but can be found as low as 975 m (3,200 feet) in some cases. It was sampled at 14 locations in the park. Sites cover a wide range of landscapes, from gentle to somewhat steep lower to upper slopes and ridgetops with mostly northern aspects. Soils are typically moderately well-drained loams. The unvegetated surface is dominated by leaf litter with some downed wood. Evidence of disturbance includes possible past logging, wind/ice damage, and the presence of exotic plant species.
Global Environment: This association includes forests on high but sheltered slopes in the Southern Appalachians. This forest occurs on deep, rocky soils on the upper slopes of coves, and on other protected landforms, at elevations of 1070-1525 m (3500-5000 feet), and can be associated with mafic substrates.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy includes *Betula alleghaniensis, Aesculus flava, Acer saccharum, Fraxinus americana*, and *Tilia americana*, particularly *Tilia americana var. heterophylla*. Shrubs are variable but often comprised of canopy regeneration. The rich mesic herbaceous layer approaches that of a cove forest. Indicator species include *Caulophyllum thalictroides, Actaea*

racemosa, Collinsonia canadensis, Laportea canadensis, and *Campanulastrum americanum*. Additional common and/or abundant herbs include *Carex pensylvanica, Dryopteris intermedia, Prenanthes altissima, Sanguinaria canadensis*, and *Solidago curtisii (= Solidago caesia var. curtisii)*. In addition, the community supports TN state-imperiled *Agastache scrophulariifolia, Ageratina altissima var. roanensis, Allium tricoccum*, and *Polygonatum biflorum var. commutatum*, and VA state-imperiled *Phacelia fimbriata*.

Global Vegetation: The canopy of these forests always has a component of *Betula alleghaniensis* and/or *Fagus grandifolia*, occurring with *Acer saccharum*, over a lush and diverse herbaceous stratum. The canopies of stands are dominated by species typically known as "northern hardwoods" (*Aesculus flava, Fagus grandifolia, Betula alleghaniensis, Acer saccharum*), but with a rich herbaceous flora dominated by forbs and more typical of lower elevation "cove" forests. Other canopy species can include *Tilia americana var. heterophylla, Fraxinus americana*, and *Quercus rubra*. In the Great Smoky Mountains and the Nantahala Mountains, *Halesia tetraptera var. monticola* can be an important canopy component. The shrub stratum is typically open, but small trees such as *Acer spicatum, Acer pensylvanicum*, and *Amelanchier laevis* are frequent. Herbaceous cover can be lush, quite diverse, and is typically dominated and characterized by large forbs such as *Caulophyllum thalictroides, Actaea podocarpa (= Cimicifuga americana), Actaea racemosa (= Cimicifuga racemosa), Collinsonia canadensis, Ageratina altissima var. roanensis, Laportea canadensis, Campanulastrum americanum*, and *Tiarella cordifolia*. Other species typical of northern hardwood forests such as *Dryopteris intermedia* and *Eurybia chlorolepis* are also common.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Aesculus flava*, *Betula alleghaniensis*, *Fraxinus americana*
Herb (field)	Flowering forb	*Laportea canadensis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia*
Herb (field)	Flowering forb	*Actaea racemosa*, *Laportea canadensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer saccharum*, *Betula alleghaniensis*, *Caulophyllum thalictroides*, *Dryopteris intermedia*, *Fraxinus americana*

Global: *Acer saccharum*, *Betula alleghaniensis*, *Deparia acrostichoides*, *Fagus grandifolia*, *Halesia tetraptera* var. *monticola*, *Viola canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Agastache scrophulariifolia* (G4, TN state-critically imperiled), *Ageratina altissima* var. *roanensis* (G5T3T4, TN state-imperiled), *Allium tricoccum* (G5, TN state-critically imperiled), *Phacelia fimbriata* (G4, VA state-imperiled), *Polygonatum biflorum* var. *commutatum* (G5T5, TN state-imperiled); **Invasive/Exotic Plants**: *Stellaria media* (Low)

Global: Vulnerable Plants: *Aconitum reclinatum* (G3), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Carex ruthii* (G3), *Coreopsis latifolia* (G3), *Gentiana austromontana* (G3), *Geum geniculatum* (G2), *Lilium grayi* (G3, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Solidago glomerata* (G3), *Stachys clingmanii* (G2); **Other Plants**: *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (27-Oct-2003). This community is naturally uncommon due to specific habitat requirements and a restricted geographic range. It only occurs at moderate to high elevations, on protected landforms, in the Southern Blue Ridge. Most documented occurrences are of moderate to high quality, although destructive silvicultural practices could threaten remaining occurrences. The European gypsy moth (*Lymantria dispar*) is predicted to spread within the range of this community by 2005 and poses a threat to this community. There are potential difficulties in assigning plots or occurrences to this association (Southern Appalachian Northern Hardwood Forest [Rich Type] (CEGL004973)) versus Southern Appalachian Cove Forest (Rich Montane Type) (CEGL007695). The current (2003) understanding of the differences would dictate leaving the rank at G3.

RELATED CONCEPTS

Global Similar Types:

- *Aesculus flava - Acer saccharum - (Tilia americana var. heterophylla) / Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695) lacks *Betula alleghaniensis* and occurs at lower elevations.
- *Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides / Eurybia chlorolepis - Dryopteris intermedia* Forest (CEGL007285) occurs on higher, more open slopes with lower soil fertility.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: "Rich" northern hardwoods of the Southern Appalachians. This unit occupies more concave slopes than Southern Appalachian Northern Hardwood Forest (Typic Type) (CEGL007285) at somewhat lower elevations, and is associated with soils that have slightly higher pH, Ca, Mg, and total base saturation. In analysis, a number of plots shifted allegiance between this group and the group representing Southern Appalachian Rich Cove Forest (Montane Calcareous Type) (CEGL007695) of the Rich Cove Forests class depending on the protocols used for cluster analysis. In the field, these two types intergrade in the elevation range 1,100 to 1,300 m (3,600-4,300 feet), and some plots may be difficult to subjectively classify and could be assigned equally well to either type. At the other end of the gradient, this type can merge into Southern Appalachian Northern Hardwood Forest (Typic Type) (CEGL007285) along a topographic cline.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: Other species that have high diagnostic value and constancy in this type, and that might be considered as alternate nominals, are *Fagus grandifolia, Dryopteris intermedia*, and *Actaea podocarpa (= Cimicifuga americana)*.
Global Classification Comments: These forests occur above the elevational limit of some of the typical "cove" canopy species [see *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava* Forest Alliance (A0235)] such as *Liriodendron tulipifera* and *Carya cordiformis*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Frequent along and near the AT in most high-elevation areas from Mount Rogers south to the Nantahala Mountains. This community was sampled in North Carolina, including Standing Indian Mountain and Yellow Mountain in Nantahala National Forest; in Tennessee, including Great Smoky Mountains National Park (Devil's Tater Patch, Mud Gap) and Cherokee National Forest (Hughes Gap); and at Whitetop Mountain in Virginia.
Global Range: This community is a regional endemic, found only in the high-mountain areas of the Southern Blue Ridge, from Virginia south through western North Carolina, eastern Tennessee, and northeastern Georgia, with outlying examples in the Cumberlands and Southern Ridge and Valley in Virginia (Clinch Mountain and High Knob massif).
Nations: US
States/Provinces: GA, NC, TN, VA:S2, WV
TNC Ecoregions: 50:C, 51:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ce:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Monongahela, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FSAH
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (10 plots; 5 observation points; 12 accuracy assessment points): APPA.0079, APPA.0087, APPA.0116, APPA.0135, APPA.0146, APPA.0151, APPA.0172, APPA.0178, APPA.0365, APPA.0636, APPA.1103, APPA.1116, APPA.1127, APPA.1129, APPA.1131, APPA_AA_0129, APPA_AA_0199, APPA_AA_0355, APPA_AA_0507, APPA_AA_0588, APPA_AA_0765, APPA_AA_0888, APPA_AA_1080, APPA_AA_1129, APPA_AA_1210, APPA_AA_1435, APPA_AA_1537.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming and K. Patterson

References: Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Major et al. 1999, Peet et al. unpubl. data, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

[CEGL007861] *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest

Translated Name: **Yellow Birch - (Eastern Hemlock) / Great Laurel / (Highland Doghobble) Forest**
Common Name: **Blue Ridge Hemlock - Northern Hardwood Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Betula alleghaniensis - Aesculus flava* Forest Alliance (A0266)

Element Concept

Global Summary: This association occurs in the Great Smoky Mountains and high mountain areas of southwestern Virginia, and at lower elevations in protected mountain settings in West Virginia. This community is found on steep, mostly north-facing slopes, and on slopes and flats along and above streams. These forests occur on midslope or toeslope positions, protected by higher landforms, where solar exposure is very low. The elevations of samples range from as low as 320 m in West Virginia (1040 feet) to around 1350 m (4400 feet), but the community can probably occur as high as 1524 m (5000 feet) or until *Picea rubens* begins to dominate. Sites are rocky, often with many large boulders and talus. Soils are stony with heavy litter layers and pockets of colluvium. This forest is affected by occasional disturbance by ice, wind and landslides. This mixed forest type has an open to closed canopy dominated by *Betula alleghaniensis* and/or *Tsuga canadensis*, although either of these species may be locally dominant at a small scale. In some stands, *Acer rubrum, Betula lenta, Liriodendron tulipifera* (at lower elevations), *Tilia americana var. heterophylla, Picea rubens*, or *Quercus rubra* can be important in the canopy or occur as minor associates. Other minor canopy and subcanopy species may include *Fagus grandifolia, Prunus serotina*, and *Magnolia acuminata*. The tall-shrub stratum is over 2 m in height, very dense (50-100% coverage) and dominated by *Rhododendron maximum*. Other minor shrubs commonly include *Acer pensylvanicum, Amelanchier laevis, Amelanchier arborea, Clethra acuminata, Hamamelis virginiana* (West Virginia), *Ilex montana*, and *Vaccinium erythrocarpum*. The ground layer is dominated by leaf litter, fallen trees and rocks. Herbaceous cover is sparse to moderate and is composed of scattered plants typical of mid- to high-elevation acidic forests. Composition can be quite variable among stands, but some of the more characteristic species include *Dryopteris intermedia, Oclemena acuminata, Polystichum acrostichoides* (West Virginia), *Viola blanda*, and *Viola rotundifolia*. The bryophyte layer can be well-developed and diverse. This association grades into forests dominated by *Picea rubens* or *Tsuga canadensis* at higher elevations.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This mixed hemlock - northern hardwood forest of the Blue Ridge Mountains is found at elevations of 320 to 1,040 m (1,000-5,000 feet) on steep, mostly north-facing mesic slopes, and on toeslopes and flats along streams. It was sampled once in the Central Appalachian project area. The site occupies a flat cove head known as Pine Swamp located just below the crest of Peters Mountain with mesic clay loam soil. Seepage swales interlace the matrix forest. The unvegetated surface is dominated by leaf litter with some downed wood. No evidence of disturbance was reported.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This evergreen-deciduous mixed forest occurs at elevations usually greater than 1,100 m (3,600 feet), but as low as 975 m (3,200 feet) in some cases. Sites range from gentle to somewhat steep mid and upper slopes and summits. Soils are rapidly to well-drained clay loam. The unvegetated surface is dominated by leaf litter with some downed wood or may be a mix of leaf litter, exposed bedrock and large rocks.
Global Environment: This community occurs on steep, mostly north-facing mesic slopes, and on toeslopes and flats along streams. It typically occupies mid- to lower slope and valley-bottom topographic positions that are well-protected by higher landforms. These sites have low solar exposure and may be subject to cold-air inversions. Elevations (of plot-sampled stands) range from 320-750 m (1040-2400 feet) in West Virginia, to 915-1450 m (3000-4800 feet) in the Virginia mountains, and to 1030-1450 m (3400-4800 feet) in the Great Smoky Mountains. Lower elevation stands may intergrade with *Betula lenta*-dominated forest types. Sites are often rocky, with many large

boulders and stones and pockets of colluvium. Soils, weathered from sandstone, acidic shale, or metamorphic igneous rocks, have dense, root-rich duff layers. Samples collected from plots are highly acidic (mean pH = 3.7 to 4.8) with low base status and moderately high organic matter content (mean = 20%). On stream-bottom sites, local areas of seepage are not uncommon, and habitats may be somewhat transitional to a saturated hydrologic regime. Sites occupied by this forest are affected by occasional ice, wind, and landslide disturbances.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This forest has a strong *Betula alleghaniensis* component with variable amounts of *Tsuga canadensis* and *Acer rubrum*. *Liriodendron tulipifera, Prunus serotina*, and *Acer pensylvanicum* may also be present in the canopies of some stands. The shrub layer is made up of dense *Rhododendron maximum* cover along with other shrubs such as *Ilex montana* and *Hamamelis virginiana*. Few herbs are present but may include *Agrostis perennans, Carex debilis var. rudgei, Dennstaedtia punctilobula*, and *Dryopteris intermedia*.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy of this mixed forest is codominated by *Tsuga canadensis* and *Betula alleghaniensis*, but in some stands *Tsuga canadensis* may not be present; additional species may include *Acer* spp., *Magnolia acuminata, Oxydendrum arboreum, Picea rubens* and *Prunus serotina*. *Rhododendron maximum* dominates the dense shrub layer which can also include *Hamamelis virginiana, Ilex montana*, and *Rubus flagellaris*. Common herbs are *Agrostis perennans, Carex debilis var. rudgei, Carex digitalis, Dennstaedtia punctilobula*, and *Dryopteris intermedia*.

Global Vegetation: This mixed forest has an open to closed canopy codominated by *Betula alleghaniensis* and/or *Tsuga canadensis*, although either of these species may be solely dominant over small areas. In some stands, *Acer rubrum, Betula lenta, Liriodendron tulipifera* (at lower elevations), *Tilia americana var. heterophylla, Picea rubens*, or *Quercus rubra* can be important in the canopy or occur as minor associates. Other minor canopy and subcanopy species may include *Fagus grandifolia, Prunus serotina*, and *Magnolia acuminata*. The community has a very dense (50-100% cover), evergreen tall-shrub stratum (>2 m tall) dominated by *Rhododendron maximum*. In the Great Smoky Mountains, a dense low-shrub stratum dominated by *Leucothoe fontanesiana* is typical, but this species is absent from Virginia and West Virginia examples of the type. Other minor shrubs commonly include *Acer pensylvanicum, Amelanchier laevis, Hamamelis virginiana* (in West Virginia stands), *Ilex montana*, and *Vaccinium erythrocarpum*. Herbaceous cover is sparse to occasionally moderate and is composed of scattered plants typical of mid- to high-elevation acidic forests. Composition can be quite variable among stands, but some of the more characteristic species include *Dryopteris intermedia, Oclemena acuminata, Polystichum acrostichoides* (in West Virginia stands), *Viola blanda*, and *Viola rotundifolia*. Some additional herbaceous species found in this community include *Arisaema triphyllum, Dennstaedtia punctilobula, Huperzia lucidula*, and *Medeola virginiana*. In Southern Appalachian stands with very dense evergreen shrub layers, species richness can be extraordinarily low (<10 taxa per 1000-square-meter sample), but in stands with somewhat more open shrub layers, richness can exceed 30 taxa per sample. The bryophyte layer can be well-developed and diverse; mosses and liverworts collected from West Virginia plots include *Anomodon attenuatus, Aulacomnium heterostichum, Bryhnia graminicolor, Bryoandersonia illecebra, Campylium chrysophyllum, Hypnum curvifolium, Hypnum imponens, Loeskeobryum brevirostre, Mnium stellare, Plagiothecium denticulatum, Platyhypnidium riparioides, Thuidium delicatulum, Bazzania trilobata, Leucobryum glaucum*, and *Mnium hornum*. The regionally rare plants *Botrychium oneidense* and *Prenanthes roanensis* are minor components of this vegetation type.

Global Dynamics: The *Tsuga canadensis* component of Virginia stands has been devastated by outbreaks of hemlock woolly adelgid over the past several decades, leading to more open canopy conditions, along with increased regeneration and greater importance of *Betula alleghaniensis* in most stands.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron maximum*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Betula alleghaniensis*, *Dennstaedtia punctilobula*, *Dryopteris intermedia*, *Rhododendron maximum*, *Tsuga canadensis*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Betula alleghaniensis*, *Carex digitalis*, *Dennstaedtia punctilobula*, *Rhododendron maximum*, *Tsuga canadensis*
Global: *Betula alleghaniensis*, *Betula lenta*, *Botrychium oneidense*, *Magnolia fraseri*, *Mitchella repens*, *Oxalis montana*, *Picea rubens*, *Polypodium appalachianum*, *Polypodium virginianum*, *Polystichum acrostichoides*, *Rhododendron maximum*, *Ribes cynosbati*, *Tiarella cordifolia*, *Tsuga canadensis*, *Viola rotundifolia*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Botrychium oneidense* (G4, VA state-rare), *Geum geniculatum* (G2), *Hypericum mitchellianum* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (23-May-2011). This community type is naturally uncommon within its range due to specific requirements for protected, mesic sites at high elevations. Most remaining examples of this community have been affected by past logging and are currently threatened with the loss of their *Tsuga canadensis* component due to ongoing or potential infestations by the exotic pest hemlock woolly adelgid (*Adelges tsugae*). This community type has a restricted but locally extensive distribution in the highest mountains of southwestern and west-central Virginia, North Carolina, West Virginia, and Tennessee. This association was originally described from Great Smoky Mountains National Park.

RELATED CONCEPTS

Global Similar Types:
- *Acer rubrum var. rubrum - Betula lenta - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Ruderal Forest (CEGL008558) is a post-disturbance forest, some stands of which could resemble CEGL007861 without *Tsuga*.
- *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543)
- *Picea rubens - (Betula alleghaniensis, Aesculus flava) / Rhododendron (maximum, catawbiense)* Forest (CEGL004983)
- *Picea rubens - (Betula alleghaniensis, Aesculus flava) / Viburnum lantanoides / Solidago glomerata* Forest (CEGL006256)
- *Picea rubens / Betula alleghaniensis / Bazzania trilobata* Forest (CEGL008501)
- *Tsuga canadensis - (Betula alleghaniensis, Quercus rubra) / Ilex montana / Rhododendron catawbiense* Forest (CEGL008513)
- *Tsuga canadensis - Acer saccharum - Fagus grandifolia / Dryopteris intermedia* Forest (CEGL006639)
- *Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest (CEGL006638)
- *Tsuga canadensis - Betula alleghaniensis - Prunus serotina / Rhododendron maximum* Forest (CEGL006206)
- *Tsuga canadensis - Halesia tetraptera - Magnolia fraseri / Rhododendron maximum / Dryopteris intermedia* Forest (CEGL007693)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Examples of this community exhibit wide variation in species richness. As defined by the more constant species, however, the composition appears to be "classic" with *Betula alleghaniensis* and *Tsuga canadensis* over *Rhododendron maximum*.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Stands of this community may be hard to distinguish from Southern Appalachian Ruderal Acidic Mixed Hardwood Forest (CEGL008558).

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: As defined by the more constant species, however, composition appears to be "classic" CEGL007861, with *Betula alleghaniensis* with or without *Tsuga* over *Rhododendron maximum*, and in most of the Great Smokies plots, *Leucothoe fontanesiana*. Variation in the cover/density of these ericads may account (at least in part) for the great fluctuation in herbaceous richness in this group.

Global Classification Comments: This association is a high-elevation acidic cove forest and is characterized by species indicative of montane, infertile environments, a dense shrub layer of *Rhododendron maximum*, and a mixed deciduous-evergreen to mostly deciduous canopy. Species richness is typically low, ranging from 4 to 38 species per sample with an average of 19 species per 400-square-meter sample. Analysis of plot samples from the Great Smoky and Virginia mountains, and from Fayette and Raleigh counties, West Virginia, shows the most constant species as *Betula alleghaniensis, Rhododendron maximum, Tsuga canadensis*, and *Dryopteris intermedia*.

Some stands in West Virginia may be better classified as *Tsuga canadensis - Betula alleghaniensis - Prunus serotina / Rhododendron maximum* Forest (CEGL006206), a seemingly more diverse and lower-elevation type. Forests of high-elevation coves at Salt Pond Mountain in Giles County (e.g., War Spur Branch), where *Picea rubens* is codominant with or subordinate to *Tsuga canadensis* and *Betula alleghaniensis*, are tentatively placed here. Some of these stands, however, may be better classified as wetlands and require additional investigation.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is locally distributed throughout higher elevations of the Southern and Central Appalachians and along the AT from Potts Mountain, Virginia, to the Nantahala Mountains. In the Central Appalachian project area, it was sampled along the Virginia/West Virginia stateline at Pine Swamp Branch in Giles County, Virginia.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Present in scattered high-elevation areas along the AT corridor from Potts Mountain, Virginia, to the Nantahala Mountains in Tennessee.

Global Range: This community has been documented in the Great Smoky Mountains of Tennessee; in the Mount Rogers - Whitetop Mountain area of the Virginia Blue Ridge (Grayson, Smyth and Washington counties); on Salt Pond Mountain in the Ridge and Valley of west-central Virginia (Giles County); on Allegheny Mountain in Highland County, Virginia, and adjacent Pocahontas County, West Virginia; and in Fayette County, West Virginia, along and near the New River Gorge, and along Gauley River in West Virginia. This vegetation type may be locally distributed throughout higher elevations of the Southern and Central Appalachians.

Nations: US

States/Provinces: NC:S2, TN, VA:S2, WV

TNC Ecoregions: 50:C, 51:C, 59:C

USFS Ecoregions (1994/95): M221Aa:CCC, M221Ba:CCC, M221Bd:CC?, M221Ca:CCC, M221Cb:CCC, M221Dc:CCC, M221Dd:CCC

Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Gauley River, Great Smoky Mountains, New River Gorge); USFS (Cherokee, George Washington, Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FBHH

Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 3 accuracy assessment points): APPA.0490, APPA_AA_0506, APPA_AA_0671, APPA_AA_1547.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 1 observation point; 29 accuracy assessment points): APPA.0184, APPA.0335, APPA.1093, APPA_AA_0042, APPA_AA_0093, APPA_AA_0145, APPA_AA_0196, APPA_AA_0383, APPA_AA_0400, APPA_AA_0440, APPA_AA_0475, APPA_AA_0590, APPA_AA_0701, APPA_AA_0849, APPA_AA_1024, APPA_AA_1040, APPA_AA_1082, APPA_AA_1190, APPA_AA_1200, APPA_AA_1247, APPA_AA_1258, APPA_AA_1302, APPA_AA_1303, APPA_AA_1352, APPA_AA_1362, APPA_AA_1454, APPA_AA_1481, APPA_AA_1492, APPA_AA_1551, APPA_AA_1586, APPA_AA_3357, APPA_AA_3361.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay

Global Description Author(s): G. Fleming, P. Coulling, S.C. Gawler and K.D. Patterson
References: Adams and Stephenson 1991, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Grafton and McGraw 1976, Livingston and Mitchell 1976, NatureServe Ecology - Southeastern U.S. unpubl. data, Newell 1997, Newell et al. 1997, Peet et al. unpubl. data, Schafale 2012, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, VDNH 2003, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2010

[CEGL007285] *Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides / Eurybia chlorolepis - Dryopteris intermedia* Forest

Translated Name: **Yellow Birch - American Beech / Hobblebush / Appalachian Heartleaf Aster - Intermediate Woodfern Forest**
Common Name: **Southern Appalachian Northern Hardwood Forest (Typic Type)**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Betula alleghaniensis - Aesculus flava* Forest Alliance (A0266)

Element Concept

Global Summary: This is a broadly defined association meant to cover typical "northern hardwood forests" over 1220 m (4000 feet) elevation of the Southern Blue Ridge and the highest adjacent ridges of the Virginia Ridge and Valley. This deciduous forest association occurs on exposed landforms such as open, north-facing slopes. The canopy is dominated by various mixtures of *Betula alleghaniensis, Fagus grandifolia*, and sometimes *Aesculus flava*. In the northern part of the range, *Acer saccharum* can codominate in the canopy. Other canopy trees may be present but are of minor importance (e.g., *Prunus serotina, Quercus rubra, Halesia tetraptera var. monticola*). Common subcanopy trees include *Acer pensylvanicum, Acer spicatum, Amelanchier laevis*, and *Acer saccharum*. A shrub stratum may be absent to moderately dense. *Viburnum lantanoides* is a typical shrub. Other possible shrub species include, but are not limited to, *Hydrangea arborescens, Ilex montana, Rubus canadensis*, and *Sambucus racemosa var. racemosa (= Sambucus racemosa var. pubens)*. Herbaceous cover can be dominated by sedges or ferns or be composed of a mixture of sedges, ferns, and other forbs. Typical herbaceous species include *Ageratina altissima var. roanensis, Eurybia chlorolepis (= Aster chlorolepis), Arisaema triphyllum, Athyrium filix-femina ssp. asplenioides (= Athyrium asplenioides), Carex pensylvanica, Dryopteris intermedia, Solidago curtisii (= Solidago caesia var. curtisii), Stellaria pubera, Stellaria corei*, and *Streptopus lanceolatus var. roseus (= Streptopus roseus)*.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This typic Southern Appalachian northern hardwood forest occurs on exposed landforms such as open, north-facing slopes at high elevations typically over 1,220 m (4,000 feet). It was sampled at three locations in the Central Appalachian project area. Sites are somewhat steep to steep mid and upper slopes. Soils are well-drained. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. Evidence of disturbance reported at one site includes logging, wind/ice damage, and chestnut blight.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This northern hardwood forest is usually found at elevations greater than 1,100 m (3,600 feet), but can occur as low as 975 m (3,200 feet) in some cases. It was sampled at 24 locations in the park. Sites cover a wide range of landscapes, from gentle to steep mid to upper slopes and ridgetops with mostly northern aspects, but any aspect is possible. Soils are typically well-drained loams. The unvegetated surface is dominated by leaf litter with some downed wood, but sometimes there will be good amounts of exposed bedrock and large/small rocks. Evidence of disturbance includes past logging, trails, wind/ice damage, feral hog damage, and the presence of exotic plant species.
Global Environment: This deciduous forest association occurs at high elevations (typically over 1220 m [4000 feet]) in the Southern Appalachians, on exposed landforms such as open, north-facing slopes. Virginia examples of the type occur at elevations from 1100-1585 m (3600-5200 feet). Mean elevation of 28 plot-sampled Virginia stands is 1340 m (4400 feet). Habitats include a wide range of slope positions and aspects. Surface cover of bedrock and boulders is typically less than 25%, but occasionally higher. Soil samples collected from plot-sampling sites are consistently extremely acidic (mean pH = 3.8) with low base status.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: Variable canopy includes *Betula alleghaniensis, Fagus grandifolia, Aesculus flava* and *Acer saccharum*. Additional canopy species can include *Fagus grandifolia*. *Acer pensylvanicum, Crataegus punctata, Rubus canadensis*, and *Rubus flagellaris* are dominant shrubs. Indicator species include *Viburnum lantanoides, Ageratina altissima var. roanensis, Eurybia chlorolepis, Athyrium filix-femina ssp. asplenioides, Carex pensylvanica, Carex lucorum var. austrolucorum, Viola blanda var. blanda*, and *Solidago curtisii*. Other common herbs include *Arisaema triphyllum, Dryopteris intermedia*, and *Laportea canadensis*.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy tends to be dominated by *Betula alleghaniensis* with smaller amounts of *Fagus grandifolia, Aesculus flava*, and *Acer saccharum*. Additional canopy and subcanopy species include *Acer pensylvanicum, Quercus rubra*, and occasionally *Picea rubens*. Indicator species include *Viburnum lantanoides, Ageratina altissima var. roanensis, Eurybia chlorolepis, Athyrium filix-femina ssp. asplenioides, Carex pensylvanica*, and *Solidago curtisii*. Additional common and/or abundant vegetation includes shrubs *Rhododendron maximum* and *Rubus canadensis*; ferns *Dennstaedtia punctilobula, Dryopteris carthusiana, Dryopteris intermedia*; and forbs *Arisaema triphyllum, Laportea canadensis, Maianthemum canadense, Oclemena acuminata*, and *Stellaria pubera*. In addition, this community supports many state-rare species, including TN state-critically imperiled *Thalictrum coriaceum*, TN state-imperiled *Allium burdickii, Stachys clingmanii* (also considered globally imperiled), *Ageratina altissima var. roanensis, Brachyelytrum septentrionale*, and *Rugelia nudicaulis*, and NC state-imperiled *Dryopteris carthusiana*.

Global Vegetation: Over most of this community's range, the canopy is dominated by various mixtures of *Betula alleghaniensis, Fagus grandifolia* and, less commonly, *Aesculus flava*. In Virginia stands of this type (primarily from the Mount Rogers - Whitetop massif), *Acer saccharum* is generally a codominant canopy tree in mixed stands with *Fagus grandifolia* and *Betula alleghaniensis* and with *Aesculus flava* less important. Other canopy trees, including *Prunus serotina, Quercus rubra*, and *Halesia tetraptera var. monticola*, may be present but are of minor importance. Common subcanopy trees include *Acer pensylvanicum, Acer spicatum, Amelanchier laevis*, and *Acer saccharum*. The shrub stratum may vary from nearly undeveloped to moderately dense. *Viburnum lantanoides* is a typical shrub, except in the northern portion of the range, where it varies from infrequent to locally dominant. Other potential shrub components include, but are not limited to, *Hydrangea arborescens, Ilex montana, Rubus canadensis*, and *Sambucus racemosa (= Sambucus pubens)*. Herbaceous cover is variably dominated by sedges, ferns and forbs. Typical herbaceous species include *Ageratina altissima var. roanensis, Eurybia chlorolepis (= Aster chlorolepis), Arisaema triphyllum, Athyrium filix-femina ssp. asplenioides (= Athyrium asplenioides), Carex pensylvanica, Carex lucorum var. austrolucorum, Dryopteris intermedia, Solidago curtisii (= Solidago lancifolia), Stellaria pubera, Stellaria corei, Streptopus lanceolatus var. roseus (= Streptopus roseus)*, and *Viola blanda var. blanda*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Acer saccharum*, *Aesculus flava*, *Betula alleghaniensis*
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer pensylvanicum*
Herb (field)	Flowering forb	*Ageratina altissima* var. *roanensis*, *Eurybia chlorolepis*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*
Herb (field)	Flowering forb	*Eurybia chlorolepis*, *Solidago curtisii*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Acer saccharum*, *Acer spicatum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Viburnum lantanoides*
Herb (field)	Flowering forb	*Ageratina altissima* var. *roanensis*, *Eurybia chlorolepis*
Herb (field)	Graminoid	*Carex pensylvanica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer pensylvanicum*, *Acer saccharum*, *Aesculus flava*, *Ageratina altissima* var. *roanensis*, *Betula alleghaniensis*, *Carex lucorum* var. *austrolucorum*, *Dryopteris intermedia*, *Eurybia chlorolepis*, *Rubus canadensis*, *Viburnum lantanoides*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer pensylvanicum*, *Aesculus flava*, *Ageratina altissima* var. *roanensis*, *Athyrium filix-femina* ssp. *asplenioides*, *Betula alleghaniensis*, *Eurybia chlorolepis*, *Fagus grandifolia*, *Rubus canadensis*, *Solidago curtisii*
Global: *Acer pensylvanicum*, *Acer saccharum*, *Acer spicatum*, *Aesculus flava*, *Ageratina altissima* var. *roanensis*, *Betula alleghaniensis*, *Carex lucorum* var. *austrolucorum*, *Carex pensylvanica*, *Eurybia chlorolepis*, *Fagus grandifolia*, *Ilex montana*, *Magnolia fraseri*, *Rubus canadensis*, *Viburnum lantanoides*, *Viola blanda*, *Viola rotundifolia*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4), *Carex lucorum* var. *austrolucorum* (G5T3T4); **Other Plants**: *Viola blanda* var. *blanda* (G5T4T5)
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Abies fraseri* (G2, globally imperiled & TN-state critically imperiled), *Ageratina altissima* var. *roanensis* (G5T3T4, TN state-imperiled), *Allium burdickii* (G4G5, TN state-critically imperiled), *Brachyelytrum aristosum* (G5, TN state-imperiled), *Clintonia borealis* (G5, TN state-imperiled), *Dryopteris carthusiana* (G5, NC state-imperiled), *Rugelia nudicaulis* (G3, TN state-imperiled), *Smilax biltmoreana* (G4, TN state-imperiled), *Solidago glomerata* (G3, TN state-imperiled), *Stachys clingmanii* (G2, globally imperiled & TN-state critically imperiled), *Thalictrum coriaceum* (G4, TN state-critically imperiled); **Invasive/Exotic Plants**: *Poa compressa* (High/Low, invasive/exotic), *Viburnum lantana* (invasive/exotic)
Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, All Virginia stands and Subtype 1; Southern Blue Ridge endemic), *Arnoglossum muehlenbergii* (G4, VA state-rare), *Cardamine clematitis* (G3), *Carex lucorum* var. *austrolucorum* (G5T3T4, All Virginia stands and Subtype 2), *Carex manhartii* (G3G4), *Carex misera* (G3), *Erythronium umbilicatum* ssp. *monostolum* (G5T3), *Gentiana austromontana* (G3), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Gymnoderma lineare* (G3), *Hypericum graveolens* (G3), *Hypericum mitchellianum* (G3), *Ilex collina* (G3, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Stachys clingmanii* (G2); **Other Plants**: *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (14-Dec-1998). This is a broadly defined association meant to cover typical "northern hardwood forests" of the Southern Blue Ridge. If needed, more subassociations may be recognized based on differences related to geology and other environmental variables. Even if broadly defined, this type is limited in distribution to western North Carolina, eastern Tennessee, and southwestern Virginia, and in extent by its requirement for higher elevations (typically over 1220 m [4000 feet]). Most of the area of this community type is on public lands administered by the U.S. Forest Service (Pisgah, Nantahala, Cherokee, and Jefferson national forests) and National Park Service (Great Smoky Mountains National Park and Blue Ridge Parkway). Most sites for this community are relatively secure from most threats. Exotics plants and animals, such as garlic mustard (*Alliaria petiolata*) and the gypsy moth may represent significant threats to this community.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Betula alleghaniensis - Prunus serotina* Forest (CEGL006045)
- *Aesculus flava - Betula alleghaniensis - Acer saccharum / Caulophyllum thalictroides - Actaea podocarpa* Forest (CEGL004973) has a more diverse canopy and a richer and more diverse herbaceous layer.
- *Betula alleghaniensis - Acer saccharum - Aesculus flava / Acer pensylvanicum / Trillium grandiflorum* Forest (CEGL004417)
- *Betula alleghaniensis - Quercus rubra / Acer spicatum / Dryopteris intermedia - Oclemena acuminata* Forest (CEGL008502)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community is the "typic" Southern Appalachian northern hardwood forest. In Virginia stands of this type (primarily from the Mount Rogers - Whitetop massif), *Acer saccharum* is generally a codominant canopy tree in mixed stands with *Fagus grandifolia* and *Betula alleghaniensis*; *Aesculus flava* is less important; and *Viburnum lantanoides* is not very constant in the shrub layer.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This association appears to represent the "Typic" Southern Appalachian northern hardwood forest. There is a disproportionate number of Virginia plots in the group, which perhaps makes the summary statistics diverge a bit from the classic concept and name that was derived from further south. In Virginia stands of this type (primarily from the Mount Rogers - Whitetop massif), *Acer saccharum* is generally a codominant canopy tree in mixed stands with *Fagus grandifolia* and *Betula alleghaniensis*; *Aesculus flava* is less important; and *Viburnum lantanoides* is not very constant in the shrub layer.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: This community tends to be more common than Southern Appalachian Northern Hardwood Forest (Rich Type) (CEGL004973).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is frequent along and near the AT in most high-elevation areas from Mount Rogers south to the Great Smoky Mountains. In the Central Appalachian project area, it was sampled in Virginia at Garden Mountain and Hurricane Mountain.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Frequent along and near the AT in most high-elevation areas from Mount Rogers south to the Great Smoky Mountains. This community was sampled in North Carolina; at Great Smoky Mountains National Park (Devil's Tater Patch, Masa Knob, and Mollies Ridge Shelter) and Pisgah National Forest (Hughes Gap), in Tennessee; and at Garden Mountain, Hurricane Mountain, Mount Rogers, Quebec Branch, and Whitetop Mountain, Virginia.
Global Range: The type is nearly endemic to high elevations of the Southern Blue Ridge in eastern Tennessee, western North Carolina, and southwestern Virginia. In the Virginia Blue Ridge, it is prevalent in the Mount Rogers - Whitetop Mountain area and at high elevations of the Iron Mountains. Local outliers also occur at the highest elevations of Clinch Mountain in the adjacent Ridge and Valley province.
Nations: US
States/Provinces: NC, TN, VA:S3
TNC Ecoregions: 50:C, 51:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Da:CCP, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FSAH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 1 observation point): APPA.0379, APPA.1182.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (17 plots; 5 observation points; 32 accuracy assessment points): APPA.0081, APPA.0085, APPA.0086, APPA.0091, APPA.0114, APPA.0158, APPA.0159, APPA.0174, APPA.0176, APPA.0177, APPA.0179, APPA.0334, APPA.0369, APPA.0370,

APPA.0371, APPA.0376, APPA.0576, APPA.1073, APPA.1079, APPA.1082, APPA.1119, APPA.1185, APPA_AA_0047, APPA_AA_0068, APPA_AA_0128, APPA_AA_0264, APPA_AA_0325, APPA_AA_0424, APPA_AA_0509, APPA_AA_0530, APPA_AA_0539, APPA_AA_0599, APPA_AA_0700, APPA_AA_0709, APPA_AA_0777, APPA_AA_0778, APPA_AA_0805, APPA_AA_0830, APPA_AA_0899, APPA_AA_0925, APPA_AA_0955, APPA_AA_0964, APPA_AA_0999, APPA_AA_1087, APPA_AA_1157, APPA_AA_1169, APPA_AA_1212, APPA_AA_1274, APPA_AA_1286, APPA_AA_1310, APPA_AA_1342, APPA_AA_1428, APPA_AA_1542, APPA_AA_1566.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo

Global Description Author(s): G. Fleming, P. Coulling, K.D. Patterson

References: Allard 1990, Brown 1941, Eyre 1980, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, McLeod 1988, NatureServe Ecology - Southeastern U.S. unpubl. data, Newell et al. 1997, Peet et al. unpubl. data, Rheinhardt and Ware 1984, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

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[CEGL004982] *Betula alleghaniensis - Tilia americana var. heterophylla / Acer spicatum / Ribes cynosbati / Dryopteris marginalis* Forest

Translated Name: **Yellow Birch - Appalachian Basswood / Mountain Maple / Eastern Prickly Gooseberry / Marginal Woodfern Forest**

Common Name: **Southern Appalachian Hardwood Rich Boulderfield Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Betula alleghaniensis* - *Aesculus flava* Forest Alliance (A0266)

Element Concept

Global Summary: This association includes boulderfield forests of the Southern Appalachians, with abundant *Betula alleghaniensis*, but in habitats that allow for more diverse canopies, including other species such as *Aesculus flava, Betula lenta*, and *Tilia americana var. heterophylla*. This community occurs in a cool, humid climate, on steep, rocky, northwest- to northeast-facing, middle to upper concave slopes, or in saddles between ridges, at moderate to high elevations (610-1220 m [2000-4000 feet]) of the Blue Ridge and possibly ranging into the Cumberland Mountains and adjacent Ridge and Valley and Appalachian Plateau provinces. It grows on bouldery talus and is often associated with small streams and seepage. *Betula alleghaniensis* in the canopy are often stunted and gnarled, with roots that may have grown to encircle the boulders. The canopy is much more open than the surrounding forest and tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. A woody layer of shrubs and vines is usually well-developed. Rooting opportunities for most herbaceous plants is limited because of the development of this community on periglacial boulderfields of blocky talus, thus herbaceous cover is only sparse to moderate. Typical shrubs and vines which are more abundant in this type than in other associations in this alliance include *Acer spicatum, Aristolochia macrophylla, Hydrangea arborescens, Parthenocissus quinquefolia, Toxicodendron radicans, Vitis* spp., *Ribes cynosbati*, and *Ribes rotundifolium*. *Dryopteris marginalis* is often an abundant herb. This type is conceptually similar to *Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum* Forest (CEGL006124), which is more restricted to more extreme boulderfield situations at high elevations (1370-1615 m [4500-5300 feet]). The association described here generally occurs at lower elevations in less extreme environmental situations and lacks species characteristic of high elevations. However, it ranges to higher elevations than the typical rich cove forests with which it shares canopy species. Similar *Betula alleghaniensis*-dominated forests occur on glaciated rocky slopes in the upper mid-Atlantic and in the northeastern United States. The *Betula alleghaniensis*-dominated periglacial boulderfields of the southern Appalachian Mountains are distinguished from the northern forests by the occurrence of Southern Appalachian endemic species, better developed shrub layers and slightly less species diversity.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This boulderfield forest typically occurs below 1,220 m (4,000 feet) elevation. The rooting substrate is composed of large rocks and boulders with very little soil development. The sampled site is a steep, north-facing upper slope with well-drained loam soil. This example is an old-growth forest with many canopy gaps, likely due to wind and/or ice damage.
Global Environment: This community occurs in a cool, humid climate, usually found on steep, rocky, northwest- to northeast-facing, middle to upper concave slopes, or in saddles between ridges, at moderate to high elevation (610-1220 m [2000-4000 feet]). These forests grow over bouldery talus and are often associated with small streams and seepage.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is more diverse than other boulderfield forests and typically dominated by *Betula alleghaniensis* with associates including *Betula lenta* and *Tilia americana var. heterophylla*. Common shrubs and subcanopy trees are *Acer spicatum, Acer pensylvanicum, Hydrangea arborescens, Clethra acuminata, Hamamelis virginiana*, and *Ilex montana*. Herbs can be quite abundant and include *Athyrium filix-femina, Dryopteris intermedia, Eupatorium purpureum, Eurybia divaricata, Euonymus obovatus*, and *Ribes* spp. Mosses may cover much (up to 60%) of the rock surfaces. In addition, this community supports GA-state imperiled *Veratrum viride*.
Global Vegetation: This association includes boulderfield forests of the Southern Appalachians, with abundant *Betula alleghaniensis*, but in habitats that allow for more diverse canopies, including other species such as *Aesculus flava, Betula lenta*, and *Tilia americana var. heterophylla*. *Betula alleghaniensis* in the canopy are often stunted and gnarled, with roots that may have grown to encircle the boulders. The canopy is much more open than the surrounding forest and tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. A woody layer of shrubs and vines is usually well-developed. Rooting opportunities for most herbaceous plants is limited because of the development of this community on periglacial boulderfields of blocky talus, thus herbaceous cover is only sparse to moderate. Typical shrubs and vines which are more abundant in this type than in other associations in this alliance include *Acer spicatum, Aristolochia macrophylla, Toxicodendron radicans, Hydrangea arborescens, Parthenocissus quinquefolia, Ribes cynosbati*, and *Ribes rotundifolium*. *Dryopteris marginalis* is often an abundant herb.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*, *Betula lenta*, *Tilia americana* var. *heterophylla*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*, *Ilex montana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Clethra acuminata*, *Hydrangea arborescens*
Herb (field)	Flowering forb	*Eurybia divaricata*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer spicatum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Ribes cynosbati*, *Ribes rotundifolium*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer pensylvanicum*, *Betula alleghaniensis*, *Betula lenta*, *Dryopteris intermedia*, *Eurybia divaricata*, *Hydrangea arborescens*, *Ilex montana*, *Tilia americana* var. *heterophylla*
Global: *Acer spicatum*, *Aesculus flava*, *Aristolochia macrophylla*, *Betula alleghaniensis*, *Betula lenta*, *Dryopteris marginalis*, *Hydrangea arborescens*, *Ribes cynosbati*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Veratrum viride* (G5, GA state-imperiled)
Global: Vulnerable Plants: *Aconitum reclinatum* (G3), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Cardamine clematitis* (G3), *Geum geniculatum* (G2), *Micranthes careyana* (G3), *Scutellaria*

saxatilis (G3), *Solidago glomerata* (G3), *Stachys clingmanii* (G2); **Other Plants**: *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (22-Jan-2008). This community is scattered throughout the high mountains but is fairly uncommon. Unlike many other forest types in the Southern Appalachians, this community has not historically been threatened by logging as much as other types because of the stunted nature of the trees and the relative inaccessibility to loggers of these boulderfields. North Carolina, in which most of the examples should be found, estimates to have about 15 occurrences, mostly small ones (M. Schafale pers. comm. 2007).

RELATED CONCEPTS

Global Similar Types:

- *Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum* Forest (CEGL006124) more affiliated with northern hardwoods.
- *Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest (CEGL007710) often associated, but on less extremely rocky soils.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Small group of plots crosswalked somewhat tentatively to this association (CEGL004982). Soil data were not available for six plots of this group, so it was not possible to assess whether the greater representation of "rich-site" species (compared to Southern Appalachian Boulderfield Forest (Currant & Rockcap Fern Type) (CEGL006124)) correlates with a fertility gradient.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: *Ribes cynosbati* is much less constant than either *Hydrangea arborescens* or *Euonymus obovatus*. Likewise, *Dryopteris marginalis* is much less constant or abundant than a number of other herbs.
Global Classification Comments: This association includes boulderfield forests of the Southern Appalachians, with abundant *Betula alleghaniensis*, but in habitats that allow for more diverse canopies, including other species such as *Aesculus flava, Betula lenta*, and *Tilia americana var. heterophylla*. This community occurs in a cool, humid climate, on steep, rocky, northwest- to northeast-facing, middle to upper concave slopes, or in saddles between ridges, at moderate to high elevations (610-1220 m [2000-4000 feet]) of the Blue Ridge and possibly ranging into the Cumberland Mountains and adjacent Ridge and Valley and Appalachian Plateau provinces. It grows on bouldery talus and is often associated with small streams and seepage. *Betula alleghaniensis* in the canopy are often stunted and gnarled, with roots that may have grown to encircle the boulders. The canopy is much more open than the surrounding forest and tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. A woody layer of shrubs and vines is usually well-developed. Rooting opportunities for most herbaceous plants is limited because of the development of this community on periglacial boulderfields of blocky talus, thus herbaceous cover is only sparse to moderate. Typical shrubs and vines which are more abundant in this type than in other associations in this alliance include *Acer spicatum, Aristolochia macrophylla, Hydrangea arborescens, Parthenocissus quinquefolia, Toxicodendron radicans, Vitis* spp., *Ribes cynosbati*, and *Ribes rotundifolium*. *Dryopteris marginalis* is often an abundant herb. This type is conceptually similar to *Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum* Forest (CEGL006124), which is more restricted to more extreme boulderfield situations at high elevations (1370-1615 m [4500-5300 feet]). The association described here generally occurs at lower elevations in less extreme environmental situations and lacks species characteristic of high elevations. However, it ranges to higher elevations than the typical rich cove forests with which it shares canopy species. Similar *Betula alleghaniensis*-dominated forests occur on glaciated rocky slopes in the upper mid-Atlantic and in the northeastern United States. The *Betula alleghaniensis*-dominated periglacial boulderfields of the southern Appalachian Mountains are distinguished from the northern forests by the occurrence of Southern Appalachian endemic species, better developed shrub layers and slightly less species diversity.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Rare and local along the AT in the southernmost part of the study area, from the Great Smoky Mountains south. This community was sampled on Chattahoochee National Forest in Georgia.
Global Range: This community occurs in the southern Appalachian Mountains of the eastern United States.
Nations: US

States/Provinces: GA, KY?, NC, TN, VA?
TNC Ecoregions: 50:?, 51:C
USFS Ecoregions (1994/95): M221C:CC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FARB
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 4 accuracy assessment points): APPA.0557, APPA.0560, APPA_AA_0259, APPA_AA_0640, APPA_AA_0689, APPA_AA_1358.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): M.P. Schafale and M. Pyne
References: Allard 1990, Chafin and Jones 1989, Evans 1991, Evans et al. 2009, Fleming and Patterson 2009a, Major et al. 1999, Peet et al. unpubl. data, Pyne 1994, Rawinski 1992, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

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[CEGL006124] *Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum* Forest

Translated Name: **Yellow Birch / Skunk Currant / Appalachian Polypody Forest**
Common Name: **Southern Appalachian Boulderfield Forest (Currant & Rockcap Fern Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Betula alleghaniensis - Aesculus flava* Forest Alliance (A0266)

ELEMENT CONCEPT

Global Summary: This association includes high-elevation boulderfield forests of the Southern Appalachians, strongly dominated by *Betula alleghaniensis*, with few or no other species in the canopy, and with other species indicative of high elevations. This community occurs in a cool, humid climate, on steep, rocky, northwest- to northeast-facing, middle to upper concave slopes, or in saddles between ridges, at elevations of 1370-1615 m (4500-5300 feet). It is known from the high elevations of the Blue Ridge from West Virginia south to eastern Tennessee and western North Carolina. This forest is distinguished by a closed to somewhat open canopy dominated by *Betula alleghaniensis*, occurring over angular rocks (0.25-1 m diameter) covered by thin soil, lichens, mosses or vines. The rocks may be almost totally covered by moss. *Betula alleghaniensis* in the canopy are often stunted and gnarled, with roots that may have grown to encircle the boulders. Tree density is typically less than that of the surrounding forests. Other species that may form a minor canopy component include *Aesculus flava, Prunus pensylvanica, Sorbus americana, Acer spicatum, Picea rubens, Tilia americana var. heterophylla, Sambucus racemosa var. racemosa (= Sambucus racemosa var. pubens)*, or *Quercus rubra*. Tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. The shrub density is typically high but may vary between occurrences. Herbaceous cover is generally sparse because of thin, rocky soil, but herbs and mosses may cover the rocks and boulders. Characteristic species include, in the herb stratum, *Oclemena acuminata (= Aster acuminatus), Eurybia chlorolepis (= Aster chlorolepis), Aconitum reclinatum, Cardamine clematitis, Carex aestivalis, Actaea podocarpa (= Cimicifuga americana), Claytonia caroliniana, Clintonia borealis, Dryopteris campyloptera, Dryopteris marginalis, Huperzia lucidula, Oxalis montana, Polypodium appalachianum, Streptopus amplexifolius*, and in the shrub stratum, *Acer pensylvanicum, Acer spicatum, Amelanchier arborea var. austromontana, Diervilla sessilifolia, Hydrangea arborescens, Ilex montana, Lonicera canadensis, Ribes glandulosum, Ribes rotundifolium, Rubus canadensis, Sambucus racemosa var. racemosa, Vaccinium erythrocarpum*, and *Viburnum lantanoides*. Seepage areas are common, producing wet microhabitats with unique species assemblages (*Chelone lyonii, Chrysosplenium americanum, Circaea alpina, Rudbeckia laciniata, Impatiens pallida*, and *Monarda didyma*). This association is distinguished by being strongly dominated by *Betula alleghaniensis*, with few or no other species in the canopy, and with other species indicative of high elevations (e.g., *Abies fraseri, Dryopteris campyloptera, Ribes glandulosum, Rugelia nudicaulis, Streptopus amplexifolius, Prunus pensylvanica*, and *Sorbus americana*. On less extreme sites, generally at lower elevations in the Blue Ridge and adjacent montane ecoregions, a similar boulderfield forest is *Betula alleghaniensis - Tilia americana var. heterophylla / Acer spicatum / Ribes cynosbati / Dryopteris marginalis*

Forest (CEGL004982). Similar *Betula alleghaniensis*-dominated forests occur on glaciated rocky slopes in the upper mid-Atlantic and in the northeastern United States. The *Betula alleghaniensis*-dominated periglacial boulderfields of the southern Appalachian Mountains are distinguished from the northern forests by the occurrence of Southern Appalachian endemic species, better developed shrub layers and slightly less species diversity.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This boulderfield forest typically occurs below 1,220 m (4,000 feet) elevation. The rooting substrate is composed of large rocks and boulders with very little soil development. The sampled sites are variable, ranging from gentle to steep slopes and ridgetops with mostly northern and eastern aspects. Soils may be well-drained or wet and somewhat poorly drained. The unvegetated surface is dominated by leaf litter but may also include significant amounts of large rocks, some downed wood and bare soil.

Global Environment: This community occurs in rocky habitats with cool, humid microclimates. Typical sites are steep, boulder-strewn slopes; northwest- to northeast-facing, middle to upper concave slopes; or in saddles between ridges. Elevations typically range from 1370-1615 m (4500-5300 feet), but may vary somewhat. Surface substrate is characterized by angular boulders (0.25-1 m diameter) derived from various bedrock types and covered by thin soil, lichens, mosses or vines. The rocks may be almost totally covered by moss. Seepage areas are frequent, producing wet microhabitats with unique species assemblages. Extreme winter temperatures, high winds, and ice storms periodically affect these forests. Mean elevation of plot-sampled Virginia sites is 1450 m (4760 feet) and aspect ranges from northwest to north. Mean surface cover of exposed bedrock and boulders is 42% and mean cover of bryophytes and lichens is 37%. Soil samples collected from these sites are extremely acidic (mean pH = 3.5), with high organic matter content (mean = 40%) and low base saturation (mean = 10%).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is strongly dominated by *Betula alleghaniensis* and includes other mesophytic species such as *Aesculus flava, Fagus grandifolia, Acer pensylvanicum, Acer spicatum, Prunus pensylvanica, Sorbus americana*, and *Quercus rubra*. Common and/or abundant shrubs include *Ribes glandulosum, Rubus canadensis*, and *Viburnum lantanoides*. Herbs can be very dense (up to 90% cover) and include *Polypodium appalachianum, Arisaema triphyllum, Athyrium filix-femina ssp. asplenioides, Dryopteris intermedia, Eurybia chlorolepis*, and *Oclemena acuminata*. Mosses, when present, can cover large surfaces. This community also supports VA-state imperiled *Cuscuta rostrata*.

Global Vegetation: Stands of this association are distinguished by a closed to somewhat open canopy overwhelmingly dominated by *Betula alleghaniensis*. Canopy trees are often stunted and gnarled, with roots that have grown to encircle the boulders. Tree density is typically less than that of the surrounding forests. Minor canopy associates include *Aesculus flava, Prunus pensylvanica, Sorbus americana, Acer spicatum, Picea rubens, Tilia americana var. heterophylla*, and *Quercus rubra*. Tree windthrow is common, creating canopy gaps and patches of exposed mineral soil. Shrub density is typically high but varies between occurrences. Characteristic shrubs are *Acer pensylvanicum, Acer spicatum, Amelanchier arborea var. austromontana, Diervilla sessilifolia, Hydrangea arborescens, Ilex montana, Lonicera canadensis, Ribes glandulosum, Ribes rotundifolium, Rubus canadensis, Sambucus racemosa var. racemosa (= var. pubens), Vaccinium erythrocarpum*, and *Viburnum lantanoides*. Herbaceous cover is generally sparse because of the rocky substrate, but specially adapted herbs and mosses may cover the rocks and boulders. Characteristic herbs over the range of this community include *Oclemena acuminata (= Aster acuminatus), Eurybia chlorolepis (= Aster chlorolepis), Aconitum reclinatum, Cardamine clematitis, Carex aestivalis, Actaea podocarpa (= Cimicifuga americana), Claytonia caroliniana, Clintonia borealis, Dryopteris campyloptera, Dryopteris marginalis, Huperzia lucidula, Oxalis montana, Polypodium appalachianum*, and *Streptopus amplexifolius*. Local seepage areas may support *Chelone lyonii, Chrysosplenium americanum, Circaea alpina, Rudbeckia laciniata, Impatiens pallida*, and *Monarda didyma*. Six plots from North Carolina, Tennessee, and Virginia were classified as this association in the Appalachian Trail classification project (Fleming and Patterson 2009a). In those plots, *Acer spicatum, Ribes glandulosum, Rubus canadensis*, and *Viburnum lantanoides* are the most constant lower woody species, while *Ageratina altissima var. roanensis, Arisaema triphyllum, Carex aestivalis, Dryopteris intermedia, Eurybia chlorolepis, Huperzia lucidula, Oclemena acuminata*, and *Polypodium appalachianum* are the most constant herbs. Mean species richness in these samples is 28 taxa per plot.

Global Dynamics: Windthrow of trees and damage to the canopy caused by lightning strikes and ice storms are common phenomena in boulderfields. The ice-fractured boulderfields that characterize this community in the upper elevations of the Southern Appalachians are believed to be remnants of Pleistocene periglacial activity. During this time, the high elevations (1120-1525 m [4000-5000 feet]) of the Southern Appalachians were covered by treeless snow fields and exposed rock. Frost and ice action resulted in the accumulation of boulders that persist on the upper

slopes (King and Stupka 1950). Farther north, such as in Pennsylvania, boulderfields are on flat surfaces and are the result of glacial deposition (Allard 1984).

Betula alleghaniensis is well-adapted to the environmental dynamics of boulderfields and can perpetuate because it takes advantage of canopy gaps formed during periodic natural disturbances. This species produces a large number of seeds and is able to germinate on logs and rocks in a minimum amount of soil. The roots of trees develop to form false trunks that encircle the rocks. It is possible that over time, due to soil formation and weathering, these forests may succeed to forests dominated by a mixture of northern hardwood species (*Betula alleghaniensis, Fagus grandifolia, Acer saccharum, Aesculus flava*). However, many *Betula alleghaniensis* forests and the boulderfields on which they occur appear fairly stable. Chafin and Jones (1989) found that despite large trees growing on top of boulders, there is no evidence of rock shattering.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Short shrub/sapling	Broad-leaved deciduous shrub	*Ribes glandulosum*
Herb (field)	Flowering forb	*Eurybia chlorolepis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Shrub/sapling (tall & short)	Liana	*Aristolochia macrophylla*
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Acer spicatum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Ribes glandulosum*, *Ribes rotundifolium*
Herb (field)	Flowering forb	*Eurybia chlorolepis*, *Oxalis montana*
Herb (field)	Graminoid	*Carex aestivalis*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris marginalis*, *Polypodium appalachianum*
Nonvascular	Moss	*Hylocomium splendens*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Aesculus flava*, *Arisaema triphyllum*, *Betula alleghaniensis*, *Dryopteris intermedia*, *Polypodium appalachianum*, *Quercus rubra*, *Ribes glandulosum*, *Rubus canadensis*, *Viburnum lantanoides*

Global: *Acer spicatum*, *Aesculus flava*, *Amelanchier arborea* var. *austromontana*, *Betula alleghaniensis*, *Circaea alpina*, *Dryopteris campyloptera*, *Dryopteris intermedia*, *Ilex montana*, *Lonicera canadensis*, *Oclemena acuminata*, *Polypodium appalachianum*, *Ribes glandulosum*, *Ribes rotundifolium*, *Rubus canadensis*, *Vaccinium erythrocarpum*, *Viburnum lantanoides*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Cuscuta rostrata* (G4, VA state-imperiled)

Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Aconitum reclinatum* (G3), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Cardamine clematitis* (G3), *Cuscuta rostrata* (G4, VA state-rare), *Geum geniculatum* (G2), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Lilium grayi* (G3, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Prosartes maculata* (G3G4), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Stachys clingmanii* (G2); **Other Plants**: *Chelone lyonii* (G4), *Conioselinum chinense* (G5), *Meehania cordata* (G5), *Stellaria corei* (G4), *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (27-Oct-2003). This community is scattered throughout the high elevations of the Southern Blue Ridge with highly localized outliers also found at the highest elevations of Clinch Mountain in the adjacent Ridge and Valley province. Examples are further confined to boulder strewn substrates which are relatively uncommon. Unlike many other forest types in the Southern Appalachians, this community has been less impacted by logging due to the stunted nature of the trees and the relative inaccessibility of these boulderfield sites. As of 2003, North Carolina has 12 (principal) Element Occurrences, and given their proportion of the total occurrences and their protection status, a rank of G2G3 is probably justified (M. Schafale pers. comm.).

RELATED CONCEPTS

Global Similar Types:

- *Betula alleghaniensis - Tilia americana var. heterophylla / Acer spicatum / Ribes cynosbati / Dryopteris marginalis* Forest (CEGL004982)
- *Betula alleghaniensis / Sorbus americana - Acer spicatum / Polypodium appalachianum* Forest (CEGL008504)
  Both of these associations occur on high-elevation boulderfields and have much species overlap, including many constant and dominant species, but CEGL008504 is geographically restricted to the Central Appalachians, is much less species-rich, and lacks all of the Southern Appalachian species found in CEGL006124.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This small group of plots appears to be representative of this type (CEGL006124).
Global Classification Comments: Unlike many other forest types in the Southern Appalachians, this community has not been threatened by logging because of the stunted nature of the trees and the inaccessibility of boulderfields to loggers.

This association is similar to *Betula alleghaniensis / Sorbus americana - Acer spicatum / Polypodium appalachianum* Forest (CEGL008504) of the Central Appalachians, but appears to occupy more mesic boulderfields and contains a number of Southern Appalachian species (e.g., *Ribes glandulosum, Eurybia chlorolepis, Heuchera villosa, Abies fraseri, Prenanthes roanensis, Vaccinium erythrocarpum, Aesculus flava*, etc.) that are generally absent from CEGL008504.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Uncommon and local along the AT in high-elevation areas from Mount Rogers to the Nantahala Mountains. This community was sampled in Tennessee, at Yellow Mountain (Nantahala National Forest) in North Carolina, and at Pine Mountain and Whitetop Mountain, Virginia.
Global Range: This community type ranges at high elevations of the Blue Ridge from eastern Tennessee and western North Carolina north to southwestern Virginia. In the southern Virginia Blue Ridge, it occurs frequently on steep, north-facing slopes of Mount Rogers, Whitetop, and Pine Mountain. Small, highly localized outliers also occur at the highest elevations of Clinch Mountain in the adjacent Ridge and Valley province.
Nations: US
States/Provinces: GA?, NC, TN, VA:S1, WV?
TNC Ecoregions: 51:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FABF
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (4 plots; 1 observation point; 3 accuracy assessment points): APPA.0139, APPA.0362, APPA.0366, APPA.0601, APPA.1076, APPA_AA_0038, APPA_AA_0760, APPA_AA_0774.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo
Global Description Author(s): K.D. Patterson, G. Fleming and P. Coulling
References: Allard 1984, Allard 1990, Ambrose 1990a, CAP pers. comm. 1998, Chafin and Jones 1989, Dellinger 1992, Eyre 1980, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Golden 1981, King and Stupka 1950, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Pittillo and Smathers 1979, Pyne 1994, Rawinski 1992, Rheinhardt and Ware 1984, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d.*, Stamper 1976, TDNH unpubl. data, VDNH 2003, Wharton 1978, Wood 1975

[CEGL008504] *Betula alleghaniensis / Sorbus americana - Acer spicatum / Polypodium appalachianum* Forest

Translated Name: **Yellow Birch / American Mountain-ash - Mountain Maple / Appalachian Polypody Forest**
Common Name: **Central Appalachian High-Elevation Boulderfield Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Betula alleghaniensis - Aesculus flava* Forest Alliance (A0266)

Element Concept

Global Summary: This community is known from high elevations of the Northern Blue Ridge, Ridge and Valley, and Allegheny Mountains in Virginia and West Virginia. It occupies steep, boulder-strewn slopes at elevations from 975 m (3200 feet) to over 1250 m (4100 feet). The type is most frequent and extensive on straight or concave, middle to upper slopes with northerly aspects, but is found occasionally on slopes with other aspects. Surface substrate is characterized by a surface cover of angular boulders weathered from granite, metabasalt (greenstone), quartzite, or sandstone. This vegetation type has a partly closed to very open canopy overwhelmingly dominated by *Betula alleghaniensis*. The canopy trees are usually stunted and gnarled, exhibiting the effects of frequent ice and wind damage. Tree density is typically less than that of the surrounding forests. *Sorbus americana* and *Prunus pensylvanica* are minor canopy associates. Small tree and shrub densities are variable; *Sorbus americana* and *Acer spicatum* often have high cover in these layers. *Menziesia pilosa, Sambucus racemosa (= Sambucus pubens), Rubus idaeus ssp. strigosus*, and *Ribes cynosbati* are frequent shrubs. Herbaceous cover is often limited by the rocky substrate.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This high-elevation boulderfield woodland or open forest was sampled once in the park at Shenandoah National Forest in Virginia on a somewhat steep, northwest-facing upper slope with rapidly drained soil. The unvegetated surface is dominated by large rocks with some leaf litter and downed wood. Evidence of disturbance includes wind/ice damage.
Global Environment: This community occupies steep (up to 38°), boulder-strewn slopes at elevations from 975 m to over 1250 m (3200-4100 feet). Mean elevation of plot-sampled Virginia sites is 1119 m (3672 feet). The type is most frequent and extensive on straight or concave, middle to upper slopes with northerly aspects, but is found occasionally on slopes with other aspects. Surface substrate is characterized by surface cover >75% of angular boulders weathered from granite, metabasalt (greenstone), quartzite, and sandstone. Surface cover of bryophytes and lichens on rocks is typically >60%. Mineral soil samples could not be extracted from any of the Virginia plot-sampling sites. Surficial groundwater seepage is very rare in these habitats, although perched, subsurface groundwater may be present in some localities. Extreme winter temperatures, high winds, and ice storms are frequent, and strongly influence the physiognomy of forests on the boulderfields.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The very open canopy is dominated by stunted and gnarled *Betula alleghaniensis* typically with no other species in the canopy. *Sorbus americana, Prunus pensylvanica*, and *Acer spicatum* often have high cover. *Menziesia pilosa, Sambucus racemosa*, and/or *Ribes cynosbati* are frequent shrubs. Herbaceous cover is often limited by the rocky substrate; however, *Polypodium appalachianum* may abundantly cover mossy and lichen-covered rock surfaces.
Global Vegetation: This vegetation type has a partly closed to very open canopy overwhelmingly dominated by *Betula alleghaniensis*. The canopy trees are usually stunted and gnarled, exhibiting the effects of frequent ice and wind damage. Tree density is typically less than that of the surrounding forests. *Sorbus americana* and *Prunus pensylvanica* are minor canopy associates. Small tree and shrub densities are variable; *Sorbus americana* and *Acer spicatum* often have high cover in these layers. *Menziesia pilosa, Sambucus racemosa (= Sambucus pubens)*, and *Ribes cynosbati* are frequent shrubs. Herbaceous cover is often limited by the rocky substrate, but lithophytic species such as *Polypodium appalachianum* may abundantly cover mossy rock surfaces. Additional characteristic herbs include *Oclemena acuminata (= Aster acuminatus), Dryopteris marginalis, Hylotelephium telephioides (= Sedum telephioides), Carex brunnescens ssp. sphaerostachya, Carex aestivalis, Arisaema triphyllum, Dryopteris intermedia, Maianthemum canadense*, and *Polygonatum pubescens*. *Gymnocarpium appalachianum* and *Rubus*

idaeus ssp. strigosus are rare plants associated with this vegetation. Mean species richness of plot-sampled stands is 17 taxa per 400 m2.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Menziesia pilosa*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer spicatum*, *Betula alleghaniensis*, *Polypodium appalachianum*, *Sorbus americana*
Global: *Acer spicatum*, *Betula alleghaniensis*, *Menziesia pilosa*, *Oclemena acuminata*, *Polypodium appalachianum*, *Rubus idaeus* ssp. *strigosus*, *Sorbus americana*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Gymnocarpium appalachianum* (G3, WV state-rare), *Rubus idaeus* ssp. *strigosus* (G5T5, VA state-rare), *Scutellaria saxatilis* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (21-Jun-2001). This is a small-patch community type occupying very restricted habitats within a narrow geographic range. There are less than 20 known occurrences of the type in Virginia.

RELATED CONCEPTS

Global Similar Types:

- *Betula alleghaniensis - Quercus rubra / Acer spicatum / Dryopteris intermedia - Oclemena acuminata* Forest (CEGL008502) a closed-canopy northern hardwood forest of the same region, occurring on more weathered substrates with better soil development.
- *Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum* Forest (CEGL006124) occupies more mesic boulderfields and has a number of typical Southern Appalachian species such as *Ribes glandulosum, Tilia americana var. heterophylla, Rubus canadensis, Vaccinium erythrocarpum, Eurybia chlorolepis*, and *Cardamine clematitis*.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: See Global Comments.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: On the landscape, this association (CEGL008504) grades into fully exposed, lichen-dominated boulderfields at one extreme, and into rocky northern hardwood, red oak, or cove forests at the other. It has not been formally documented from West Virginia but has been observed by Virginia Division of Natural Heritage ecologists at several sites, including Reddish Knob and Panther Knob, Pendleton County, and Black Mountain, Pocahontas County. It is probably widely but locally distributed at high elevations throughout the extreme western Ridge and Valley and Allegheny Mountains of West Virginia.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs in the Northern Blue Ridge, Ridge and Valley, and Allegheny Mountains in Virginia and West Virginia. It was sampled at The Pinnacle in Shenandoah National Forest, Virginia.
Global Range: This community type is known from high elevations of the Northern Blue Ridge, Ridge and Valley, and Allegheny Mountains in Virginia and West Virginia.
Nations: US
States/Provinces: VA:S2, WV
TNC Ecoregions: 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ba:CCC, M221Bd:CCC, M221Da:CCC

Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Shenandoah); USFS (George Washington, Jefferson, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCAB
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 7 accuracy assessment points): APPA.0222, APPA_AA_0098, APPA_AA_0612, APPA_AA_0895, APPA_AA_0904, APPA_AA_1027, APPA_AA_1166, APPA_AA_1525.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 1996, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2007a, Young et al. 2006, Young et al. 2009

[CEGL006130] *Fagus grandifolia / Carex pensylvanica - Ageratina altissima var. roanensis* Forest

Translated Name: **American Beech / Pennsylvania Sedge - Appalachian White Snakeroot Forest**
Common Name: **Southern Appalachian Beech Gap**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Betula alleghaniensis - Aesculus flava* Forest Alliance (A0266)

ELEMENT CONCEPT

Global Summary: This community includes forest vegetation with short-statured canopies dominated by *Fagus grandifolia* and occurring in the high-elevation landscapes of the Southern Appalachians. On drier sites, such as south slopes, the association is expressed as the classic "beech gap "having a dense, graminoid-dominated herbaceous stratum. On more mesic sites, such as north slopes, the community is thought to be more similar to northern hardwood forests, having a more diverse canopy and subcanopy, occurring over a field stratum that is a mixture of coarse forbs, ferns and sedges. This forest association typically occurs on concave slopes, in gaps, flat ridgetops, or upper slopes of all aspects, at elevations of greater than 1370 m (4500 feet). It is found in scattered sites on high elevations of the southern Appalachian Mountains of North Carolina and Tennessee and possibly Georgia. This community is a broad-leaved deciduous forest with a canopy dominated by stunted, sometimes gnarled *Fagus grandifolia*, sometimes with lesser amounts of *Halesia tetraptera var. monticola* or *Aesculus flava* and *Betula alleghaniensis*. The subcanopy, if present, may include small stems of canopy species as well as *Acer spicatum, Acer pensylvanicum, Amelanchier laevis*, and *Sorbus americana*. Typically there is little shrub development (0-10%) with such species as *Crataegus punctata, Ribes* spp., *Viburnum lantanoides, Rubus canadensis, Hydrangea arborescens*, and *Cornus alternifolia*. Herbaceous cover can vary from dense, often approaching 100% coverage by species of *Carex* including *Carex aestivalis, Carex brunnescens, Carex debilis, Carex intumescens*, and *Carex pensylvanica*, to moderately dense (40-60% cover) and dominated by large herbs and patches of ferns, with lesser amounts of sedges. Other herbaceous species in this community are typical of rich Southern Appalachian forests and may include *Ageratina altissima var. roanensis, Anemone quinquefolia, Arisaema triphyllum, Eurybia chlorolepis (= Aster chlorolepis), Athyrium filix-femina ssp. asplenioides, Actaea racemosa (= Cimicifuga racemosa) Dryopteris campyloptera, Epifagus virginiana, Impatiens pallida, Medeola virginiana, Oxalis montana, Laportea canadensis, Luzula acuminata, Phacelia bipinnatifida, Poa alsodes, Prenanthes altissima, Prenanthes roanensis, Stellaria pubera, Thelypteris noveboracensis*, and *Trillium erectum*. This community commonly occurs as small patches surrounded by other forest types, montane grasslands and shrublands.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This beech gap forest is found above 1,370 m (4,500 feet) elevation. Sites range from gentle to steep upper slopes and, more typically, ridgetops on any aspect. Soils are moderately well- to well-drained sandy loam and loam. The unvegetated surface is dominated by leaf litter with small amounts of downed wood and rocks. Evidence of disturbance includes past catastrophic fire, trails, and wind/ice damage.

Global Environment: This community typically occurs on concave slopes, in gaps, flat ridgetops, or upper slopes of all aspects, at elevations of greater than 1370 m (4500 feet) (Russell 1953, Whittaker 1956, Crandall 1958). High rainfall and low temperatures create mesic conditions. Strong winds and ice storms periodically damage these forests, creating canopy gaps and contributing to its stunted appearance. This community commonly occurs as small patches surrounded by other forest types, montane grasslands and shrublands. In North Carolina, Burton series (Typic Haplumbrept) soils support the Southern Appalachian Beech Gap (Schafale and Weakley 1990). The soil is generally greater than 20 cm deep. The pH ranges from 4.5-6.0, which is considerably less acidic than the adjacent Red Spruce-Fraser Fir Forests (Russell 1953). Leaf mold is thinner compared to the spruce-fir ecosystems. Also lacking is the accumulation of peat or excessive depth of litter (Russell 1953).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is entirely dominated (or nearly so) by *Fagus grandifolia*. Common tree species include *Acer* spp., *Aesculus flava, Betula alleghaniensis*, and *Quercus rubra*. Common and/or abundant shrubs include *Amelanchier arborea, Fagus grandifolia*, and *Ilex montana*. Herbs may be dense (up to 90% cover) and include *Ageratina altissima var. roanensis, Angelica triquinata, Arisaema triphyllum, Athyrium filix-femina ssp. asplenioides, Carex pensylvanica, Dennstaedtia punctilobula, Dryopteris intermedia, Laportea canadensis, Luzula* spp., *Poa alsodes*, and *Solidago curtisii*. In addition, this community supports many state-rare species: in TN, state-critically imperiled *Carex appalachica* and state-imperiled *Ageratina altissima var. roanensis*; and in NC, state-critically imperiled *Streptopus lanceolatus var. roseus* and state-imperiled *Eupatorium steelei*.

Global Vegetation: This community is a broad-leaved deciduous forest with a canopy dominated by stunted, sometimes gnarled *Fagus grandifolia* sometimes with lesser amounts of *Halesia tetraptera var. monticola* or *Aesculus flava* and *Betula alleghaniensis*. The subcanopy, if present, may include small stems of canopy species as well as *Acer spicatum, Acer pensylvanicum, Amelanchier laevis*, and *Sorbus americana*. Typically there is little shrub development (0-10%) with such species as *Crataegus punctata, Ribes* spp., *Viburnum lantanoides, Rubus canadensis, Hydrangea arborescens*, and *Cornus alternifolia*. Herbaceous cover can vary from dense, often approaching 100% coverage by species of *Carex* including *Carex aestivalis, Carex brunnescens, Carex debilis, Carex intumescens*, and *Carex pensylvanica* to moderately dense (40-60% cover) and dominated by large herbs and patches of ferns, with lesser amounts of sedges (Whittaker 1956, Crandall 1958, Bratton 1975). Other herbaceous species in this community are typical of rich Southern Appalachian forests and may include *Ageratina altissima var. roanensis, Anemone quinquefolia, Arisaema triphyllum, Eurybia chlorolepis (= Aster chlorolepis), Athyrium filix-femina ssp. asplenioides, Actaea racemosa (= Cimicifuga racemosa), Dryopteris campyloptera, Epifagus virginiana, Impatiens pallida, Medeola virginiana, Oxalis montana, Laportea canadensis, Luzula acuminata, Phacelia bipinnatifida, Poa alsodes, Prenanthes altissima, Prenanthes roanensis, Stellaria pubera, Thelypteris noveboracensis*, and *Trillium erectum* (Whittaker 1956, Crandall 1958, Schafale and Weakley 1990).

Global Dynamics: Extreme exposure to wind and storms contribute to the high number of wind-blown trees and the stunted nature of the canopy. Frequent damage caused by wind and ice create gaps in the canopy. The origin and maintenance of this community has been debated by ecologists. It has been proposed that beech gaps became established during warmer climates of 7000-900 BC, and that they were once more extensive than today (Flint 1957 in Schofield 1960). Russell (1953) concluded that cold and high winds were responsible for the occurrence of these forests. Fuller (1977) suggested that the allelopathic effects of beech litter may be a factor in maintaining this community. Due to the extreme environment, growth and reproduction of *Fagus grandifolia* are relatively slow in this mid to late successional community. Despite their small size, canopy trees may be quite old. Although beech nuts may be produced by the larger trees, reproduction of beech appears to be almost entirely vegetative from root or stump sprouts (Russell 1953). Small canopy gaps within this type are commonly invaded by a dense thicket of *Rubus canadensis*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fagus grandifolia*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Fagus grandifolia*
Herb (field)	Flowering forb	*Laportea canadensis*
Herb (field)	Graminoid	*Carex pensylvanica*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fagus grandifolia*, *Halesia tetraptera* var. *monticola*
Herb (field)	Graminoid	*Carex aestivalis*, *Carex brunnescens*, *Carex debilis*, *Carex intumescens*, *Carex pensylvanica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Ageratina altissima* var. *roanensis*, *Betula alleghaniensis*, *Carex pensylvanica*, *Fagus grandifolia*, *Laportea canadensis*
Global: *Ageratina altissima* var. *roanensis*, *Carex aestivalis*, *Carex albicans*, *Carex brunnescens*, *Carex debilis*, *Carex intumescens*, *Carex pensylvanica*, *Epifagus virginiana*, *Eurybia chlorolepis*, *Fagus grandifolia*, *Halesia tetraptera* var. *monticola*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4, TN state-imperiled), *Carex appalachica* (G4, TN state-critically imperiled), *Castanea dentata* (G4, TN state-imperiled), *Clintonia borealis* (G5, TN state-imperiled), *Eupatorium steelei* (G4, NC state-imperiled), *Lonicera dioica* (G5, NC state-imperiled), *Stellaria corei* (G4, TN state-imperiled), *Streptopus lanceolatus var. roseus* (G5T4, NC state-critically imperiled); **Invasive/Exotic Plants**: *Poa compressa* (High/Low)
Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Erythronium umbilicatum* ssp. *monostolum* (G5T3), *Gentiana austromontana* (G3), *Geum geniculatum* (G2), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum graveolens* (G3), *Hypericum mitchellianum* (G3), *Lilium grayi* (G3, Southern Blue Ridge endemic), *Platanthera grandiflora* (G5, rare or regionally rare), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Stachys clingmanii* (G2), *Streptopus lanceolatus var. roseus* (G5T4, rare or regionally rare); **Other Plants**: *Phacelia fimbriata* (G4), *Stellaria corei* (G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (1-Nov-2002). This community has a very restricted range with scattered occurrences of small acreage. Many occurrences have been, and continue to be, severely damaged by the European wild boar (*Sus scrofa*). Grazing and soil disturbance by this animal reduces understory herb cover to 10-30 percent of undisturbed levels and may affect tree growth and nutrient cycling (Singer et al. 1984). Beech bark disease, a complex made up of the Beech scale insect (*Cryptococcus fagisuga*) and a closely associated fungus (*Nectria coccinea var. faginata*) poses a severe threat to this community. Most all of the beech gap communities in the Great Smoky Mountains had succumbed to the beech bark disease or a combination of the beech bark disease and pollution by 2002 (R. White pers. comm.). Presumably this trend is being seen throughout the Southern Appalachians, resulting in the possible extinction of this community in the next few years. Therefore, this community was assigned a rank of G1.

RELATED CONCEPTS

Global Similar Types:
- *Fagus grandifolia* Ridge and Valley Forest (CEGL007200)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: "Beech Gap" northern hardwood forest dominated by stunted *Fagus grandifolia* and abundant graminoid cover. This community occupies the high end of an elevation gradient among the four northern hardwood types, and more often occurs at higher topographic positions on sites with lower site moisture potential.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: This type is represented by a clear and strong group of plots in the analysis.
Global Classification Comments: This community includes forest vegetation with short-statured canopies dominated by *Fagus grandifolia* and occurring in the high-elevation landscapes of the Southern Appalachians. On drier sites, such as south slopes, the association is expressed as the classic "beech gap "having a dense, graminoid-

dominated herbaceous stratum On more mesic sites, such as north slopes, the community is thought to be more similar to northern hardwood forests, having a more diverse canopy and subcanopy, occurring over a field stratum that is a mixture of coarse forbs, ferns and sedges. This community is thought to be limited to the range of *Picea rubens* and *Abies fraseri* (Whittaker 1956).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Documented along the AT at local, high-elevation sites in the southern part of the study area including Standing Indian Mountain (Nantahala National Forest) in North Carolina and Hughes Gap (Cherokee National Forest), Tennessee.
Global Range: This community is found in scattered sites on high elevations of the southern Appalachian Mountains of North Carolina, and Tennessee and possibly Georgia.
Nations: US
States/Provinces: GA?, NC:S1, TN
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221A:C?, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FBGP
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (5 plots; 2 observation points; 27 accuracy assessment points): APPA.0112, APPA.0134, APPA.0144, APPA.0592, APPA.0605, APPA.1080, APPA.1128, APPA_AA_0021, APPA_AA_0174, APPA_AA_0181, APPA_AA_0261, APPA_AA_0271, APPA_AA_0316, APPA_AA_0324, APPA_AA_0381, APPA_AA_0433, APPA_AA_0437, APPA_AA_0447, APPA_AA_0500, APPA_AA_0528, APPA_AA_0554, APPA_AA_0584, APPA_AA_0592, APPA_AA_0819, APPA_AA_0821, APPA_AA_0867, APPA_AA_1047, APPA_AA_1130, APPA_AA_1167, APPA_AA_1195, APPA_AA_1323, APPA_AA_1377, APPA_AA_1429, APPA_AA_1460.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson
References: Allard 1990, Allard et al. 1990, Bratton 1975, Crandall 1958, Davis 1930, Eyre 1980, Fleming and Patterson 2009a, Fuller 1977, Golden 1981, Lindsay and Bratton 1979a, McLeod 1988, Peet et al. unpubl. data, Pittillo and Smathers 1979, Pyne 1994, Ramseur 1960, Rawinski 1992, Rheinhardt 1981, Russell 1953, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Schofield 1960, Singer et al. 1984, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, USFS 1988, White et al. 1993, White pers. comm., Whittaker 1956

A3303 *Quercus rubra - Acer saccharum - Betula lenta* Forest Alliance

Alliance Summary Description: This alliance, found in the Allegheny, Lake Erie-Lake Ontario, and Lower New England regions south to the Central Appalachians, contains mesic forests dominated by *Quercus rubra* with a variety of mesic hardwoods, including *Acer rubrum, Acer saccharum, Betula lenta, Fagus grandifolia, Fraxinus americana, Quercus alba*, and *Tilia americana*. Typical shrubs include *Amelanchier* spp., *Hamamelis virginiana, Lindera benzoin*, and *Viburnum acerifolium*. Herbs include *Polystichum acrostichoides, Medeola virginiana*, and *Geranium maculatum*. These forests typically occur on deep, moist to well-drained loams and silt loams on north and east midslopes and coves.

[CEGL006046] *Acer saccharum - Quercus rubra / Hepatica nobilis var. obtusa* Forest

Translated Name: **Sugar Maple - Northern Red Oak / Round-lobe Liverleaf Forest**
Common Name: **Sugar Maple - Ash - Oak - Hickory Mesic Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Quercus rubra - Acer saccharum - Betula lenta* Forest Alliance (A3303)

ELEMENT CONCEPT

Global Summary: These are forests of well-drained to moist and often on very rocky slopes. *Fraxinus americana* and *Acer saccharum* are common in the tree canopy, with *Quercus rubra, Carya ovata, Carya glabra, Carya ovalis, Quercus velutina, Tilia americana, Betula lenta*, and *Quercus alba* as associates. *Tsuga canadensis* can be occasional. *Ostrya virginiana* and *Carpinus caroliniana* can form a prominent subcanopy. The shrub layer includes *Hamamelis virginiana, Viburnum acerifolium, Viburnum recognitum, Cornus florida, Corylus cornuta*, and *Lindera benzoin*. The herb layer is often quite diverse with *Carex platyphylla, Carex pedunculata, Carex blanda, Carex laxiflora, Actaea rubra, Polygonatum pubescens, Phegopteris hexagonoptera (= Thelypteris hexagonoptera), Viola rotundifolia, Thalictrum dioicum, Hepatica nobilis var. obtusa (= Hepatica americana), Thalictrum thalictroides (= Anemonella thalictroides), Festuca subverticillata, Actaea pachypoda, Viola sororia, Arabis* spp., *Packera obovata (= Senecio obovatus)*, and *Arisaema triphyllum*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This sugar maple - oak forest occurs on rocky slopes. Sites are low flats or gentle to steep low and midslopes with mostly eastern, southern and northern aspects. Soils are dry-mesic to mesic rapidly to moderately well-drained silt loam, loam and sandy loam. The unvegetated surface consists of leaf litter, with lesser amounts of exposed bedrock, large/small rocks, bare soil, and/or downed wood. Evidence of disturbance includes trails and the presence of exotic plants.
Global Environment: These are forests of well-drained to moist and often on very rocky slopes.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This semi-rich, dry-mesic forest has some combination of *Quercus rubra, Acer saccharum*, and *Fraxinus americana* in the canopy, with *Carya glabra* and *Betula lenta* as canopy and subcanopy associates. *Tsuga canadensis* can be occasional. *Ostrya virginiana* and *Viburnum acerifolium* are characteristic in the understory. *Arisaema triphyllum, Polystichum acrostichoides, Eurybia divaricata*, and *Polygonatum biflorum* are common in a diverse herb layer.
Global Vegetation: *Fraxinus americana* and *Acer saccharum* are common in the tree canopy, with *Quercus rubra, Carya ovata, Carya glabra, Carya ovalis, Quercus velutina, Tilia americana, Betula lenta*, and *Quercus alba* as associates. *Tsuga canadensis* can be occasional. *Ostrya virginiana* and *Carpinus caroliniana* can form a prominent subcanopy. The shrub layer includes *Hamamelis virginiana, Viburnum acerifolium, Viburnum recognitum, Cornus florida, Corylus cornuta*, and *Lindera benzoin*. The herb layer is often quite diverse with *Carex platyphylla, Carex pedunculata, Carex blanda, Carex laxiflora, Actaea rubra, Polygonatum pubescens, Phegopteris hexagonoptera (= Thelypteris hexagonoptera), Viola rotundifolia, Thalictrum dioicum, Hepatica nobilis var. obtusa (= Hepatica americana), Thalictrum thalictroides (= Anemonella thalictroides), Festuca subverticillata, Actaea pachypoda, Viola sororia, Arabis* spp., *Packera obovata (= Senecio obovatus)*, and *Arisaema triphyllum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*, *Carya glabra*
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*, *Viburnum acerifolium*
Herb (field)	Fern (Spore-bearing forb)	*Polystichum acrostichoides*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fraxinus americana*
Tree subcanopy	Broad-leaved deciduous tree	*Carpinus caroliniana*, *Ostrya virginiana*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Cornus florida*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*, *Lindera benzoin*, *Viburnum acerifolium*, *Viburnum recognitum*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Corylus cornuta*
Herb (field)	Graminoid	*Carex* spp.

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer saccharum*, *Arisaema triphyllum*, *Carya glabra*, *Eurybia divaricata*, *Hamamelis virginiana*, *Polystichum acrostichoides*, *Quercus rubra*, *Viburnum acerifolium*

Global: *Acer saccharum*, *Arisaema triphyllum*, *Fraxinus americana*, *Hepatica nobilis* var. *obtusa*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Euonymus alatus* (Low), *Lonicera morrowii* (High/Medium), *Microstegium vimineum* (High/Medium), *Rosa multiflora* (Medium/Low)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This association can be distinguished from Sugar Maple - Chinquapin Oak / Sedge Forest (CEGL006162) by the absence of *Quercus muehlenbergii* from the canopy.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut (Housatonic Valley - Buck Hill, Mt. Prospect, Sharon Mountain - North End, Warren Turnpike Hillocks), New Jersey (Wawayanda Mountain), New York (Hammersley Ridge, Fort Defiance Hill).
Global Range: Currently described from central and southern New England, it extends to adjacent Canada and south to New Jersey.
Nations: CA, US
States/Provinces: CT, MA, NH, NJ, NY, QC, VT
TNC Ecoregions: 61:C
USFS Ecoregions (1994/95): 221Ae:CCC, 221Ah:CCC, 221Ai:CC?, 221Ak:CCC, 221Bc:CCC, M212Bc:CCC, M212Bd:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Saratoga, Weir Farm)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCNO
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 plots; 6 observation points; 11 accuracy assessment points): APPA.0684, APPA.0689, APPA.0921, APPA.1406, APPA.1426, APPA.1441, APPA.1443, APPA.1445, APPA.1447, APPA_AA_1650, APPA_AA_1760, APPA_AA_1813, APPA_AA_2368, APPA_AA_2436, APPA_AA_2479, APPA_AA_2743, APPA_AA_2745, APPA_AA_3174, APPA_AA_3294, APPA_AA_3334.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): Eastern Ecology Group
References: CDPNQ unpubl. data, Damman and Kershner 1977, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Metzler and Barrett 1996, Metzler and Barrett 2001, Metzler and Barrett 2004, Metzler and Barrett 2006, Metzler et al. 2009, NRCS 2004a, Rawinski 1984a, Sperduto 1997a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson and Sorenson 2000

[CEGL006125] *Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest

Translated Name: **Northern Red Oak - Sugar Maple - Tuliptree Forest**
Common Name: **High Allegheny Rich Red Oak - Sugar Maple Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Quercus rubra - Acer saccharum - Betula lenta* Forest Alliance (A3303)

ELEMENT CONCEPT

Global Summary: This red oak - sugar maple community is found primarily in the Allegheny Plateau and Appalachian Mountains of the United States, as well as on the northern Piedmont north to the Hudson Valley, with possible extensions east and west of those areas. It is typically found in coves, on moist north- and east-facing slopes and on well-drained flats. Soils are slightly acidic and of intermediate fertility. The closed-canopy tree layer is dominated by a mixture of oaks, primarily *Quercus alba* and *Quercus rubra*, with other hardwoods including *Acer saccharum, Acer rubrum*, and *Liriodendron tulipifera*. *Carya ovata, Carya alba (= Carya tomentosa), Nyssa sylvatica*, and *Quercus velutina* are possible associates. *Carya* spp. may share dominance in some stands. Dominance by *Acer rubrum* or *Liriodendron* may indicate a past disturbance history. A wide variety of more mesic associates, such as *Betula alleghaniensis, Betula lenta, Fagus grandifolia, Fraxinus americana*, and *Tilia americana* could occur but are negligible in dominance. In addition to *Acer saccharum* reproduction, some understory species may include *Carpinus caroliniana, Cercis canadensis, Cornus florida*, and *Ostrya virginiana*. Shrub and vine species include *Amelanchier laevis, Amelanchier arborea, Cornus* spp., *Hamamelis virginiana, Lindera benzoin, Viburnum acerifolium, Viburnum recognitum*, and *Vitis riparia*. Ericaceous shrubs, such as *Kalmia latifolia, Vaccinium angustifolium* and *Vaccinium pallidum*, may also be present but are not abundant. The ground layer species are highly variable but include *Caulophyllum thalictroides, Ageratina altissima, Dennstaedtia punctilobula, Podophyllum peltatum, Maianthemum racemosum (= Smilacina racemosa), Medeola virginiana, Thelypteris noveboracensis, Dryopteris marginalis, Dryopteris intermedia, Actaea* spp., and *Uvularia sessilifolia*. Exotic species, including *Rosa multiflora* and *Alliaria petiolata*, may be present in the shrub and herb layers of disturbed stands.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This mesic red oak - sugar maple - tuliptree forest is typically found in coves, on moist north- and east-facing slopes and on well-drained flats, often covered by bouldery colluviums. It was sampled once in the Central Appalachian project area on a gentle north-facing midslope with moderately well-drained silt soil. The unvegetated surface is dominated by leaf litter with some downed wood, large rocks and bare soil. Evidence of disturbance includes past logging.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This red oak - sugar maple forest ranges from Massachusetts to Pennsylvania and the Central Appalachians. Elevations of sampled plots range from 230-309 m (755-1,014 feet). Sites are mesic somewhat steep to steep low and midslopes (rock outcrops) with mostly eastern and western aspects. Soils are poorly to well-drained sandy loam and loam. The unvegetated surface consists of various combinations leaf litter, exposed bedrock, large and small rocks, bare soil, and downed wood. Evidence of disturbance includes possible windthrow and the presence of exotic plants.

Global Environment: Throughout the range, stands are typically found in coves, on moist north- and east-facing slopes, and on well-drained flats. Soils are slightly acidic and of intermediate fertility (Anderson 1982, Reschke 1990, Fike 1999). In the Catoctin Mountains of Maryland, sites occupied by this community are often covered by bouldery colluvium weathered from metabasalt bedrock. Soils collected from these sites are strongly acidic (mean pH = 4.8) but have moderately high calcium and magnesium levels, typical of soils weathered from iron- and aluminum-rich mafic bedrock.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus rubra, Acer saccharum*, and *Liriodendron tulipifera* codominate the canopy. *Betula lenta* and *Acer rubrum* are common in the subcanopy. The sparse shrub layer includes *Hamamelis virginiana* and the short shrubs *Vaccinium pallidum* and *Vaccinium angustifolium*. *Dryopteris intermedia* is a common herb.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This deciduous forest is dominated by *Quercus rubra* and *Acer saccharum* with *Fagus grandifolia, Liriodendron tulipifera*, and/or *Fraxinus americana* common and abundant (usually >20% relative cover). *Hamamelis virginiana* and *Lindera benzoin* are common shrubs. Herbs are variable and often sparse. This community contains MA state-imperiled *Quercus muehlenbergii*.

Global Vegetation: Stands of this red oak - sugar maple forest contain a closed-canopy tree layer. *Acer saccharum, Liriodendron tulipifera, Quercus alba*, and *Quercus rubra* are the leading dominants. *Acer rubrum, Carya ovata, Carya alba (= Carya tomentosa), Nyssa sylvatica*, and *Quercus velutina* are associates on various sites. *Liriodendron tulipifera* dominance may indicate a past disturbance history, and *Carya* spp. may share dominance in some stands. A wide variety of more mesic associates, such as *Betula alleghaniensis, Betula lenta, Fagus grandifolia*, and *Fraxinus americana*, may occur but are negligible in dominance. In addition to *Acer saccharum* reproduction, understory species may include *Carpinus caroliniana, Cercis canadensis*, and *Ostrya virginiana*.

Shrub and vine species include *Amelanchier laevis, Amelanchier arborea, Cornus* spp., *Hamamelis virginiana, Lindera benzoin, Viburnum acerifolium, Viburnum recognitum*, and *Vitis riparia*. Ericaceous shrubs such as *Kalmia latifolia, Vaccinium angustifolium* and *Vaccinium pallidum* may also be present. The ground layer species are highly variable but include *Caulophyllum thalictroides, Dennstaedtia punctilobula, Podophyllum peltatum, Maianthemum racemosum (= Smilacina racemosa), Medeola virginiana, Thelypteris noveboracensis*, and *Uvularia sessilifolia*. At the southern end of the type's range in the Catoctin Mountains of Maryland, *Liriodendron tulipifera* and *Quercus rubra* are the leading overstory dominants, with *Acer saccharum* common in both the overstory and understory. Minor tree associates include *Fraxinus americana, Tilia americana, Quercus alba, Betula lenta, Fagus grandifolia*, and *Acer rubrum*. *Lindera benzoin* and *Hamamelis virginiana* are the most constant and abundant species in a rather open shrub layer. The most constant herbs in eight plot samples are *Arisaema triphyllum, Brachyelytrum erectum, Carex digitalis, Erythronium americanum, Eurybia divaricata (= Aster divaricatus), Galium triflorum, Pilea pumila, Polystichum acrostichoides, Thalictrum thalictroides, Uvularia sessilifolia, Viola pubescens*, and *Viola sororia*. Many other species occur at lower constancies.

Global Dynamics: Catoctin Mountain, Maryland, stands have been degraded by past clearing, cutting and more recent invasion by introduced species, including *Microstegium vimineum* and *Alliaria petiolata*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*, *Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum acerifolium*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Herb (field)	Flowering forb	*Podophyllum peltatum*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer saccharum*, *Liriodendron tulipifera*, *Quercus rubra*, *Vaccinium pallidum*

Appalachian National Scenic Trail (Lower New England Project Area): *Acer saccharum*, *Fraxinus americana*, *Hamamelis virginiana*, *Liriodendron tulipifera*, *Quercus rubra*

Global: *Acer saccharum*, *Carex pensylvanica*, *Carpinus caroliniana*, *Caulophyllum thalictroides*, *Liriodendron tulipifera*, *Vaccinium angustifolium*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Quercus muehlenbergii* (G5, MA state-imperiled); **Invasive/Exotic Plants**: *Berberis thunbergii* (High/Medium), *Epipactis helleborine* (Medium/Low), *Microstegium vimineum* (High/Medium), *Poa compressa* (High/Low), *Rhamnus cathartica* (High/Medium), *Rosa multiflora* (Medium/Low)

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (2-Oct-2006). This community is reported as a matrix or large-patch type in every ecoregion where it occurs. Despite covering large areas, high-quality stands are probably rare because of widespread historical impacts and ongoing susceptibility to exotics weeds.

Related Concepts

Global Similar Types:
- *Fagus grandifolia - Quercus alba - Quercus rubra* Forest (CEGL006377)
- *Quercus alba - Quercus rubra - Carya ovalis / Acer saccharum / Polystichum acrostichoides* Forest (CEGL007233) is a related type to the south and west.
- *Quercus alba - Quercus rubra - Quercus prinus - Acer saccharum / Lindera benzoin* Forest (CEGL002059)
- *Quercus prinus - Quercus (alba, coccinea) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023)
- *Quercus rubra - Acer saccharum - Tilia americana var. heterophylla - Aesculus flava - (Cladrastis kentukea)* Forest (CEGL007698)
- *Quercus rubra - Acer saccharum / Ostrya virginiana / Cardamine concatenata* Forest (CEGL008517) related vegetation occurring on calcareous substrates at low elevations in the Ridge and Valley province of Virginia and Maryland.
- *Quercus rubra - Tsuga canadensis - Liriodendron tulipifera / Hamamelis virginiana* Forest (CEGL006566)

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Occurs from Pennsylvania and north along the Appalachian Trail corridor.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Some examples in New York have *Acer rubrum* instead of *Acer saccharum*, and not all sites have *Lindera benzoin*.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: Dominant presettlement forest in New Jersey and New York.
Global Classification Comments: According to Anderson (1982) in Ohio, where this community is found in the southeastern unglaciated plateau region, it is differentiated from the oak-maple type, *Quercus alba - Quercus rubra - Quercus prinus - Acer saccharum / Lindera benzoin* Forest (CEGL002059), and the Appalachian oak forest type, *Quercus prinus - Quercus (alba, coccinea) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023), by the substantial presence (over 20% canopy or basal area) of *Liriodendron tulipifera* and insignificant amounts of *Fagus grandifolia* or other mesic tree species. This type concept may overlap considerably with that of the oak-maple type, *Quercus alba - Quercus rubra - Quercus prinus - Acer saccharum / Lindera benzoin* Forest (CEGL002059). Braun (1950, e.g., p. 140) reports stands similar to this type in the Shawnee Hills and Mammoth Cave area of Kentucky, as well as other Interior Low Plateau sites. In New York, this type is reported primarily from the southeastern part of the State (Reschke 1990). In the mid-Atlantic states, this type is differentiated from *Quercus (alba, rubra, velutina) - Carya* spp. / *Viburnum acerifolium* Forest (CEGL006336) by somewhat more mesic conditions, a higher non-oak canopy component, and the absence of *Quercus prinus*.

Element Distribution

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from southeastern New York and New Jersey to Pennsylvania, Maryland, West Virginia, and southeastern Ohio. It was sampled in Cumberland County, Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Massachusetts (Sheffield-Egremont Town Line Natural Heritage Site) and New York (Black Mountain - Harriman State Park, Canada Hill/Curry Pond, Canopus Lake North and Canopus Lake South in Fahnestock State Park, West Mountain - Bear Mountain State Park).
Global Range: This red oak - sugar maple community is found primarily in the Allegheny Plateau and Appalachian Mountain regions of the United States, with possible extensions east and west of those areas, ranging from Massachusetts and New Jersey west to southeastern Ohio.
Nations: US
States/Provinces: CT, MA:S1, MD, NJ, NY, OH, PA, WV
TNC Ecoregions: 48:C, 49:C, 50:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCP, 221Ae:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCP, 221Bd:CCC, 221Da:CCC, 221Db:CCP, 221Dc:CCC, 221Ea:CCC, 221Ec:CCC, 221Ed:CCC, 221Ee:CCC, 221Ef:CCC, 221Eg:CCC, 221Fa:CCC, 221Fb:CCC, 221He:CCC, M212Ea:CPP, M212Eb:CPP, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CC?, M221Be:CC?, M221Bf:CCC, M221C:C?

Federal Lands: NPS (Allegheny Portage Railroad, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Catoctin Mountain, Delaware Water Gap, Fort Necessity, Friendship Hill, Upper Delaware); USFS (Wayne); USFWS (Erie)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FOTM
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot): APPA.0514.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 5 observation points; 7 accuracy assessment points): APPA.0025, APPA.1391, APPA.1394, APPA.1401, APPA.1416, APPA.1421, APPA_AA_1876, APPA_AA_1976, APPA_AA_2029, APPA_AA_2136, APPA_AA_2508, APPA_AA_2961, APPA_AA_3168.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): D. Faber-Langendoen, E. Largay, S.C. Gawler and G.P. Fleming
References: Anderson 1982, Braun 1950, Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Fleming 1999, Harrison 2004, Lundgren 2001, Metzler and Barrett 2001, Metzler and Barrett 2006, ONHD unpubl. data, Perles et al. 2006a, Perles et al. 2006b, Perles et al. 2006d, Perles et al. 2007, Perles et al. 2008, Reschke 1990, Swain and Kearsley 2011

[CEGL008517] *Quercus rubra - Acer saccharum / Ostrya virginiana / Cardamine concatenata* Forest

Translated Name: **Northern Red Oak - Sugar Maple / Hophornbeam / Cutleaf Toothwort Forest**
Common Name: **Central Appalachian Rich Red Oak - Sugar Maple Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Quercus rubra - Acer saccharum - Betula lenta* Forest Alliance (A3303)

ELEMENT CONCEPT

Global Summary: This community type is currently known from the Ridge and Valley region of west-central and northwestern Virginia and adjacent Maryland, with a few outliers in the Piedmont of both states. It occupies submesic slopes with various aspects, broad crests, and occasionally high alluvial terraces at low and middle elevations. Elevation ranges from less than 300 to 1146 m (<1000-3760 feet). Middle slope positions are typical, but stands also occur on lower and upper slopes. This forest association occurs in small to large patches. *Acer saccharum, Quercus rubra*, and, to a lesser extent, *Carya* spp. are the dominant trees in closed-canopy stands. *Carya glabra* and *Carya ovata* are the two most frequent hickories, but *Carya cordiformis, Carya alba*, and *Carya ovalis* are also present in some stands. *Fraxinus americana, Liriodendron tulipifera, Quercus alba, Quercus prinus, Quercus velutina, Fagus grandifolia, Quercus muehlenbergii*, and *Tilia americana* each attain importance in a subset of stands. Understory layers contain substantial reproduction of *Acer saccharum* and moderate representation of the other major canopy species. The shrub layer is usually very open, with much of its cover contributed by tree saplings; *Ostrya virginiana* is the most constant and abundant small tree/shrub, while *Cornus florida, Cercis canadensis*, and *Hamamelis virginiana* are more locally important understory species. Herbaceous growth is usually not lush and frequently exhibits patch-dominance by one to a few species.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This rich oak-hickory forest occurs on midslopes at elevations from 300 to 1,146 m (<1,000-3,760 feet) on limestone, dolomite, and calcareous shales. It was sampled at five locations in the Central Appalachian project area. Sites are generally steep slopes with northerly aspects. Soils are well-drained clay loam. The unvegetated surface is dominated by leaf litter with some downed wood. Evidence of disturbance includes woolly hemlock adelgid infestation and the presence of exotic plant species.
Global Environment: The community occupies submesic slopes with various aspects, broad crests, and occasionally high alluvial terraces at low and middle elevations. Elevation ranges from less than 300 to 1146 m (<1000-3760 feet). Middle slope positions are typical, but stands also occur on lower and upper slopes. Habitats

only occasionally have substantial surface cover of bedrock or stones; at most sites, leaf litter is the predominant surface substrate. Soil moisture regime is intermediate between that of mesic cove forests and that of subxeric forests and woodlands of rocky, calcareous slopes. Soil samples collected from plots are friable, light to dark brown silt loams or clay loams that are strongly to moderately acidic (mean pH = 5.0) but have moderately high calcium values (mean about 1200 ppm). Parent geologic material of Ridge and Valley sites includes limestone, dolomite, interbedded limestone and sandstone, calcareous shales and calcareous sandstone. Piedmont sites occur on calcareous Triassic siltstones and interbedded metasedimentary and intrusive mafic rocks of the Potomac River valley.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is dominated by *Acer saccharum, Quercus rubra*, and, *Carya* spp. in variable combinations. *Fraxinus americana* may be important and *Liriodendron tulipifera* may be common in disturbed stands. The understory layers contain substantial reproduction of *Acer saccharum* and *Acer rubrum*. *Quercus muehlenbergii* can occur as a minor associate in stands on limestone or dolomite. *Ostrya virginiana* is the most constant and abundant small tree/shrub, with *Cornus florida, Cercis canadensis*, and/or *Hamamelis virginiana* also common. Herbs are patchy and can include *Ageratina altissima, Carex* spp., *Eurybia divaricata, Packera obovata, Hepatica nobilis var. obtusa, Carex platyphylla, Symphyotrichum cordifolium, Carex laxiflora var. laxiflora, Asplenium platyneuron, Galium circaezans, Carex digitalis*, and others.

Global Vegetation: This forest association occurs in small to large patches. *Acer saccharum, Quercus rubra*, and, to a lesser extent, *Carya* spp. are the dominant trees in closed-canopy stands. *Carya glabra* and *Carya ovata* are the two most frequent hickories, but *Carya cordiformis, Carya alba*, and *Carya ovalis* are also present in some stands. *Fraxinus americana, Liriodendron tulipifera, Quercus alba, Quercus prinus, Quercus velutina, Fagus grandifolia*, and *Tilia americana* each attain importance in a subset of stands. Understory layers contain substantial reproduction of *Acer saccharum* and moderate representation of the other major canopy species. The shrub layer is usually very open, with much of its cover contributed by tree saplings; *Ostrya virginiana* is the most constant and abundant small tree/shrub, while *Cornus florida, Cercis canadensis*, and *Hamamelis virginiana* are more locally important understory species. Herbaceous growth is usually not lush and frequently exhibits patch-dominance by one to a few species. The most constant and/or abundant herbs in the type's principal Ridge and Valley range are *Ageratina altissima, Amphicarpaea bracteata, Arabis laevigata, Bromus pubescens, Cardamine concatenata, Carex digitalis, Carex platyphylla, Claytonia virginica, Eurybia divaricata (= Aster divaricatus), Festuca subverticillata, Polystichum acrostichoides*, and *Solidago caesia*. Species richness in 42 plot-sampled stands ranges from 17 to 84 taxa per 400 square meters (mean = 50).

Global Dynamics: At some sites, this community type appears to result from the invasion of fire-suppressed oak-hickory stands by *Acer saccharum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*
Tall shrub/sapling	Broad-leaved deciduous tree	*Ostrya virginiana*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*
Tall shrub/sapling	Broad-leaved deciduous tree	*Ostrya virginiana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Acer saccharum*, *Ageratina altissima*, *Carex platyphylla*, *Eurybia divaricata*, *Fraxinus americana*, *Ostrya virginiana*, *Quercus prinus*, *Quercus rubra*

Global: *Acer saccharum*, *Ageratina altissima*, *Bromus pubescens*, *Carex digitalis*, *Carex hirtifolia*, *Carya ovata*, *Muhlenbergia tenuiflora*, *Polystichum acrostichoides*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Lithospermum latifolium* (G4, VA state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (2-Oct-2006). This community type is suspected of being widespread in the Central Appalachians and possibly Kentucky and Tennessee, but additional data analysis is needed to sort out relationships between reported types that are similar. The type appears to be fairly common and secure in west-central and northwestern Virginia and adjacent Maryland.

RELATED CONCEPTS

Global Similar Types:

- *Quercus alba - Quercus rubra - Carya ovalis / Acer saccharum / Polystichum acrostichoides* Forest (CEGL007233)
- *Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest (CEGL006125) has a more northern distribution, usually on non-calcareous soils of intermediate fertility.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: In Virginia, this type is strictly in the Ridge and Valley, occurring at low to middle elevations on limestone, dolomite, and calcareous shales. It does not occur on the metamorphic rocks of the Blue Ridge. Due to the fact that the AT largely follows the Blue Ridge, you will not encounter this type except in the Ridge and Valley divergence area between I-81 and Roanoke, and through most of that stretch, it is very uncommon. This type (CEGL008517) and Central Appalachian Montane Oak - Hickory Forest (Basic Type) (CEGL008518) have some compositional similarities but are pretty well separated by geological substrates and elevation in the areas where their ranges overlap.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: This community type has some affinities to *Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest (CEGL006125) that is centered in the high Allegheny Mountains and lower New England regions to the north, but it is typically associated with more calcareous soils and differs considerably in floristic composition. *Liriodendron tulipifera* is inconstant (52% constancy) in plot-sampled Central Appalachian stands of this association (CEGL008517) and entirely absent from stands above about 975 m (3200 feet). In two Virginia plots, there is evidence (in the form of numerous large, rotting boles) that *Castanea dentata* (American chestnut) was formerly dominant or codominant and that this type has developed as a residual type following chestnut blight. The Middle Mountain (Highland County) stand is especially important because the site evidently escaped logging and contains an essentially complete record of successional change since the demise of *Castanea dentata*.

Similar oak - hickory - sugar maple vegetation is reported by Andreu and Tukman (1995) and Bryant (1981) from Tennessee and Kentucky. In the old-growth forests of the Kentucky Eden Shale Belt, young *Acer saccharum* reproduction was abundant in all stands, while oak and hickory reproduction was scarce, suggesting that a reduction of wildfire frequencies was contributing to successional replacement of oak-hickory forests by *Acer saccharum* (Bryant 1981). The resemblance of these forests to some aspects of the Central Appalachian type is striking, but comparable quantitative data on environmental factors and total floristic composition are needed to sort out ecologically meaningful units from across a considerable geographic range.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs strictly in the Ridge and Valley in the Virginia and Maryland portions of the Central Appalachians. It was sampled in Virginia at Trout Creek West, Route 624 East, Rich Valley, Kimberling Creek, and Catawba Mountain.
Global Range: This community type is currently known from the Ridge and Valley region of west-central and northwestern Virginia and adjacent Maryland, with a few outliers in the Piedmont of both states. The type may be more widespread than documentation indicates. Within the known range, it appears to be widely but somewhat locally distributed on fertile Ridge and Valley substrates and very locally on calcium-enriched substrates of the Piedmont Plateau. Similar vegetation has been observed in the Cumberland Mountains of southwestern Virginia, but its disposition is uncertain.
Nations: US
States/Provinces: MD, VA:S4, WV
TNC Ecoregions: 50:C, 59:C, 61:C
USFS Ecoregions (1994/95): 221Db:CCC, 231Ap:CCC, M221Aa:CCC, M221Ab:CCC, M221Ca:CP?, M221Cb:CP?, M221Cc:CP?, M221Ce:CPP, M221Da:CCC

Federal Lands: NPS (Antietam, Appalachian Trail [Central Appalachians], C&O Canal, George Washington Parkway); USFS (George Washington, Monongahela); USFWS (National Conservation Training Center)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAOH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 plots; 2 observation points): APPA.0407, APPA.0482, APPA.1002, APPA.1161, APPA.1188.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Andreu and Tukman 1995, Bryant 1981, Eyre 1980, Fleming 1999, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 1996, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2007b, Harrison 2004, Rawinski et al. 1994

[CEGL006635] *Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest

Translated Name: **Northern Red Oak - Sugar Maple / Mapleleaf Viburnum - Northern Spicebush Forest**
Common Name: **Red Oak - Transitional Northern Hardwood Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Quercus rubra - Acer saccharum - Betula lenta* Forest Alliance (A3303)

ELEMENT CONCEPT

Global Summary: These mesic forests of oak and northern hardwoods, sometimes mixed with hemlock or pine, are distributed across the Allegheny Plateau, Lake Ontario and Lake Erie plains and Lower New England regions of the northeastern United States. They occur on slightly acidic, well-drained loamy and often rocky soils of intermediate fertility, most often positioned on midslopes and coves. Soil depth is often shallow, but some stands occur on deep tills. Most are at low to mid elevations, usually under 520 m (1700 feet), but they may range up to 765 m (2500 feet). The deciduous-to-mixed canopy is mostly closed, and the lower layers are variable in extent. Tall shrubs are well-represented, although scattered, with occasional denser patches. Herbs are sparse and bryoids are nearly absent. Ericads and other dwarf-shrubs are also nearly absent, a characteristic that distinguishes this association from most other red oak forests in the Northeast. Canopy composition is a variable mixture of *Quercus rubra* (usually at least 30% of the canopy), *Fagus grandifolia, Acer saccharum, Acer rubrum*, and in some stands *Pinus strobus* or *Tsuga canadensis*. Conifers generally make up less than 20% of the canopy cover, and even in mixed stands the cover of deciduous trees exceeds that of conifers. Minor canopy associates include *Fraxinus americana, Tilia americana, Betula lenta, Juglans cinerea*, and *Ulmus americana*. *Acer pensylvanicum* is common as a small tree; in the central and southern portions of the distribution, *Cornus florida* and *Prunus serotina* are common small trees as well. *Corylus cornuta, Viburnum acerifolium*, and *Hamamelis virginiana* are typical shrubs, with *Kalmia latifolia* and *Lindera benzoin* occasional in all but the northern portions of the range. Typical species in the herb layer include *Gaultheria procumbens, Maianthemum canadense, Aralia nudicaulis, Trientalis borealis, Uvularia sessilifolia, Medeola virginiana, Brachyelytrum erectum, Dryopteris intermedia, Polystichum acrostichoides, Dennstaedtia punctilobula, Pteridium aquilinum*, and *Thelypteris noveboracensis*. On more nutrient-rich soils, the herb layer may contain *Solidago caesia, Caulophyllum thalictroides, Dryopteris marginalis*, and *Eurybia divaricata (= Aster divaricatus)*. This association is distinguished from other transitional northern hardwood forests by its greater amount of oak, from other oak forests by its greater prominence of northern hardwoods and lack of dwarf-shrub ericads, and from hemlock-hardwoods by the relatively low importance of hemlock.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This red oak - northern hardwood forest occurs on sideslopes at low to mid elevations, usually under 600 m (1,970 feet) but can range up to 750 m (2,460 feet). Sites are generally moderate to steep mid and upper slopes (sideslopes) with mostly northern and eastern aspects. Soils are dry-mesic to mesic, moderately well- to well-drained sandy loam, silt loam and loam. The unvegetated surface consists of leaf litter, with lesser amounts of exposed bedrock, large/small rocks, bare soil,

and/or downed wood. Bryophytes are common. Evidence of disturbance includes trails and old roads, possible past clearing, deer browse, wind/ice damage, and the presence of exotic plants.
Global Environment: These forests occur on slightly acidic, well-drained loamy and often rocky soils of intermediate fertility, most often positioned on midslopes and coves. Soil depth is often shallow, but some occur on deep tills. Stands often occur at low to mid elevations, usually under 520 m (1700 feet), but in the southern portion of their distribution they may range up to 760 m (2500 feet).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: Canopy composition is a variable mixture of *Quercus rubra* (usually at least 30% of the canopy), *Fagus grandifolia, Acer saccharum, Acer rubrum*, and in some stands *Pinus strobus* or *Tsuga canadensis* (conifers generally make up less than 20% of the canopy cover); *Picea rubens* may occur sporadically at the northern extent, and *Nyssa sylvatica* may occur to the south. *Fraxinus americana* and/or *Betula alleghaniensis* are canopy associates. *Acer pensylvanicum* and *Viburnum acerifolium* are common shrubs. *Aralia nudicaulis, Dennstaedtia punctilobula, Athyrium filix-femina*, and *Polystichum acrostichoides* are common herbs. In addition, this community supports CT state-imperiled *Panax quinquefolius*, MA state-imperiled *Solidago macrophylla*, and VT state-imperiled *Conopholis americana*.
Global Vegetation: The deciduous-to-mixed canopy is mostly closed, and the lower layers are variable in extent. Tall shrubs are well represented, although scattered, with occasional denser patches. Herbs are sparse, and bryoids are nearly absent. Ericads and other dwarf-shrubs are also nearly absent, a characteristic that distinguishes this association from most other red oak forests in the Northeast. Canopy composition is a variable mixture of *Quercus rubra* (usually at least 30% of the canopy), *Fagus grandifolia, Acer saccharum, Acer rubrum*, and, in some stands, *Pinus strobus* or *Tsuga canadensis*. In mixed stands, the cover of deciduous trees exceeds that of conifers. Minor canopy associates include *Fraxinus americana, Tilia americana, Betula lenta, Juglans cinerea*, and *Ulmus americana*. *Acer pensylvanicum* is common as a small tree; in the central and southern portions of the distribution, *Cornus florida* and *Prunus serotina* are common small trees as well. *Corylus cornuta, Viburnum acerifolium*, and *Hamamelis virginiana* are typical shrubs, with *Kalmia latifolia* and *Lindera benzoin* occasional in all but the northern portions of the range. Typical species in the herb layer include *Gaultheria procumbens, Maianthemum canadense, Aralia nudicaulis, Trientalis borealis, Uvularia sessilifolia, Medeola virginiana, Brachyelytrum erectum, Dryopteris intermedia, Polystichum acrostichoides, Dennstaedtia punctilobula, Pteridium aquilinum*, and *Thelypteris noveboracensis*. On more nutrient-rich soils, the herb layer may contain *Solidago caesia, Caulophyllum thalictroides*, and *Eurybia divaricata (= Aster divaricatus)*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*, *Fagus grandifolia*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved deciduous tree	*Fagus grandifolia*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fagus grandifolia*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Cornus florida*, *Prunus serotina*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*, *Viburnum acerifolium*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Corylus cornuta*
Herb (field)	Flowering forb	*Aralia nudicaulis*, *Trientalis borealis*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Acer saccharum*, *Aralia nudicaulis*, *Dryopteris intermedia*, *Fagus grandifolia*, *Maianthemum canadense*, *Polystichum acrostichoides*, *Quercus rubra*
Global: *Acer pensylvanicum*, *Acer rubrum*, *Aralia nudicaulis*, *Cornus florida*, *Corylus cornuta*, *Dennstaedtia punctilobula*, *Hamamelis virginiana*, *Polystichum acrostichoides*, *Prunus serotina*, *Pteridium aquilinum*, *Quercus rubra*, *Trientalis borealis*, *Viburnum acerifolium*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Conopholis americana* (G5, VT state-imperiled), *Panax quinquefolius* (G3G4, CT state-imperiled), *Solidago macrophylla* (G5, MA state-imperiled); **Invasive/Exotic Plants**: *Berberis thunbergii* (High/Medium), *Epipactis helleborine* (Medium/Low), *Galeopsis tetrahit*, *Poa compressa* (High/Low)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (2-Dec-2014). This association is well-distributed, but patchy throughout its range.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Betula alleghaniensis - Quercus rubra / Viburnum acerifolium* Forest (CEGL006943)
- *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632)
- *Acer saccharum - Pinus strobus / Acer pensylvanicum* Forest (CEGL005005)
- *Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest (CEGL006293)
- *Quercus rubra - Acer rubrum - Betula* spp. *- Pinus strobus* Ruderal Forest (CEGL006506)
- *Quercus rubra - Acer saccharum - (Betula alleghaniensis)* Forest (CEGL002461)
- *Quercus rubra - Acer saccharum - Fagus grandifolia / Viburnum acerifolium* Forest (CEGL006633)
- *Quercus rubra - Acer saccharum - Tilia americana var. heterophylla - Aesculus flava - (Cladrastis kentukea)* Forest (CEGL007698)
- *Quercus rubra - Quercus alba - (Quercus velutina, Acer rubrum) / Viburnum acerifolium* Forest (CEGL002462)
- *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community contains small seepage areas along small stream channels that cannot be mapped separately from the matrix forest community.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: *Acer saccharum* is not found reliably in the canopy of some of the Massachusetts sites. *Picea rubens* is common in the canopy and subcanopy of some of the Massachusetts sites. Some New York examples have very few herbs and shrubs, most likely due to deer browse. Pockets of hemlock are present in the understory at Mosley Hill in Windsor County, Vermont.
Global Classification Comments: This type was formerly included in CEGL006173. It was separated from *Quercus rubra - Acer saccharum - Fagus grandifolia / Viburnum acerifolium* Forest (CEGL006633) to more clearly distinguish the Allegheny Plateau and Lower New England characteristics from the Northern Appalachian region stands.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut (Hatch Brook), Massachusetts (Beartown State Forest, Greylock South, Mt. Prospect), New Jersey (Unionville West), New York (Fort Defiance Hill, West Mountain - Bear Mountain State Park), and Vermont (Dana Hill, Middle Pinnacle, Moseley Hill, Spring Lake-Shrewsbury).
Global Range: This association occurs in the Allegheny Plateau, Lake Ontario and Lake Erie plains and Lower New England regions and south to New Jersey.
Nations: CA, US
States/Provinces: CT, MA, NH, NJ, NY, ON, PA, RI
TNC Ecoregions: 48:C, 59:?, 60:C, 61:C, 62:C, 64:C
USFS Ecoregions (1994/95): 212Fb:CPP, 221Aa:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Bb:CCC, 221Bc:CCC, 221D:CC, 221E:C?, 221F:CP, 222Ib:CCC, 222Id:CCP
Federal Lands: NPS (Appalachian Trail [Lower New England], Minute Man, Saratoga); USFS (Finger Lakes); USFWS (Iroquois)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCNO
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (6 plots; 10 observation points; 11 accuracy assessment points): APPA.0001, APPA.0013, APPA.0014, APPA.0051, APPA.0834, APPA.0954, APPA.1359, APPA.1393, APPA.1407, APPA.1459, APPA.1499, APPA.1500, APPA.1501, APPA.1513, APPA.1740, APPA.1742, APPA_AA_1640, APPA_AA_1681, APPA_AA_1735, APPA_AA_1751, APPA_AA_1955, APPA_AA_2422, APPA_AA_2715, APPA_AA_2773, APPA_AA_2792, APPA_AA_3179, APPA_AA_3280.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler and D. Faber-Langendoen
References: Breden et al. 2001, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Enser 1999, Enser and Lundgren 2006, Eyre 1980, Fike 1999, Gawler et al. 2005, Metzler and Barrett 2001, NRCS 2004a, Rawinski 1984a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001

[CEGL006000] *Quercus rubra - Betula alleghaniensis / Osmunda cinnamomea* Forest

Translated Name: **Northern Red Oak - Yellow Birch / Cinnamon Fern Forest**
Common Name: **Upland/Wetland Transitional Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Quercus rubra - Acer saccharum - Betula lenta* Forest Alliance (A3303)

ELEMENT CONCEPT

Global Summary: This lower slope, wetland transitional forest of southern New England to New Jersey generally occurs immediately upslope from seasonally flooded acidic swamps or small drainages. It occurs on somewhat poorly drained mineral soils, with a soil moisture regime of moist to somewhat wet. The tree canopy is nearly closed, with tree height reflecting moisture availability. Dominant species include *Acer rubrum, Betula alleghaniensis, Quercus rubra*, and *Quercus velutina*. Occasionally *Quercus alba, Quercus palustris, Fagus grandifolia*, and *Tsuga canadensis* may occur. The shrub layer includes *Hamamelis virginiana, Vaccinium corymbosum, Clethra alnifolia, Kalmia latifolia*, and *Lindera benzoin*. The herbaceous layer is nearly continuous and dominated by *Osmunda cinnamomea, Thelypteris noveboracensis, Arisaema triphyllum*, and *Uvularia sessilifolia*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This transitional upland / wetland hardwood forest occurs in basin settings. It was sampled at two locations within the Appalachian Trail corridor in the Lower New England project area. One site is a gently sloping saturated channel bed with somewhat poorly drained loam soil. The other site is a large bottomland swamp with hummocks with poorly drained soil. The unvegetated surface is mix of leaf litter, large rocks, downed wood, bare soil, and/or standing water. Evidence of disturbance includes the presence of exotic plants.
Global Environment: This vegetation occurs on lower slopes, generally adjacent to wetlands. Mineral soils are somewhat poorly drained and moist to somewhat wet sandy loams. The substrate is often rocky.

VEGETATION DESCRIPTION

Global Vegetation: The tree canopy is nearly closed, with tree height reflecting moisture availability. Dominant species include *Acer rubrum, Betula alleghaniensis, Quercus rubra*, and *Quercus velutina*. Occasionally *Quercus alba, Quercus palustris, Fagus grandifolia*, and *Tsuga canadensis* may occur. *Liriodendron tulipifera* is a common associate in the southern portion of the range. The shrub layer includes *Hamamelis virginiana, Vaccinium corymbosum, Clethra alnifolia, Kalmia latifolia*, and *Lindera benzoin*. The herbaceous layer is nearly continuous and dominated by *Osmunda cinnamomea, Thelypteris noveboracensis, Arisaema triphyllum*, and *Uvularia sessilifolia*. *Impatiens capensis, Veratrum viride*, and *Symplocarpus foetidus* may also occur where this vegetation grades into a wetland forest.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula alleghaniensis*, *Quercus velutina*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Clethra alnifolia*, *Hamamelis virginiana*, *Lindera benzoin*, *Vaccinium corymbosum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Herb (field)	Flowering forb	*Arisaema triphyllum*, *Uvularia sessilifolia*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*, *Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area):
Global: *Arisaema triphyllum*, *Betula alleghaniensis*, *Osmunda cinnamomea*, *Quercus rubra*, *Thelypteris noveboracensis*, *Uvularia sessilifolia*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Fagus grandifolia - Betula lenta - Quercus (alba, rubra) / Carpinus caroliniana* Forest (CEGL006921)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: The lack of surface water and drier soil conditions during the growing season (relative to adjacent, seasonally flooded wetlands) make this forest suitable for species found more frequently in uplands.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: No plots or observation points.
Global Range: The association ranges from New Jersey north to Maine and Quebec, Canada.
Nations: CA, US
States/Provinces: CT, MA, ME, NH:S3S4, NJ, NY, QC, RI
TNC Ecoregions: 61:C, 62:C, 63:?
USFS Ecoregions (1994/95): 221Ae:CCC, 221Af:CCC, 221Ag:CCP, 221Ai:CCC, 221Al:CCC, 221Bc:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Boston Harbor Islands, Minute Man, Morristown, Saratoga); USFWS (Assabet River, Great Meadows, Oxbow, Rachel Carson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAHS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (5 accuracy assessment points): APPA_AA_1907, APPA_AA_2313, APPA_AA_2597, APPA_AA_2842, APPA_AA_3338.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): S.L. Neid and L.A. Sneddon
References: CDPNQ unpubl. data, Damman and Kershner 1977, Eastern Ecology Working Group n.d., Edinger et al. 2002, Edinger et al. 2007, Ehrenfeld 1977, Gawler et al. 2005, Golet et al. 1993, Largay and Sneddon 2010, Metzler and Barrett 2001, Metzler and Barrett 2001*, Metzler and Barrett 2006, NRCS 2004a, Rawinski 1984a, Sneddon et al. 2008, Sperduto 2000b, Sperduto and Nichols 2004

[CEGL006566] *Quercus rubra - Tsuga canadensis - Liriodendron tulipifera / Hamamelis virginiana* Forest

Translated Name: **Northern Red Oak - Eastern Hemlock - Tuliptree / American Witch-hazel Forest**
Common Name: **Red Oak - Hemlock - Mixed Hardwood Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Quercus rubra - Acer saccharum - Betula lenta* Forest Alliance (A3303)

Element Concept

Global Summary: This closed-canopy, dry-mesic deciduous forest occurs on deep, moist to well-drained loams and silt loams on northern and eastern midslopes and coves. The canopy is dominated by a variety of oaks, hickories and conifers, including *Quercus rubra, Acer saccharum, Fagus grandifolia, Quercus alba, Quercus velutina, Betula lenta, Carya alba (= Carya tomentosa), Fraxinus americana*, and *Liriodendron tulipifera*, with notable presence of *Tsuga canadensis* and/or *Pinus strobus*. The subcanopy and shrub layer consists of *Ostrya virginiana, Carpinus caroliniana, Kalmia latifolia, Hamamelis virginiana, Vaccinium pallidum, Amelanchier laevis, Lindera benzoin, Viburnum acerifolium*, and *Viburnum recognitum*. The herbaceous layer is characterized by *Maianthemum racemosum (= Smilacina racemosa), Gaultheria procumbens, Mitchella repens, Chimaphila maculata, Thelypteris noveboracensis, Dennstaedtia punctilobula, Maianthemum canadense*, and *Podophyllum peltatum*.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This mixed hemlock - hardwood forest occurs on northern and eastern midslopes and in coves. Sampled sites range from 384-797 m (1,261-2,614 feet) elevation. Sampled sites are a somewhat xeric ravine with clay loam soil and a gently sloping, north-facing flat with well-drained sandy loam soil. The unvegetated surface is a variable mix of leaf litter, exposed bedrock, large rocks, and downed wood. Evidence of disturbance include erosion, grazing/browsing, wind/ice damage, chestnut blight, woolly hemlock adelgid, and the presence of exotic plant species.
Global Environment: This vegetation occurs on deep, moist to well-drained loams and silt loams on northern and eastern midslopes and coves. Soils may be rocky, and slopes may be steep.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Liriodendron tulipifera* forms the canopy along with *Quercus rubra, Tsuga canadensis, Betula lenta, Betula alleghaniensis, Fagus grandifolia*, and/or *Pinus strobus*. *Hamamelis virginiana* is the dominant shrub. *Thelypteris noveboracensis* is the dominant herb in the sparse ground layer.
Global Vegetation: The canopy has a notable presence of *Tsuga canadensis* and/or *Pinus strobus*. Sharing dominance with these conifers is a variety of oaks and hickories including *Quercus rubra, Acer saccharum, Fagus grandifolia, Quercus alba, Quercus velutina, Betula lenta, Carya alba (= Carya tomentosa), Fraxinus americana, Liriodendron tulipifera*. The subcanopy and shrub layer consists of *Ostrya virginiana, Carpinus caroliniana, Kalmia latifolia, Hamamelis virginiana, Amelanchier laevis, Lindera benzoin, Viburnum acerifolium*, and *Viburnum recognitum*. The herbaceous layer is characterized by *Maianthemum racemosum (= Smilacina racemosa), Gaultheria procumbens, Maianthemum canadense*, and *Podophyllum peltatum*.

Most Abundant Species

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula alleghaniensis*, *Fagus grandifolia*
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera*, *Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris noveboracensis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera*, *Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Short shrub/sapling	Dwarf-shrub	*Gaultheria procumbens*
Herb (field)	Flowering forb	*Maianthemum racemosum*, *Podophyllum peltatum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Betula alleghaniensis*, *Fagus grandifolia*, *Hamamelis virginiana*, *Liriodendron tulipifera*, *Quercus rubra*, *Tsuga canadensis*
Global: *Hamamelis virginiana*, *Liriodendron tulipifera*, *Pinus strobus*, *Quercus rubra*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Epipactis helleborine* (Medium/Low), *Microstegium vimineum* (High/Medium)
Global: Other Plants: *Maianthemum canadense* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (29-Sep-2004). Within its range, this community type occurs extensively in suitable habitats. Occurrences are subject to compositional modification by outbreaks of hemlock woolly adelgid (*Adelges tsugae*), an exotic insect pest that causes decline and eventual mortality of *Tsuga canadensis*.

RELATED CONCEPTS

Global Similar Types:
- *Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest (CEGL006125)
- *Tsuga canadensis - Fagus grandifolia - Quercus (prinus, alba)* Forest (CEGL006474)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at High Point Hemlock Ravine in New Jersey and at Canada Hill/Curry Pond in New York.
Global Range: This vegetation occurs in New York, New Jersey and Pennsylvania and may occur in adjacent states.
Nations: US
States/Provinces: NJ, NY, PA
TNC Ecoregions: 49:C, 59:C, 61:C
USFS Ecoregions (1994/95): 221Ae:CCC, 221Ea:CCC, 221Fa:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Morristown)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FHHO
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 1 observation point; 10 accuracy assessment points): APPA.0911, APPA.1399, APPA_AA_1641, APPA_AA_1829, APPA_AA_2087, APPA_AA_2222, APPA_AA_2505, APPA_AA_2904, APPA_AA_2921, APPA_AA_2980, APPA_AA_3089, APPA_AA_3262.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo
Global Description Author(s): L.A. Sneddon
References: Anderson et al. 1998, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Ehrenfeld 1977, Fike 1999, Sneddon et al. 2008

A3302 *Tsuga canadensis - Betula lenta - Betula alleghaniensis* Forest Alliance

Alliance Summary Description: This mixed conifer-hardwood forested alliance is dominated by *Tsuga canadensis*, alone or in combination with *Pinus strobus*, and a variety of mesic hardwoods such as *Acer rubrum, Acer saccharum*, and *Fagus grandifolia*. Other common and sometimes dominant trees include *Betula alleghaniensis, Betula lenta, Liriodendron tulipifera, Prunus serotina*, and *Quercus* spp. (most commonly *Quercus rubra*). It occurs in the northeastern U.S., ranging from central New England west to the Lake Erie-Lake Ontario ecoregion in Ontario and south to the higher elevations of Virginia and West Virginia. Stands are often found in ravines or low cool sites, on a variety of primarily mesic soils.

[CEGL006019] *Pinus strobus - Tsuga canadensis / Acer pensylvanicum / Polystichum acrostichoides* Forest

Translated Name: **Eastern White Pine - Eastern Hemlock / Striped Maple / Christmas Fern Forest**
Common Name: **Central Appalachian White Pine - Eastern Hemlock Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Tsuga canadensis - Betula lenta - Betula alleghaniensis* Forest Alliance (A3302)

Element Concept

Global Summary: This dry-mesic white pine - hemlock forest of the northern central Appalachian Mountains and High Allegheny Plateau occurs on well-drained, nutrient-poor acidic soils. The vegetation is a closed-canopy conifer forest dominated by *Pinus strobus* and/or *Tsuga canadensis*. Canopy associates include *Fagus grandifolia, Acer rubrum, Betula lenta, Betula alleghaniensis, Quercus rubra*, and *Liriodendron tulipifera*. The sparse shrub layer contains *Acer spicatum, Hamamelis virginiana, Acer pensylvanicum*, and *Viburnum acerifolium*. *Rhododendron maximum* also occurs in this association in northern Pennsylvania. The sparse herb layer includes *Cypripedium acaule, Gaultheria procumbens, Lycopodium* spp., *Maianthemum canadense, Trientalis borealis, Mitchella repens, Medeola virginiana*, and *Polystichum acrostichoides*.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This matrix white pine - hemlock forest of the northern part of the Central Appalachians occurs on mid to upper slopes with infertile, sandy soils. It was sampled once in the park in Cumberland County, Pennsylvania, on a somewhat steep, northwest-facing midslope. Soil is well-drained silt loam. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. Evidence of disturbance includes past logging.
Global Environment: This vegetation type is reported to occur on dry-mesic sites (e.g., middle slopes) with infertile, sandy soils.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is codominated by *Pinus strobus* and *Tsuga canadensis* with scattered *Liriodendron tulipifera*. Canopy associates include *Prunus serotina, Nyssa sylvatica*, and *Quercus prinus*. *Pinus strobus* and *Tsuga canadensis* are common in the subcanopy and shrub layers. *Mitchella repens* and *Dryopteris intermedia* are typical herbs.
Global Vegetation: This is a closed-canopy, largely coniferous forest dominated by *Pinus strobus* and *Tsuga canadensis* in variable proportions. Canopy associates include *Fagus grandifolia, Acer rubrum, Betula lenta, Betula alleghaniensis, Quercus rubra*, and *Liriodendron tulipifera*. The often sparse shrub layer contains *Acer pensylvanicum, Acer spicatum, Hamamelis virginiana*, and *Viburnum acerifolium*. Herb cover is usually limited by deep shade but includes *Cypripedium acaule, Gaultheria procumbens, Lycopodium* spp., *Maianthemum canadense, Mitchella repens, Polystichum acrostichoides*, and *Trientalis borealis*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Dryopteris intermedia*, *Mitchella repens*, *Pinus strobus*, *Tsuga canadensis*
Global: *Carex amphibola*, *Fagus grandifolia*, *Lycopodium digitatum*, *Mitchella repens*, *Oxydendrum arboreum*, *Pinus strobus*, *Polystichum acrostichoides*, *Pyrola americana*, *Triphora trianthophora*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Triphora trianthophora* (G3G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (1-Feb-2008). This is a somewhat geographically restricted type that is apparently uncommon but not rare.

RELATED CONCEPTS

Global Similar Types:

- *Liriodendron tulipifera - Pinus strobus - Tsuga canadensis - Quercus rubra / Polystichum acrostichoides* Forest (CEGL006304)
- *Pinus strobus - Tsuga canadensis / Rhododendron maximum - (Leucothoe fontanesiana)* Forest (CEGL007102)
- *Pinus strobus - Tsuga canadensis* Lower New England-Northern Piedmont Forest (CEGL006328)
- *Tsuga canadensis - Liriodendron tulipifera - Platanus occidentalis / Rhododendron maximum - Xanthorhiza simplicissima* Wet Forest (CEGL007143)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Classification confidence is high given the amount of *Pinus strobus* and *Tsuga canadensis* in the canopy and subcanopy. Hemlock woolly adelgid-induced hemlock mortality is a primary disturbance within this community.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: The compositional and environmental factors that differentiate these community types need further scrutiny. Additional inventory and data collection is needed for further evaluation of this vegetation type's distribution and characterization.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is restricted to the northern part of the Central Appalachians in Pennsylvania where it was sampled in Cumberland County.
Global Range: The range of this community is restricted to the northern part of the Central Appalachians in Pennsylvania, and possibly the High Allegheny Plateau in Pennsylvania and New York. It is also reported as possibly occurring in ravines along the Susquehanna River in the Pennsylvania Piedmont (Lancaster County) (G. Podniesinski pers. comm.).
Nations: US
States/Provinces: OH, PA
TNC Ecoregions: 49:C, 59:C, 61:P
USFS Ecoregions (1994/95): 212F:CC, 212G:CC, 221F:CC, 231Ak:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCP, M221Bf:CCP, M221C:CC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians]); USFS (Monongahela, Wayne)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCWH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 9 accuracy assessment points): APPA.1192, APPA_AA_0040, APPA_AA_0075, APPA_AA_0331, APPA_AA_0538, APPA_AA_0648, APPA_AA_1268, APPA_AA_1299, APPA_AA_1405, APPA_AA_1498.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and P.P. Coulling
References: Eastern Ecology Working Group n.d.*, Eyre 1980, Fike 1999, Lutz 1930, Smith 1983

[CEGL006328] *Pinus strobus - Tsuga canadensis* Lower New England-Northern Piedmont Forest

Translated Name: **Eastern White Pine - Eastern Hemlock Lower New England-Northern Piedmont Forest**
Common Name: **Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Tsuga canadensis - Betula lenta - Betula alleghaniensis* Forest Alliance (A3302)

ELEMENT CONCEPT

Global Summary: This dry-mesic coniferous forest of usually sloping (moderately to steeply) sites is dominated by *Pinus strobus* and/or *Tsuga canadensis*. It can occur in somewhat sheltered ravines where *Tsuga canadensis* is nearly monotypic in all layers. Other frequent tree species depend on geography and can include *Betula papyrifera, Quercus rubra*, and *Acer rubrum*, with *Pinus rigida, Prunus serotina, Quercus velutina, Carya alba, Betula lenta, Acer saccharum, Fraxinus americana, Betula alleghaniensis*, and *Betula populifolia* occurring less frequently. Although frequent, deciduous tree species generally occur with low abundance. Canopy cover is typically 80-90%. The subcanopy is often sparse but may extend up to 40% cover. *Acer pensylvanicum* is a common, though rarely abundant, small tree. Shrubs are absent or sparse but when present may include *Hamamelis virginiana, Kalmia latifolia, Rhododendron maximum, Vaccinium angustifolium*, and *Viburnum acerifolium*. The herbaceous layer is generally not well-developed nor diverse and is generally characterized by *Gaultheria procumbens, Medeola virginiana, Polystichum acrostichoides*, and *Thelypteris noveboracensis*. Other herbaceous associates often include *Aralia nudicaulis, Uvularia sessilifolia, Mitchella repens, Trientalis borealis, Monotropa uniflora, Dryopteris intermedia, Dryopteris marginalis, Dryopteris carthusiana, Polypodium virginianum*, and *Maianthemum canadense*. *Deschampsia flexuosa* and other grasses may be present in small openings and gaps. Nonvascular plants tend to be sparse but can include *Leucobryum albidum* and *Polytrichum* and *Dicranum* species. Soils are moderately to extremely well-drained (dry-mesic to mesic) loamy sands and sandy loams, often sandy, stony or bouldery. The major natural disturbance in this forest type is generally single-tree blowdowns.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This hemlock - pine forest occurs on sloping sites and in sheltered ravines from Pennsylvania and New Jersey north to Maine. Sites range from gentle to steep mid and upper slopes. Soils are well-drained sandy loam. The unvegetated surface consists of leaf litter, with lesser amounts of exposed bedrock, large/small rocks, and/or downed wood. No evidence of disturbance was reported.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This uncommon association is only known from one location in New Hampshire at 350 m (1,150 feet) in elevation on a moderate high slope on a west aspect. The soil is sandy loam.
Global Environment: This dry-mesic coniferous forest is usually found on sloping (moderately to steeply) sites or in sheltered ravines. Soils are moderately to extremely well-drained (dry-mesic to mesic), loamy sands and sandy loams, often sandy, stony, or bouldery.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Tsuga canadensis* is dominant in the canopy with abundant or codominant *Pinus strobus* (often emergent); *Acer rubrum* and *Quercus rubra* are common associates. *Acer pensylvanicum* is a common, though rarely abundant small tree. *Picea rubens* is

absent to minor. *Kalmia latifolia* is a common shrub. Herbs are very sparse but include *Arisaema triphyllum, Eurybia divaricata*, and *Polygonatum pubescens*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only occurrence of this association is a closed-canopy evergreen forest dominated by *Pinus strobus* with *Tsuga canadensis* having about half the cover of the former. The understory is sparse with only trace amounts of *Polypodium virginianum, Pteridium aquilinum*, and *Vaccinium angustifolium*.

Global Vegetation: This coniferous forest type is dominated by *Pinus strobus* and/or *Tsuga canadensis*. Other frequent tree species depend on geography and can include *Betula papyrifera, Quercus rubra*, and *Acer rubrum*, with *Pinus rigida, Prunus serotina, Quercus velutina, Carya alba, Betula lenta, Acer saccharum, Fraxinus americana, Betula alleghaniensis*, and *Betula populifolia* occurring less frequently. Although frequent, deciduous tree species generally occur with low abundance. Canopy cover is typically 80-90%. The subcanopy is often sparse but may extend up to 40% cover. *Acer pensylvanicum* is a common, though rarely abundant, small tree. Shrubs are absent or sparse but when present may include *Hamamelis virginiana, Kalmia latifolia, Rhododendron maximum, Vaccinium angustifolium*, and *Viburnum acerifolium*. The herbaceous layer is generally not well-developed nor diverse and is generally characterized by *Gaultheria procumbens, Medeola virginiana, Polystichum acrostichoides*, and *Thelypteris noveboracensis*. Other herbaceous associates often include *Aralia nudicaulis, Uvularia sessilifolia, Mitchella repens, Trientalis borealis, Monotropa uniflora, Dryopteris intermedia, Dryopteris marginalis, Dryopteris carthusiana, Polypodium virginianum*, and *Maianthemum canadense*. *Deschampsia flexuosa* and other grasses may be present in small openings and gaps. Nonvascular plants tend to be sparse but can include *Leucobryum albidum* and *Polytrichum* and *Dicranum* species.

Global Dynamics: The major natural disturbance in this forest type is generally single-tree blowdowns. Fire is not a particularly important feature of this forest type.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Herb (field)	Fern (Spore-bearing forb)	*Polystichum acrostichoides*, *Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Arisaema triphyllum*, *Eurybia divaricata*, *Kalmia latifolia*, *Pinus strobus*, *Tsuga canadensis*

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Pinus strobus*, *Tsuga canadensis*

Global: *Acer pensylvanicum*, *Gaultheria procumbens*, *Medeola virginiana*, *Pinus strobus*, *Polystichum acrostichoides*, *Thelypteris noveboracensis*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (22-Mar-1999).

RELATED CONCEPTS

Global Similar Types:

- *Pinus strobus - Tsuga canadensis - Picea rubens* Forest (CEGL006324)
- *Pinus strobus - Tsuga canadensis / Acer pensylvanicum / Polystichum acrostichoides* Forest (CEGL006019)
- *Pinus strobus - Tsuga canadensis* Great Lakes Forest (CEGL002590)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This association is differentiated from *Pinus strobus - Tsuga canadensis - Picea rubens* Forest (CEGL006324) by its lack of *Picea rubens*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut and on Elbow Trail in Massachusetts.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from one location southeast of Balch Hill in New Hampshire.
Global Range: This association occurs in the northeastern United States and possibly adjacent Canada.
Nations: CA?, US
States/Provinces: CT, MA, ME, NH:S4, NJ, NY, PA, QC?, RI, VT:S4
TNC Ecoregions: 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Da:CCC, 212E:C?, 212Fa:CCP, 212Fb:CCP, 212Fc:CCC, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Af:CCC, 221Ah:CCP, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 222I:??, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CCP, M212Eb:CCP
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Delaware Water Gap, Saint-Gaudens, Saratoga); USFWS (Assabet River, Great Meadows, Oxbow, Rachel Carson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FPHD
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 7 accuracy assessment points): APPA.0169, APPA_AA_1880, APPA_AA_2194, APPA_AA_2237, APPA_AA_2900, APPA_AA_3095, APPA_AA_3160, APPA_AA_3236.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 observation point; 15 accuracy assessment points): APPA.1526, APPA_AA_1897, APPA_AA_2195, APPA_AA_2521, APPA_AA_2529, APPA_AA_2553, APPA_AA_2613, APPA_AA_2651, APPA_AA_2671, APPA_AA_2714, APPA_AA_2735, APPA_AA_2811, APPA_AA_2867, APPA_AA_3077, APPA_AA_3115, APPA_AA_3269.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.L. Neid and S.C. Gawler
References: Brown et al. 1982a, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Enser 1999, Enser and Lundgren 2006, Eyre 1980, Fike 1999, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Gordon 1937a, Hough 1943, Hough and Forbes 1943, MNAP 1991, Metzler and Barrett 2001, Metzler and Barrett 2006, NAP pers. comm. 1998, NRCS 2004a, Perles et al. 2007, Rawinski 1984a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006639] *Tsuga canadensis - Acer saccharum - Fagus grandifolia / Dryopteris intermedia* Forest

Translated Name: **Eastern Hemlock - Sugar Maple - American Beech / Intermediate Woodfern Forest**
Common Name: **Hemlock - Transitional Northern Hardwood Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Tsuga canadensis - Betula lenta - Betula alleghaniensis* Forest Alliance (A3302)

ELEMENT CONCEPT

Global Summary: This association comprises hemlock - northern hardwood forests of the Allegheny Plateau, Lake Ontario and Lake Erie plains, Lower New England, and south to higher elevations of the Central Appalachian region. This forest is associated with cool, dry-mesic to mesic sites and acidic soils, often on rocky, north-facing

slopes. Soils can have a thick, poorly decomposed duff layer over sandy loams. *Tsuga canadensis* is characteristic and usually dominant in the coniferous to mixed canopy. While hemlock generally forms at least 50% of the canopy, in some cases it may be as low as 25% relative dominance. Hardwood codominants include *Acer saccharum* and *Fagus grandifolia* (common), *Betula alleghaniensis* (uncommon), and *Betula lenta*, which may replace *Betula alleghaniensis* in some areas. *Ostrya virginiana* may be present as a small tree. *Quercus* spp. and *Pinus strobus* tend to be absent or, if present, only occur with low abundance. The shrub layer may be dense to fairly open and often includes *Viburnum acerifolium* and *Acer pensylvanicum* in addition to *Tsuga canadensis* regeneration. Herbs may be sparse, particularly in dense shade, but include *Dryopteris intermedia, Medeola virginiana, Oxalis montana, Mitchella repens, Maianthemum canadense, Uvularia sessilifolia, Polystichum acrostichoides, Trientalis borealis, Huperzia lucidula (= Lycopodium lucidulum), Eurybia divaricata (= Aster divaricatus), Oclemena acuminata (= Aster acuminatus), Dennstaedtia punctilobula*, and *Thelypteris noveboracensis*. Nonvascular plants may be well-developed, often characterized by the liverwort *Bazzania trilobata*. Diagnostic characteristics of this forest are the dominance of *Tsuga canadensis*, presence of *Acer saccharum* and *Fagus grandifolia*, low abundance of either *Betula alleghaniensis* or *Betula lenta*, and a lack of abundant *Quercus* spp. or *Pinus strobus*. In Virginia stands, the most abundant trees are *Tsuga canadensis, Betula alleghaniensis, Acer rubrum*, and *Quercus rubra*; *Fagus grandifolia* and *Acer saccharum* are both inconstant and only occasionally important.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This hemlock - northern hardwood forest typically occurs on rocky acidic soils on north-facing slopes. It was sampled at four locations in the Central Appalachian project area. The sites are gentle to moderate lower to upper slopes. Soils are moderately well- to poorly drained clay loam, sandy loam, loam, and silt loam. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. Evidence of disturbance includes past logging, trails, grazing/browsing, hemlock woolly adelgid damage, and the presence of exotic plant species.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This hemlock - northern hardwood forest occurs on acidic soils, often on rocky, north-facing slopes. It is distributed in large patches from Vermont south through Pennsylvania (Delaware Water Gap). The elevation of sampled plots ranges from 350-543 m (1,148-1,782 feet). Sites are moderate to steep midslopes and ridges with mostly northern aspects. Soils are well-drained sandy loam and loam. The unvegetated surface consists of leaf litter, with lesser amounts of large/small rocks, bare soil and/or downed wood. Evidence of disturbance includes old roads, past logging, windthrow, and the presence of exotic plants.

Global Environment: This forest is associated with cool, dry-mesic to mesic sites and acidic soils, often on rocky, north-facing slopes. Soils can have a thick, poorly decomposed duff layer over sandy loams. In the southern part of the range, stands often occur in deep, sheltered ravines and along high-gradient mountain streams.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Tsuga canadensis* is dominant or codominant with *Betula alleghaniensis* in the canopy. *Liriodendron tulipifera* may be an important overstory associate at the southern end of the range, while to the north, *Fagus grandifolia* and *Acer saccharum* are more common. *Quercus* spp. (*Quercus prinus, Quercus alba, Quercus rubra*) and *Pinus strobus* tend to be absent or, if present, only occur with low abundance. The subcanopy includes *Tsuga canadensis, Acer rubrum*, and *Betula lenta*. *Hamamelis virginiana* is a characteristic shrub. *Rhododendron maximum* is absent in the shrub layer which is typically dominated by sapling *Tsuga canadensis*. *Dryopteris intermedia* is characteristic in the sparse herb layer. Other common herbs include *Thelypteris noveboracensis, Eurybia divaricata, Medeola virginiana*, and *Mitchella repens*.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This hemlock - northern hardwood forest lacks a significant presence of *Quercus* spp. and *Pinus strobus*. It is dominated by *Tsuga canadensis* with *Acer rubrum, Betula papyrifera, Betula lenta, Fagus grandifolia*, and *Fraxinus americana* common. *Acer pensylvanicum* is a characteristic tall shrub. The herb layer is sparse but *Dryopteris intermedia, Mitchella repens, Clintonia borealis, Trientalis borealis*, and *Lycopodium obscurum* are common.

Global Vegetation: *Tsuga canadensis* is dominant and forms at least 50% of the canopy, at least prior to impacts from the exotic insect pest hemlock woolly adelgid (*Adelges tsugae*). *Fagus grandifolia* and *Acer saccharum* are common and sometimes *Betula alleghaniensis* is uncommon or replaced by *Betula lenta*, and at the southern end of the range (in Virginia and Maryland), *Liriodendron tulipifera* may be an important overstory associate. The shrub layer may be dense to fairly open and often includes *Viburnum acerifolium* and *Acer pensylvanicum* in addition to *Tsuga canadensis* regeneration. Herbs may be sparse, particularly in dense shade, but often include *Dryopteris intermedia, Medeola virginiana, Oxalis montana, Mitchella repens, Maianthemum canadense, Trientalis borealis,*

Huperzia lucidula (= Lycopodium lucidulum), Eurybia divaricata (= Aster divaricatus), and *Thelypteris noveboracensis*. Nonvascular plants may be well-developed, often characterized by the liverwort *Bazzania trilobata*. Diagnostic characteristics of this forest are the dominance of *Tsuga canadensis*, presence of *Acer saccharum* and *Fagus grandifolia*, low abundance of either *Betula alleghaniensis* or *Betula lenta* and a lack of abundant *Quercus* spp. or *Pinus strobus*. In Virginia stands, the most abundant trees are *Tsuga canadensis, Betula alleghaniensis, Acer rubrum*, and *Quercus rubra*; *Fagus grandifolia* and *Acer saccharum* are both inconstant and only occasionally important (G. P. Fleming, pers. comm.).
Global Dynamics: Hemlock woolly adelgid (*Adelges tsugae*) is decimating hemlock stands in the eastern United States. *Betula lenta* is a common colonizer following the death of hemlocks.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Shrub/sapling (tall & short)	Needle-leaved tree	*Tsuga canadensis*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum acerifolium*
Herb (field)	Flowering forb	*Maianthemum canadense*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Betula alleghaniensis*, *Dryopteris intermedia*, *Mitchella repens*, *Thelypteris noveboracensis*, *Tsuga canadensis*
Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Betula papyrifera*, *Dryopteris intermedia*, *Fraxinus americana*, *Tsuga canadensis*
Global: *Betula alleghaniensis*, *Carex albicans*, *Dryopteris intermedia*, *Huperzia lucidula*, *Maianthemum canadense*, *Medeola virginiana*, *Mitchella repens*, *Oclemena acuminata*, *Thelypteris noveboracensis*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum caespitosum*
Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (3-Dec-2014). This association has a fairly extensive geographic distribution and occurs in large patches in the Allegheny Plateau part of its range. All stands of this community are now highly threatened by the exotic insect pest hemlock woolly adelgid (*Adelges tsugae*), which causes decline and eventual mortality in *Tsuga canadensis*.

RELATED CONCEPTS

Global Similar Types:
- *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861)
- *Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest (CEGL006129)
- *Tsuga canadensis - (Betula alleghaniensis, Quercus rubra) / Ilex montana / Rhododendron catawbiense* Forest (CEGL008513)
- *Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest (CEGL006638) is an equivalent from further north.

- *Tsuga canadensis - Fagus grandifolia - Acer saccharum / (Hamamelis virginiana, Kalmia latifolia)* Forest (CEGL005043)
- *Tsuga canadensis - Fagus grandifolia - Quercus (prinus, alba)* Forest (CEGL006474)
- *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: *Quercus* spp. and *Pinus strobus* tend to be absent or, if present, only occur with low abundance. This type is nearly extinct in Virginia due to the almost complete loss of hemlock from adelgid outbreaks.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: Sites in Pennsylvania have seasonal seeps occurring beneath the hemlock canopy. They also have *Nyssa sylvatica* and *Kalmia latifolia*.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: In New Jersey stands, hemlock woolly adelgid is killing *Tsuga canadensis* and several snags and downed trees are present. Canopy gaps stimulating *Betula lenta* growth is common in the shrub layer.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type was formerly included in CEGL006109, which was split into CEGL006638 and CEGL006639. It was separated from *Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest (CEGL006638) to better characterize the Allegheny Plateau - Lower New England and Central Appalachian characteristics. Many stands of this vegetation type in the national forests and Shenandoah National Park have been devastated during the past decade by adelgid-caused tree mortality. In some cases, 100% of the canopy hemlocks have been killed, littering the forest floor with downed wood and stimulating massive increases in understory growth, particularly of *Betula* spp. and *Acer pensylvanicum*. Since there is no practical treatment for the adelgid on a landscape level, one can only hope that natural pathogens will emerge to keep the adelgid in check before all of our examples of this community are severely degraded or lost. This type is nearly extinct in Virginia due to the almost complete loss of hemlock from adelgid outbreaks. Most of Virginia stands are now better classified as northern hardwoods of one type or another.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is distributed in large patches from New Hampshire south through Pennsylvania and restricted to local patches at higher elevations of the Central Appalachians in Maryland, West Virginia, and Virginia. In the Central Appalachian project area, it was sampled in Maryland, Pennsylvania and Virginia (Limberlost).
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut (Mt. Prospect), Massachusetts (North Mountain in Cheshire, Sage's Ravine Natural Heritage Site), New Jersey (Wawayanda State Park), and Vermont (Middle Pinnacle).
Global Range: This community is generally distributed in large patches from the Allegheny Plateau, Lake Ontario and Lake Erie plains, Lower New England and south to higher elevations of the Central Appalachian region in Maryland, West Virginia, and Virginia. In Virginia, it is restricted to the northwestern part of the state, where occurrences are rather local but sometimes extensive.
Nations: CA, US
States/Provinces: CT, MA, MD, NJ:S3, NY, ON, PA, RI, VA:S2, WV?
TNC Ecoregions: 48:C, 49:C, 59:C, 60:C, 61:C, 62:?
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ak:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Dc:CCP, 232Ad:???, M221Aa:CCC, M221Ab:CC?, M221Ba:CCP, M221Bd:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Catoctin Mountain, Delaware Water Gap, Johnstown Flood, Saratoga, Shenandoah, Upper Delaware); USFS (Finger Lakes, George Washington); USFWS (Erie, Iroquois)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 plots; 1 observation point; 1 accuracy assessment point): APPA.0220, APPA.0522, APPA.0658, APPA.1218, APPA_AA_0152.

Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 plots; 5 observation points; 21 accuracy assessment points): APPA.0019, APPA.0033, APPA.0168, APPA.1370, APPA.1412, APPA.1451, APPA.1512, APPA.1733, APPA_AA_1718, APPA_AA_1724, APPA_AA_1755, APPA_AA_2020, APPA_AA_2111, APPA_AA_2114, APPA_AA_2200, APPA_AA_2233, APPA_AA_2408, APPA_AA_2460, APPA_AA_2554_B, APPA_AA_2625, APPA_AA_2711, APPA_AA_3013, APPA_AA_3078, APPA_AA_3196, APPA_AA_3298, APPA_AA_3315, APPA_AA_3324, APPA_AA_3324_B, APPA_AA_3346.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid, S.C. Gawler, G.P. Fleming and D. Faber-Langendoen
References: Breden 1989, Breden et al. 2001, Coulling and Rawinski 1999, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Enser 1993, Enser and Lundgren 2006, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2006, Harrison 2004, Harrison 2011, Metzler and Barrett 2001, Metzler and Barrett 2006, NRCS 2004a, Perles et al. 2006e, Perles et al. 2007, Perles et al. 2008, Rawinski 1984a, Rawinski et al. 1994, Smith 1983, Swain and Kearsley 2001, VDNH 2003, Young et al. 2006, Young et al. 2009

[CEGL006206] *Tsuga canadensis - Betula alleghaniensis - Prunus serotina / Rhododendron maximum* Forest

Translated Name: **Eastern Hemlock - Yellow Birch - Black Cherry / Great Laurel Forest**
Common Name: **Central Appalachian Hemlock - Northern Hardwood Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Tsuga canadensis - Betula lenta - Betula alleghaniensis* Forest Alliance (A3302)

Element Concept

Global Summary: This hemlock forest of the central Appalachian Mountains and High Allegheny Plateau occurs on acidic, mesic sandy loams and sands of glacial till or sandstone, in rocky ravines, or moderately steep slopes of any aspect, on stream terraces, or occasionally on flats. This is a closed-canopy, late-successional, mixed forest dominated by *Tsuga canadensis* with associated deciduous canopy species, including *Acer saccharum, Prunus serotina, Betula alleghaniensis, Fagus grandifolia*, and (in the southern portion of the type's range) *Liriodendron tulipifera* and/or *Magnolia acuminata*. Other associates include *Acer rubrum, Betula lenta, Carya* spp., *Pinus strobus, Quercus alba, Quercus rubra, Ulmus americana*, and *Ostrya virginiana*. The shrub layer varies in cover and composition. It is often a patchy but may have locally dense cover of *Rhododendron maximum*, or it may consist of some mixture of *Corylus cornuta, Diervilla lonicera, Hamamelis virginiana, Lindera benzoin, Viburnum lantanoides*, and ericaceous species *Kalmia latifolia, Rhododendron maximum*, and *Vaccinium pallidum*. The herbaceous layer typically includes ferns such as *Dryopteris intermedia, Dryopteris carthusiana, Thelypteris noveboracensis*, and *Dennstaedtia punctilobula*. Forb composition is variable and may include *Anemone quinquefolia, Cornus canadensis, Cardamine diphylla, Eurybia divaricata (= Aster divaricatus), Maianthemum canadense, Medeola virginiana, Mitchella repens, Oxalis montana, Trientalis borealis, Trillium grandiflorum, Trillium erectum*, and *Viola* spp. *Rhododendron maximum, Sambucus racemosa (= Sambucus pubens)*, and the abundance of *Prunus serotina* in the canopy differentiate this from other associations of this alliance.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This hemlock - northern hardwood forest occurs on sandy loams and sands of glacial till or sandstone, in rocky ravines, or moderately steep slopes of any aspect, on stream terraces, or occasionally on flats. It was sampled once in the Central Appalachian project area in Franklin County, Pennsylvania, on a low flat with moderately well-drained soil. The unvegetated surface is dominated by leaf litter with some downed wood and bare soil. Evidence of disturbance includes past logging/thinning and hemlock (*Adelges tsugae*) adelgid damage.
Global Environment: This forest occurs on acidic, mesic sandy loams and sands of glacial till or sandstone, in rocky ravines, or moderately steep slopes of any aspect, on stream terraces, or occasionally on flats.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Tsuga canadensis* is dominant or codominant with *Betula alleghaniensis* in the canopy. *Pinus strobus* is minor to absent. *Acer rubrum, Betula lenta, Prunus serotina, Acer saccharum, Fagus grandifolia, Quercus alba*, and/or *Liriodendron tulipifera* are also common in the canopy. *Rhododendron maximum* is characteristic in the shrub layer, and *Hamamelis virginiana* is another common shrub. Herbs are sparse.

Global Vegetation: This is a closed-canopy, late-successional, mixed forest dominated by *Tsuga canadensis* with associated deciduous canopy species including *Acer saccharum, Prunus serotina, Betula alleghaniensis, Fagus grandifolia*, and (in the southern portion of the type's range) *Liriodendron tulipifera* and/or *Magnolia acuminata*. Other associates include *Acer rubrum, Betula lenta, Carya* spp., *Pinus strobus, Quercus alba, Quercus rubra, Ulmus americana*, and *Ostrya virginiana*. The shrub layer varies in cover and composition. It is often a patchy but may have locally dense cover of *Rhododendron maximum*, or it may consist of some mixture of *Corylus cornuta, Diervilla lonicera, Hamamelis virginiana, Lindera benzoin, Viburnum lantanoides*, and ericaceous species *Kalmia latifolia, Rhododendron maximum*, and *Vaccinium pallidum*. The herbaceous layer typically includes ferns such as *Dryopteris intermedia, Dryopteris carthusiana, Thelypteris noveboracensis*, and *Dennstaedtia punctilobula*. Forb composition is variable and may include *Anemone quinquefolia, Cornus canadensis, Cardamine diphylla, Eurybia divaricata (= Aster divaricatus), Maianthemum canadense, Medeola virginiana, Mitchella repens, Oxalis montana, Trientalis borealis, Trillium grandiflorum, Trillium erectum*, and *Viola* spp.

Global Dynamics: Hemlock woolly adelgid is killing hemlocks throughout the range of this association.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Betula alleghaniensis*, *Fagus grandifolia*, *Prunus serotina*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*, *Sambucus racemosa*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Corylus cornuta*, *Rhododendron maximum*
Herb (field)	Flowering forb	*Maianthemum canadense*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris carthusiana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Rhododendron maximum*, *Tsuga canadensis*

Global: *Prunus serotina*, *Rhododendron maximum*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (3-Oct-2006). This association is a widespread and common type over much of its range, but it is potentially threatened by the hemlock woolly adelgid.

RELATED CONCEPTS

Global Similar Types:

- *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861)
- *Picea rubens - Tsuga canadensis - Fagus grandifolia / Dryopteris intermedia* Forest (CEGL006029)
- *Thuja occidentalis / Carex eburnea - Pellaea atropurpurea* Cliff Woodland (CEGL002596)
- *Tsuga canadensis - Fagus grandifolia - Acer saccharum / (Hamamelis virginiana, Kalmia latifolia)* Forest (CEGL005043)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from Pennsylvania and southern New York south to West Virginia. In the Central Appalachian project area, it was sampled in Franklin County, Pennsylvania.
Global Range: Centered on the Central Appalachians and High Allegheny Plateau, this association ranges from Pennsylvania and southern New York south to West Virginia.
Nations: US
States/Provinces: MD?, NJ:S1S2, NY, PA, VA?, WV
TNC Ecoregions: 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCP, 221Am:CCP, 221Ba:CCP, 221Bd:CCC, 221Dc:CCP, 221E:C?, M212Eb:CCP, M221Ac:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221C:C?, M221Da:C??
Federal Lands: NPS (Allegheny Portage Railroad, Appalachian Trail [Central Appalachians]); USFS (Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 1 accuracy assessment point): APPA.0510, APPA_AA_0936.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: Breden et al. 2001, CAP pers. comm. 1998, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Harrison 2004, Harrison 2011, Perles et al. 2006d, Vanderhorst 2001a, Vanderhorst and Streets 2006

[CEGL006088] *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest

Translated Name: **Eastern Hemlock - American Beech - Northern Red Oak Forest**
Common Name: **Hemlock - Beech - Red Oak Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	*Tsuga canadensis - Betula lenta - Betula alleghaniensis* Forest Alliance (A3302)

ELEMENT CONCEPT

Global Summary: This association comprises dry-mesic hemlock-mixed hardwood forests of the northeastern United States. It occurs on dry to dry-mesic, nutrient-poor, well-drained, often stony sandy loams or loamy sands over acidic bedrock. The canopy is a mixture of *Tsuga canadensis*, with *Fagus grandifolia* and/or *Quercus rubra* in variable proportions depending on soil (site) and disturbance characteristics. The overstory can range from mostly coniferous to mostly deciduous; drier sites tend to have more abundant beech or oak, and cooler sites tend to have more abundant hemlock. Associated tree species include *Betula lenta* (sometimes replaced by *Betula papyrifera* at the northern end of this type's range), *Pinus strobus*, and *Acer rubrum*. Shrubs are often sparse but locally abundant and, in addition to saplings of canopy species, include *Hamamelis virginiana, Acer pensylvanicum, Viburnum acerifolium, Kalmia latifolia*, and in the south *Ilex montana*. Though heaths may be present, they are rarely prominent. The herb layer is generally sparse but usually includes several of the following: *Mitchella repens, Lycopodium digitatum (= Diphasiastrum digitatum), Lycopodium obscurum, Lycopodium annotinum, Epifagus virginiana, Gaultheria procumbens, Maianthemum canadense, Trientalis borealis, Medeola virginiana, Aralia nudicaulis, Uvularia sessilifolia, Pteridium aquilinum, Dryopteris intermedia, Monotropa uniflora*, and occasionally *Lycopodium dendroideum, Coptis trifolia*, and *Dennstaedtia punctilobula*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This hemlock - hardwood forest occurs on nutrient-poor, well-drained, often stony sandy loams or loamy sands. It is widespread in southern New England. The elevation of sampled plots ranges from 360-544 m (1,181-1,785 feet). Sites range from dry to mesic, gentle to steep lower to upper slopes. Soils are rapidly drained to well-drained loam and sandy loam. The unvegetated surface consists of leaf litter, with lesser amounts of exposed bedrock, large/small rocks, bare soil, and/or downed wood. Evidence of disturbance includes the minor presence of exotic plants.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This uncommon association is only known from one location in New Hampshire at 300 m (985 feet) in elevation on a moderately sloping summit with a southwest aspect. The soil is sandy loam with abundant litter and duff.
Global Environment: This forest occurs on dry to dry-mesic, nutrient-poor, well-drained, often stony sandy loams or loamy sands. Underlying bedrock is acidic. In Virginia, it occupies extremely acidic (mean pH = 3.8), infertile silt loams on mesic to submesic valley sideslopes and broad, convex ridges at elevations from 1000-1200 m. In New England, it is a common forest type found on dry-mesic acidic soils on various landscape settings.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This community contains a mixture of *Tsuga canadensis* with *Fagus grandifolia* and/or *Quercus rubra* in canopy; canopy and subcanopy associates include *Betula lenta, Pinus strobus, Prunus serotina*, and/or *Acer rubrum*. *Hamamelis virginiana, Acer pensylvanicum, Viburnum acerifolium*, and *Kalmia latifolia* are common shrubs. Herbs are sparse but include *Dryopteris intermedia*. In addition, this community supports VT state-imperiled *Lycopodium complanatum*.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only known occurrence of this association is a closed-canopy mixed evergreen-deciduous forest codominated by *Pinus strobus, Quercus rubra*, and *Tsuga canadensis* with a sparse subcanopy of *Acer rubrum*. The understory is sparse as well, with trace cover of *Carex lucorum, Maianthemum canadense*, and *Maianthemum racemosum*.
Global Vegetation: The canopy is a mixture of *Tsuga canadensis* with *Fagus grandifolia* and/or *Quercus rubra* in variable proportions depending on soil (site) and disturbance characteristics; drier sites tend to have more abundant beech or oak and cooler sites tend to have more abundant hemlock. Associated tree species include *Betula lenta* (sometimes replaced by *Betula papyrifera* at the northern end of this type's range), *Pinus strobus*, and *Acer rubrum*. Shrubs are often sparse but locally abundant and, in addition to saplings of canopy species, include *Hamamelis virginiana, Acer pensylvanicum, Viburnum acerifolium, Kalmia latifolia*, and in the south *Ilex montana*. Though heaths may be present, they are rarely prominent. The herb layer is generally sparse but usually includes several of the following: *Mitchella repens, Lycopodium digitatum (= Diphasiastrum digitatum), Lycopodium obscurum, Lycopodium annotinum, Epifagus virginiana, Gaultheria procumbens, Maianthemum canadense, Trientalis borealis, Medeola virginiana, Aralia nudicaulis, Uvularia sessilifolia, Dryopteris intermedia, Monotropa uniflora*, and occasionally *Lycopodium dendroideum, Coptis trifolia*, and *Dennstaedtia punctilobula*.
Global Dynamics: Composition of stands of this forest association vary with soil (site) and disturbance characteristics. At the drier end, *Fagus grandifolia* and/or *Quercus rubra* tend to be more prevalent. Cooler sites, where soils may freeze for longer durations, have especially abundant *Tsuga canadensis*. Disturbance affects composition as *Fagus grandifolia* can regenerate profusely through root-suckering. Stands of this vegetation on Allegheny Mountain in Virginia have low species richness (mean = 15 taxa per 400-square-meter plot samples) and were heavily impacted by logging and subsequent fires during the late 1920s and early 1930s. *Fagus grandifolia* is the most abundant tree in contemporary stands, sometimes forming nearly pure, even-aged forests that originated from root-suckers. *Tsuga canadensis* is present in the understories of most stands, and large *Tsuga* codominates the canopies of a few older stands that escaped fire damage. Small pieces of charred wood and thin charcoal horizons deposited in historical fires were present in the duff layers at most sites examined (Fleming and Moorhead 1996). Insect pests and pathogens, such as the hemlock woolly adelgid (*Adelges tsugae*) and beech bark disease (also called beech scale / *Nectria* complex) are serious threats to the dominant canopy trees in this association. *Betula lenta* is the most common successional invader of stands decimated by hemlock woolly adelgid.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula lenta*, *Fagus grandifolia*
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer pensylvanicum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Fagus grandifolia*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula lenta*
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer pensylvanicum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*, *Viburnum acerifolium*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Herb (field)	Flowering forb	*Aralia nudicaulis*, *Trientalis borealis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Betula lenta*, *Dryopteris intermedia*, *Fagus grandifolia*, *Quercus rubra*, *Tsuga canadensis*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Pinus strobus*, *Quercus rubra*, *Tsuga canadensis*
Global: *Betula lenta*, *Dryopteris intermedia*, *Fagus grandifolia*, *Quercus rubra*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Lycopodium complanatum* (G5, VT state-imperiled); **Invasive/Exotic Plants**: *Berberis thunbergii* (High/Medium)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (26-Jun-1998). This community type is widely distributed in the northern part of its range. Its long-term viability is threatened by pathogens associated with its two dominant canopy trees.

RELATED CONCEPTS

Global Similar Types:

- *Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest (CEGL006293)
- *Quercus rubra - Acer saccharum - Fagus grandifolia / Viburnum acerifolium* Forest (CEGL006633)
- *Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest (CEGL006635)
- *Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest (CEGL006129)
- *Tsuga canadensis - Acer saccharum - Fagus grandifolia / Dryopteris intermedia* Forest (CEGL006639)
- *Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest (CEGL006638)
- *Tsuga canadensis - Fagus grandifolia - (Acer saccharum)* Great Lakes Forest (CEGL005042)
- *Tsuga canadensis - Fagus grandifolia - Acer saccharum / (Hamamelis virginiana, Kalmia latifolia)* Forest (CEGL005043)
- *Tsuga canadensis - Fagus grandifolia - Quercus (prinus, alba)* Forest (CEGL006474)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: *Pinus strobus* is abundant in the canopy with *Tsuga canadensis* at the Beartown and Dalton Gulf observation point sites in Massachusetts. New York examples often have no herbs and several standing dead eastern hemlock snags from hemlock woolly adelgid damage.

Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: Successional monocultures of *Tsuga canadensis* altered by hemlock woolly adelgid are mapped as this association.
Global Classification Comments: At least in the southern portion of this type's range, the *Tsuga canadensis* component of this community type appears to have been heavily reduced by past disturbances because of this species' commercial timber value and its vulnerability to fire.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut (Mt. Prospect), Massachusetts (Beartown State Forest, Dalton Gulf), New York (Bellvale Mountain South), and Vermont (Clarendon Ridge and elsewhere).
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from southeast of Balch Hill in New Hampshire.
Global Range: This association is widespread in southern New England and ranges south locally in the northern Piedmont and High Allegheny Mountains to Pennsylvania.
Nations: US
States/Provinces: CT, MA, ME, NH:S5, NY, PA, VT
TNC Ecoregions: 52:C, 59:C, 60:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Aa:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221D:C?, M212Ba:CCC, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M221Ba:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Marsh-Billings-Rockefeller, Saint-Gaudens, Saratoga, Upper Delaware); USFS (George Washington)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FHHO
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 10 observation points; 33 accuracy assessment points): APPA.0961, APPA.0963, APPA.1379, APPA.1382, APPA.1448, APPA.1449, APPA.1465, APPA.1493, APPA.1563, APPA.1564, APPA.1565, APPA.1739, APPA_AA_1699, APPA_AA_1706, APPA_AA_1749, APPA_AA_1775, APPA_AA_1801, APPA_AA_1816, APPA_AA_1929, APPA_AA_1949, APPA_AA_1968, APPA_AA_2026, APPA_AA_2042, APPA_AA_2068, APPA_AA_2107, APPA_AA_2127, APPA_AA_2130, APPA_AA_2197, APPA_AA_2253, APPA_AA_2327, APPA_AA_2349, APPA_AA_2372, APPA_AA_2431, APPA_AA_2439, APPA_AA_2495, APPA_AA_2754, APPA_AA_2807, APPA_AA_2886, APPA_AA_3010, APPA_AA_3111, APPA_AA_3123, APPA_AA_3238, APPA_AA_3273, APPA_AA_3306, APPA_AA_3307.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 observation point; 1 accuracy assessment point): APPA.1525, APPA_AA_1632.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): G. Fleming, P. Coulling, S.L. Neid and S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Enser and Lundgren 2006, Eyre 1980, Fike 1999, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Metzler and Barrett 2001, Metzler and Barrett 2006, NRCS 2004a, Perles et al. 2008, Rawinski 1984a, Reschke 1990, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

G020. APPALACHIAN-CENTRAL INTERIOR MESIC FOREST

Group Summary Description: This group is composed of tall, productive and diverse forests primarily dominated by a diverse suite of deciduous broad-leaved trees of the unglaciated Appalachians, Piedmont, and Interior Low Plateau regions of the eastern United States. They range from about 125 m (400 feet) elevation to generally 1375 m (4500 feet), and occasionally to 1525 m (5000 feet) in the Southern Appalachians. They are best developed on lower slopes and in sheltered landforms, typically with northern to eastern exposures. Stands are most extensive, diverse and well-developed in the Central and Southern Appalachians, and in the Cumberland and Allegheny Plateaus. Examples in the Interior Low Plateau are somewhat less diverse in comparison, but are still the most diverse and productive forests in this particular region.

The most typical and usually dominant forest tree species include *Liriodendron tulipifera, Prunus serotina, Acer saccharum, Tilia americana* (both var. *americana* and var. *heterophylla*, the latter being especially characteristic), and *Fagus grandifolia*. Other associates can include *Fraxinus americana, Juglans nigra*, and

Magnolia spp. (e.g., *Magnolia acuminata, Magnolia tripetala, Magnolia macrophylla*). Stands are typically dominated by genera other than *Carya* and *Quercus*, although some species of these genera may be present, including *Carya cordiformis, Carya ovalis, Carya ovata, Quercus alba, Quercus muehlenbergii, Quercus pagoda, Quercus rubra*, and *Quercus shumardii*. A diverse herbaceous layer will contain species such as *Adiantum pedatum, Arisaema triphyllum, Galium* spp., *Osmorhiza claytonii, Podophyllum peltatum, Polygonatum biflorum, Trillium* spp., and *Viola* spp.

A2033 *Fagus grandifolia - Liriodendron tulipifera - Carya cordiformis* Forest Alliance

Alliance Summary Description: This basic mesic forest alliance occurs over a wide range, from southern Pennsylvania south along the Appalachians to Alabama and Georgia, as well as in the Cumberland Plateau of Kentucky and Tennessee, and west to the Interior Low Plateau from Illinois, Indiana, and Ohio, and including outliers in the Ozarks of Oklahoma, Missouri, and Arkansas, as well as the adjacent Upper East Gulf Coastal Plain. These are beech-oak, beech-tuliptree-maple, and tuliptree-oak forests, which are mesic but not as rich and diverse as true Appalachian cove forests. Its stands are characterized by a combination of *Acer saccharum, Carya cordiformis, Fagus grandifolia, Liriodendron tulipifera*, and a number of *Quercus* spp., as well as the presence of calciphilic species such as *Quercus muehlenbergii*. *Acer barbatum* or *Acer leucoderme* occur in portions of the range, as does *Magnolia tripetala*. Other canopy associates include *Fraxinus americana, Nyssa sylvatica, Quercus alba, Quercus rubra, Tilia americana*, and *Ulmus rubra*. The tree subcanopy is characterized by *Asimina triloba, Carpinus caroliniana, Cercis canadensis, Cornus florida*, and *Ostrya virginiana*. The herbaceous layer is characterized by calciphilic species, including *Actaea racemosa, Adiantum pedatum, Asarum canadense, Hepatica nobilis*, and *Sanguinaria canadensis*, as well as *Polystichum acrostichoides* and *Podophyllum peltatum*. These forests often occur on concave and sheltered landforms such as north- to east-facing slopes, low slopes, high terraces along streams, and possibly other situations, in generally dissected terrain south of the glacial boundary. The soils are fertile well-drained silt, silt loam, sandy loam, or loam.

[CEGL006296] *Fagus grandifolia - Betula lenta - Liriodendron tulipifera - Acer saccharum* Forest

Translated Name: **American Beech - Sweet Birch - Tuliptree - Sugar Maple Forest**
Common Name: **Beech - Tuliptree - Sugar Maple Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Fagus grandifolia - Liriodendron tulipifera - Carya cordiformis* Forest Alliance (A2033)

Element Concept

Global Summary: This mid- to lower slope deciduous forest of the mid-Atlantic region occurs on deep soils that are not strongly acidic. The tree canopy is characterized by a mixture of *Liriodendron tulipifera, Fagus grandifolia, Acer saccharum, Fraxinus americana, Betula lenta*, and other associated species, including *Acer rubrum, Betula alleghaniensis, Nyssa sylvatica*, and *Carya alba (= Carya tomentosa)*. The subcanopy, where present, is characterized by *Carpinus caroliniana, Cornus florida*, and *Ostrya virginiana*. Common species of the shrub layer include *Hamamelis virginiana* and *Lindera benzoin*. The herbaceous layer is characterized by *Podophyllum peltatum, Sanguinaria canadensis, Botrychium virginianum, Dicentra cucullaria, Dicentra canadensis, Allium tricoccum*, and *Claytonia virginica*. Associated herbs may include *Polystichum acrostichoides, Ageratina altissima var. altissima*, and *Arisaema triphyllum*. Invasive species such as *Berberis thunbergii, Elaeagnus umbellata, Rosa multiflora*, and *Alliaria petiolata* may be present and locally abundant in the shrub and herb layers. This vegetation type often occurs on land where evidence of past agriculture or silviculture is visible.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This tuliptree - beech - maple forest is a mid- to lower-slope forest of the mid-Atlantic region. It is documented in Pennsylvania and New Jersey, and plots have been sampled off the trail at Delaware Water Gap. It occurs on deep soils that are not strongly acidic.

Global Environment: This vegetation occurs on middle to lower slopes on moderately deep soils that are not extremely acidic.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The tree canopy is characterized by a mixture of *Liriodendron tulipifera, Fagus grandifolia, Acer saccharum, Fraxinus americana, Betula lenta*, and other associated species, including *Acer rubrum, Betula alleghaniensis, Nyssa sylvatica*, and *Carya alba (= Carya tomentosa)*. The subcanopy, where present, is characterized by *Carpinus caroliniana, Cornus florida*, and *Ostrya virginiana*. Common species of the shrub layer include *Hamamelis virginiana* and *Lindera benzoin*. The herbaceous layer is characterized by *Podophyllum peltatum, Sanguinaria canadensis, Botrychium virginianum, Dicentra cucullaria, Dicentra canadensis, Allium tricoccum*, and *Claytonia virginica*. Associated herbs may include *Polystichum acrostichoides, Ageratina altissima var. altissima*, and *Arisaema triphyllum*. Invasive species such as *Berberis thunbergii, Elaeagnus umbellata, Rosa multiflora*, and *Alliaria petiolata* may be present and locally abundant in the shrub and herb layers.

Global Vegetation: The tree canopy is characterized by a mixture of *Liriodendron tulipifera, Fagus grandifolia, Acer saccharum, Fraxinus americana, Betula lenta*, and other associated species, including *Acer rubrum, Betula alleghaniensis, Nyssa sylvatica*, and *Carya alba (= Carya tomentosa)*. The subcanopy, where present, is characterized by *Carpinus caroliniana, Cornus florida*, and *Ostrya virginiana*. Common species of the shrub layer include *Hamamelis virginiana* and *Lindera benzoin*. The herbaceous layer is characterized by *Podophyllum peltatum, Sanguinaria canadensis, Botrychium virginianum, Dicentra cucullaria, Dicentra canadensis, Allium tricoccum*, and *Claytonia virginica*. Associated herbs may include *Polystichum acrostichoides, Ageratina altissima var. altissima*, and *Arisaema triphyllum*. Invasive species such as *Berberis thunbergii, Elaeagnus umbellata, Rosa multiflora*, and *Alliaria petiolata* may be present and locally abundant in the shrub and herb layers.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*, *Betula lenta*, *Fraxinus americana*
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera*
Tree subcanopy	Broad-leaved deciduous tree	*Acer saccharum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Fagus grandifolia*, *Hamamelis virginiana*
Short shrub/sapling	Broad-leaved deciduous shrub	*Berberis thunbergii*, *Rosa multiflora*
Herb (field)	Flowering forb	*Alliaria petiolata*
Herb (field)	Graminoid	*Microstegium vimineum*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Polystichum acrostichoides*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Liriodendron tulipifera*
Tree subcanopy	Broad-leaved deciduous tree	*Carpinus caroliniana*, *Cornus florida*, *Ostrya virginiana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*, *Lindera benzoin*
Herb (field)	Flowering forb	*Podophyllum peltatum*
Herb (field)	Fern (Spore-bearing forb)	*Botrychium virginianum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Acer saccharum*, *Berberis thunbergii*, *Betula lenta*, *Dennstaedtia punctilobula*, *Fraxinus americana*, *Hamamelis virginiana*, *Lindera benzoin*, *Liriodendron tulipifera*, *Polystichum acrostichoides*

Global: *Acer saccharum*, *Allium tricoccum*, *Betula lenta*, *Botrychium virginianum*, *Carpinus caroliniana*, *Claytonia virginica*, *Cornus florida*, *Dicentra cucullaria*, *Fagus grandifolia*, *Liriodendron tulipifera*, *Ostrya virginiana*, *Podophyllum peltatum*, *Sanguinaria canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Microstegium vimineum* (High/Medium), *Rosa multiflora* (Medium/Low)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Dec-2004). More information is required to determine the range and rank of this vegetation type.

RELATED CONCEPTS

Global Similar Types:

- *Fagus grandifolia - Acer saccharum - Liriodendron tulipifera* Unglaciated Forest (CEGL002411) also contains *Liquidambar styraciflua, Asimina triloba, Carya cordiformis*, and *Betula lenta* is absent.
- *Fagus grandifolia - Acer saccharum* Glaciated Midwest Forest (CEGL005013) has a shrub layer characterized by *Diervilla lonicera, Euonymus obovatus, Lonicera canadensis*, and *Betula lenta* is absent.
- *Fagus grandifolia - Betula lenta - Quercus (alba, rubra) / Carpinus caroliniana* Forest (CEGL006921) lacks *Acer saccharum*, and *Quercus* spp. are more important.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This tuliptree - beech - maple forest is a mid- to lower-slope forest of the mid-Atlantic region. It is documented in Pennsylvania and New Jersey, and there are nine plots off the trail at Delaware Water Gap. It occurs on deep soils that are not strongly acidic.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: This tuliptree - beech - maple forest is a mid- to lower-slope forest of the mid-Atlantic region. It is documented in Pennsylvania and New Jersey, and plots have been sampled off the trail at Delaware Water Gap. It occurs on deep soils that are not strongly acidic.
Global Classification Comments: This description is based on the tuliptree - beech - maple forest of Fike (1999) as well as samples from NPS mapping projects in Pennsylvania and New Jersey. More information is required to determine the range of this type.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This tuliptree - beech - maple forest is documented in Pennsylvania and New Jersey; there are nine plots off the trail at Delaware Water Gap.
Global Range: This vegetation is currently described primarily from Pennsylvania and is also documented in New Jersey. It may occur in Maryland.
Nations: US
States/Provinces: MD?, NJ, PA:S4
TNC Ecoregions: 49:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Bd:CCC, 221Ea:CCC, 221Fa:CCC, M221Ac:CCC
Federal Lands: NPS (Allegheny Portage Railroad, Appalachian Trail [Lower New England], Delaware Water Gap, Friendship Hill, Morristown); USFWS (Erie)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FOTM
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (13 accuracy assessment points): APPA_AA_1638, APPA_AA_1805, APPA_AA_1858, APPA_AA_1892, APPA_AA_1900, APPA_AA_1940, APPA_AA_2273, APPA_AA_2300, APPA_AA_2334, APPA_AA_2392, APPA_AA_2736, APPA_AA_2915, APPA_AA_3299.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): J. Fike, L.A. Sneddon, E. Largay and S.C. Gawler
References: Eastern Ecology Working Group n.d., Ehrenfeld 1977, Fike 1999, Fike 1999*, Perles et al. 2006b, Perles et al. 2006d, Perles et al. 2007, Sneddon et al. 2008

[CEGL006186] *Liriodendron tulipifera - Quercus rubra - Fraxinus americana / Asimina triloba / Actaea racemosa* Forest

Translated Name: **Tuliptree - Northern Red Oak - White Ash / Pawpaw / Black Baneberry Forest**
Common Name: **Upper Piedmont-Northern Blue Ridge Basic Mesic Hardwood Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Fagus grandifolia - Liriodendron tulipifera - Carya cordiformis* Forest Alliance (A2033)

Element Concept

Global Summary: This community is a mesic rich forest occurring in the Piedmont and lower-elevation Appalachians of Virginia and Maryland and possibly extending into adjacent West Virginia, Pennsylvania, and Delaware. These forests are dominated by *Liriodendron tulipifera*, occurring with or codominating with *Quercus rubra* or *Fraxinus americana*. This community type occupies fertile, well-drained soils of mesic lower slopes and ravines, often in areas underlain by metabasalt of the Catoctin Formation but also on a variety of igneous metamorphic and metasedimentary rocks. Occasionally, stands occur on well-weathered boulder "streams" that have been deposited in low-elevation ravine bottoms and slope concavities. Other species possible in the overstory include *Quercus alba, Quercus prinus, Carya ovalis, Carya alba, Carya cordiformis, Ulmus rubra, Nyssa sylvatica, Fagus grandifolia*, and *Juglans nigra*. Subcanopy tree layers contain representatives of the overstory species and *Acer rubrum*. The lowest tree and shrub layers usually contain small to large colonies of *Asimina triloba* and *Lindera benzoin*, along with *Cercis canadensis* and *Cornus florida*. The herb layer is usually lush and dense, except where boulder streams prevail or deer grazing is severe. Patch-dominance of ferns and leafy forbs is characteristic; species achieving local abundance in the type include *Adiantum pedatum, Amphicarpaea bracteata, Arisaema triphyllum, Asarum canadense, Actaea racemosa (= Cimicifuga racemosa), Deparia acrostichoides, Hydrastis canadensis, Phegopteris hexagonoptera, Polystichum acrostichoides*, and *Uvularia perfoliata*. Other constant or characteristic herbaceous species include *Botrychium virginianum, Carex laxiflora var. laxiflora, Circaea lutetiana ssp. canadensis, Collinsonia canadensis, Cypripedium parviflorum var. pubescens, Desmodium nudiflorum, Galearis spectabilis, Galium circaezans, Galium triflorum, Hepatica nobilis var. obtusa, Maianthemum racemosum ssp. racemosum, Phryma leptostachya, Podophyllum peltatum, Sanguinaria canadensis, Sanicula canadensis*, and *Stellaria pubera*. This association is distinguished from more montane rich cove forests by its lower-elevation habitats, shrub layer dominance by *Asimina triloba* (a low-elevation species in the Mid-Atlantic region), and the absence or unimportance of many common species of montane cove forests, e.g., *Acer saccharum, Tilia americana, Caulophyllum thalictroides, Laportea canadensis, Osmorhiza claytonii, Impatiens pallida*, and *Trillium grandiflorum*.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This community occurs on lower slopes and/or ravines on deep, well-drained fine-textured silt loam soils in the lower-elevation Appalachians of Virginia and Maryland.
Global Environment: This community type occupies fertile, well-drained soils of mesic lower slopes and ravines. It is most extensive in areas underlain by metabasalt of the Catoctin Formation but also occurs on a variety of igneous metamorphic and metasedimentary rocks. Slopes vary from moderate to steep (range = 7-30°) and are typically straight or concave. The surface substrate usually has less than 10% exposed boulder and stone cover, and more than 90% cover of leaf litter and other humic material. However, a small number of stands occur on well-weathered boulder "streams" that have been deposited in low-elevation ravine bottoms and slope concavities. Soils are deep, dark loams or sandy loams of colluvial origin. Soil samples collected from representative stands were moderately acidic (mean pH is about 5.5 to 5.9), with moderately high Ca and high Mg, Mn, K, Cu, B, and total base saturation.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy of this lower slope and ravine mesic hardwood forest is characterized by a mixture of *Liriodendron tulipifera, Fraxinus americana, Quercus rubra*, and *Carya* spp. The subcanopy is codominated by *Celtis occidentalis, Acer rubrum*, and species from the canopy. Low-elevation shrubs such as *Asimina triloba* and *Cercis canadensis* are characteristic of

most stands. *Hamamelis virginiana* may also be common. The herb layer is patchy to lush and patch-dominated by widespread species such as *Actaea racemosa* and *Uvularia perfoliata*, in addition to *Asarum canadense* and ferns such as *Dryopteris intermedia* and *Polystichum acrostichoides*. It usually lacks montane rich-site herbs.

Global Vegetation: The typical stand structure of this community type consists of a tall, closed overstory, with very open understory tree layers, and a variably dense shrub layer. The overstory of most stands is dominated or codominated by tall, straight *Liriodendron tulipifera* often exceeding 35 m in height. *Fraxinus americana* and *Quercus rubra* are the most frequent overstory associates and often codominate. Less frequent overstory associates that can sometimes codominate in discrete areas include *Quercus alba, Quercus prinus, Carya ovalis, Carya alba, Carya cordiformis, Ulmus rubra, Nyssa sylvatica, Fagus grandifolia*, and *Juglans nigra*. Subcanopy tree layers contain representatives of the overstory species and *Acer rubrum*. The lowest tree and shrub layers usually contain small to large colonies of *Asimina triloba* and *Lindera benzoin*, along with *Cercis canadensis* and *Cornus florida*. More locally important small trees and shrubs include *Carpinus caroliniana* and *Hamamelis virginiana*. High-climbing vines of *Parthenocissus quinquefolia, Toxicodendron radicans*, and *Vitis* spp. are common. The herb layer is usually lush and dense, except where boulder streams prevail or deer grazing is severe. Patch-dominance of ferns and leafy forbs is characteristic; species achieving local abundance in the type include *Adiantum pedatum, Amphicarpaea bracteata, Arisaema triphyllum, Asarum canadense, Actaea racemosa (= Cimicifuga racemosa), Deparia acrostichoides, Hydrastis canadensis, Phegopteris hexagonoptera, Polystichum acrostichoides*, and *Uvularia perfoliata*. The most constant, low-cover herbs in 22 Virginia and Maryland plots of the type are *Botrychium virginianum, Circaea lutetiana ssp. canadensis, Desmodium nudiflorum, Galium circaezans, Galium triflorum, Maianthemum racemosum ssp. racemosum, Phryma leptostachya, Sanguinaria canadensis*, and *Sanicula canadensis*. Additional characteristic herbs include *Carex laxiflora var. laxiflora, Collinsonia canadensis, Cypripedium parviflorum var. pubescens, Galearis spectabilis, Hepatica nobilis var. obtusa, Podophyllum peltatum*, and *Stellaria pubera*.

Global Dynamics: Sites now supporting this community are some of the most productive in the Mid-Atlantic region, and most were cleared or cut over in the past. Dominance of *Liriodendron tulipifera* in stands is no doubt indicative of establishment following abandonment of fields, logging, and natural, large-scale forest disturbances. The ability of *Liriodendron* to opportunistically occupy and outgrow competitors in gaps created by windthrow and other disturbances apparently enables this species to maintain a position in older-aged mixed forests (Orwig and Abrams 1994, Busing 1995). Although many stands representing this community have probably reached an intermediate successional stage (70 to 140 years old) and become more mixed than a typical, early-successional forest dominated by *Liriodendron tulipifera*, their future development is unclear. Most plots contain *Quercus rubra* or *Quercus alba* in the overstory, but recruitment of these oaks is very low. The most numerous potential canopy species now present in the understory are hickories (*Carya alba, Carya cordiformis*, and *Carya ovalis*), *Fraxinus americana*, and *Nyssa sylvatica*. In the absence of longer-lived and more tolerant species such as *Fagus grandifolia* or *Acer saccharum* (usually unimportant or absent in the type), it appears that maturing stands will gradually contain more mixed dominance by *Liriodendron, Carya* spp., *Fraxinus*, and perhaps *Nyssa*, with fewer *Quercus* spp. Most likely because of their moist fertile soils, habitats of this community type are very favorable for shade-tolerant, invasive introduced plants, particularly following small-scale soil disturbances. The most problematic introduced species include *Microstegium vimineum, Rubus phoenicolasius, Lonicera japonica*, and *Alliaria petiolata*. Mortality or partial die-back of *Cornus florida* resulting from the fungal pathogen dogwood anthracnose (*Discula destructiva*) and visible damage to herbaceous plants by grazing white-tailed deer have been noted in many stands of the type.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fagus grandifolia*, *Fraxinus americana*, *Liriodendron tulipifera*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Asimina triloba*, *Lindera benzoin*
Short shrub/sapling	Broad-leaved deciduous shrub	*Asimina triloba*, *Lindera benzoin*
Herb (field)	Liana	*Parthenocissus quinquefolia*
Herb (field)	Flowering forb	*Actaea racemosa*, *Asarum canadense*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*, *Polystichum acrostichoides*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*, *Liriodendron tulipifera*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Asimina triloba*, *Lindera benzoin*
Short shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Liana	*Parthenocissus quinquefolia*, *Toxicodendron radicans*
Herb (field)	Fern (Spore-bearing forb)	*Botrychium virginianum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Actaea racemosa*, *Asimina triloba*, *Lindera benzoin*, *Liriodendron tulipifera*
Global: *Actaea racemosa*, *Asimina triloba*, *Lindera benzoin*, *Liriodendron tulipifera*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum caespitosum*, *Rubus phoenicolasius* (Medium)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (24-Jan-2005). While not a naturally rare type, this community has a restricted geographic distribution, mature examples are uncommon, and all stands are vulnerable to logging and degradation by introduced invasive weeds. Many examples are poorly buffered because of upslope land-use change, timber removal, or conversion of upslope forests to managed forest types.

RELATED CONCEPTS

Global Similar Types:

- *Fagus grandifolia - Liriodendron tulipifera - Carya cordiformis / Lindera benzoin / Podophyllum peltatum* Forest (CEGL006055) is associated with fertile ravines of the outer Piedmont and Inner Coastal Plain in Maryland and Virginia. It differs from CEGL006186 in having *Fagus grandifolia* and *Carya cordiformis* as major overstory components, as well as a number of more coastal-ranging species such as *Ilex opaca var. opaca*.
- *Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest (CEGL007710) occurs at higher elevations in more montane landscapes and contains many species more characteristic of the Appalachians; it lacks several low-elevation species (e.g., *Asimina triloba, Cercis canadensis*) that are characteristic of CEGL006186.
- *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Ruderal Forest (CEGL007220) an earlier-successional type with more monospecific dominance by *Liriodendron tulipifera* and an herb layer frequently dominated by shade-tolerant weeds (e.g., *Alliaria petiolata*, etc.).

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: *Tilia americana* and *Aesculus flava* rare to absent.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: The principal compositional differences between Upper Piedmont-Northern Blue Ridge Basic Mesic Hardwood Forest (CEGL006186) and Southern Appalachian Rich Cove Forest (Typic Type) (CEGL007710), though subtle, are driven by differences in elevation, with CEGL006186 occurring much lower and being essentially a western Piedmont/very low-elevation montane community.
Global Classification Comments: This description is based on analysis of 32 plots from Virginia and Maryland. This association is distinguished from more montane rich cove forests by its lower-elevation habitats, shrub-layer dominance by *Asimina triloba* (a low-elevation species in the Mid-Atlantic region), and the absence or unimportance of many common species of montane cove forests, e.g., *Acer saccharum, Tilia americana, Caulophyllum thalictroides, Laportea canadensis, Osmorhiza claytonii, Impatiens pallida*, and *Trillium grandiflorum*. Several plots from low elevations of Shenandoah National Park are intermediate between this type

and *Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest (CEGL007710) and could be assigned equally well to either type. For the purposes of vegetation mapping in Shenandoah , these plots were assigned to CEGL007710.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: Two examples were observed in the Central Appalachian project area, one in Clarke County, Virginia, at Ashby Gap and one near the C&O Canal and Harpers Ferry in Washington County, Maryland.
Global Range: This vegetation type is scattered in small to large patches throughout the lower Blue Ridge and northern and western Piedmont of Virginia, and much of the Maryland Piedmont and Blue Ridge. It has also been documented in Pennsylvania and may also occur in eastern West Virginia and the Piedmont portion of Delaware.
Nations: US
States/Provinces: DE?, MD, PA, VA:S4, WV?
TNC Ecoregions: 52:C, 59:C, 61:C
USFS Ecoregions (1994/95): 221Da:CCC, 231Aa:CCC, 231Ab:CCC, 231Ae:CCC, 231Ai:CCC, 231Ak:CCC, 231Al:CCC, 231Ap:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appomattox Court House, Blue Ridge Parkway, Booker T. Washington, Gettysburg, Prince William)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 observation points): APPA.1209, APPA.1331.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): E. Largay
Global Description Author(s): G.P. Fleming and K. D. Patterson
References: Busing 1995, Coxe 2009, Davis 1993, Eastern Ecology Working Group n.d., Eyre 1980, Fleming 2002a, Fleming 2002b, Fleming and Patterson 2003, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Fleming et al. 2007b, Harrison 2004, Orwig and Abrams 1994, Patterson 2008a, Patterson 2008b, Perles et al. 2006c, Townsend 2006, VDNH 2003, VDNH 2003*

A0235 *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava* Forest Alliance

Alliance Summary Description: This alliance represents the mixed mesophytic forests of the Southern Blue Ridge, Appalachian Plateau, and adjacent ecoregions, with highly variable and diverse canopies, often with no clear canopy dominant. They are locally referred to as "cove forests." Characteristic canopy species include *Acer saccharum, Aesculus flava, Liriodendron tulipifera*, and *Tilia americana var. heterophylla*. Other species that may occur in the canopy include *Acer nigrum, Carya cordiformis, Halesia tetraptera var. monticola, Fraxinus americana*, and *Quercus rubra*. Species composition varies with geology and/or elevation. Shrub strata are open to sparse and can include *Hydrangea arborescens* or *Lindera benzoin*. Herbaceous strata are typically lush and diverse. Species commonly found include *Actaea racemosa (= Cimicifuga racemosa), Asarum canadense, Caulophyllum thalictroides, Hydrophyllum canadense, Hydrophyllum virginianum, Laportea canadensis*, and *Sanguinaria canadensis*. However, the herbaceous layer is usually very diverse and variable. A partial list of other typical species includes *Adiantum pedatum, Ageratina altissima var. roanensis, Arisaema triphyllum, Carex plantaginea, Cystopteris protrusa, Delphinium tricorne, Dicentra canadensis, Dicentra cucullaria, Hepatica nobilis var. acuta, Impatiens capensis, Impatiens pallida, Osmorhiza claytonii, Polystichum acrostichoides, Prosartes lanuginosa, Tiarella cordifolia, Trillium erectum, Trillium grandiflorum*, and *Viola canadensis*. Examples of this alliance mainly occur on sites that are protected, mesic, and at low to moderate elevation (610-1370 m [2000-4500 feet]), primarily broad coves and lower slopes. Forests in this alliance are known from the Southern Blue Ridge of North Carolina, South Carolina, Georgia, Tennessee, Virginia, and the Cumberland Mountains of Kentucky, extending north at least through Virginia on the Northern Blue Ridge, as well as west into the Interior Low Plateau of southern Indiana, southern Ohio, Kentucky, and Tennessee. More information is needed to characterize forests provisionally assigned to this alliance that occur in the Allegheny Plateau of West Virginia and Ohio and in Indiana, as well as in New Jersey and Connecticut.

[CEGL006237] *Acer saccharum - Fraxinus americana - Tilia americana - Liriodendron tulipifera / Actaea racemosa* Forest

Translated Name: **Sugar Maple - White Ash - American Basswood - Tuliptree / Black Baneberry Forest**
Common Name: **Central Appalachian Rich Cove Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava* Forest Alliance (A0235)

Element Concept

Global Summary: This is a rich mesic, deciduous forest of the High Alleghenies, Western Allegheny Plateau, and Central Appalachians south to the Cumberlands of eastern Kentucky. Stands occur in coves, on slope bases, lower slopes, in middle- to upper-slope coves. Soils are typically deep, fertile, moderately to well-drained and are often derived from calcareous parent materials, with textures including sands, loams, and silt loams. The canopy is dominated by *Acer saccharum* with *Fraxinus americana, Liriodendron tulipifera*, and *Tilia americana* being very characteristic. Associated canopy trees include *Quercus rubra, Ostrya virginiana, Ulmus rubra, Acer rubrum, Betula alleghaniensis, Betula lenta, Fagus grandifolia, Juglans nigra, Carya cordiformis*, and *Prunus serotina*. The shrub layer is of variable composition, characterized by *Cornus alternifolia, Hamamelis virginiana, Asimina triloba, Lonicera canadensis, Rhododendron periclymenoides (= Rhododendron nudiflorum)*, and *Viburnum acerifolium*. *Lindera benzoin* is sparse to absent. The herb layer is diverse and made up of *Adiantum pedatum, Asarum canadense, Actaea racemosa (= Cimicifuga racemosa), Cardamine* spp. (= *Dentaria* spp.), *Hepatica nobilis var. obtusa (= Hepatica americana), Hydrophyllum virginianum, Elymus hystrix (= Hystrix patula), Osmorhiza* spp., *Trillium grandiflorum, Viola* spp., *Dryopteris marginalis, Botrychium virginianum, Anemone quinquefolia, Geranium maculatum, Caulophyllum thalictroides, Sanguinaria canadensis, Claytonia virginica, Allium tricoccum, Cardamine concatenata, Arisaema triphyllum*, and *Laportea canadensis*.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This rich cove forest occurs along slope bases, on lower concave slopes, and in middle- to upper-slope coves at elevations from 425 to 1,050 m (1,400-3,450 feet). It was sampled at four locations in the Central Appalachian project area. Sites are somewhat steep mid and upper slopes with northern or western aspects. Soils are well-drained loam. The unvegetated surface is dominated by leaf litter with some downed wood, large rocks and exposed bedrock. Evidence of disturbance includes past logging, wind/ice damage, grazing/browsing, and the presence of exotic plant species.
Global Environment: This community type occupies cool (northwest- to east-facing), mesic, lower to middle slopes, ravines, and coves at elevations from 425 to about 1050 m (1400-3450 feet). Sites may be underlain by a number of bedrock types, including limestone, dolomite, metabasalt (greenstone), granitic rocks, and sandstone. Slopes are typically steep (mean in plots = 23°) and concave in at least one direction. Soils are deep, dark, and fertile, although frequently stony or bouldery. Samples collected from plots range from very strongly acidic to circumneutral (pH range = 4.2-6.8, mean pH = 5.3) but consistently have high calcium levels (mean = 1978 ppm) and moderately high magnesium and manganese levels.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is dominated by a mixture of species which can include *Acer saccharum, Fraxinus americana, Betula alleghaniensis, Quercus rubra*, and *Tilia americana*. *Acer pensylvanicum* and *Hamamelis virginiana* are common in the shrub layer. *Lindera benzoin* is sparse to absent. Common herbs include *Actaea racemosa (= Cimicifuga racemosa), Aconitum reclinatum, Viola canadensis var. canadensis, Asarum canadense, Hydrophyllum virginianum, Impatiens pallida, Laportea canadensis, Deparia acrostichoides*, and *Angelica triquinata*. This community also supports VA-state imperiled *Rubus idaeus ssp. strigosus*.
Global Vegetation: The canopy is dominated by *Acer saccharum* with *Fraxinus americana* and *Tilia americana* being very characteristic. Associated canopy trees include *Quercus rubra, Ostrya virginiana, Ulmus rubra, Acer rubrum, Betula alleghaniensis, Betula lenta, Fagus grandifolia, Juglans nigra, Liriodendron tulipifera, Magnolia acuminata, Carya cordiformis*, and *Prunus serotina*. The shrub layer is of variable composition, characterized by *Cornus alternifolia, Hamamelis virginiana, Lindera benzoin, Asimina triloba, Lonicera canadensis, Rhododendron*

periclymenoides, and *Viburnum acerifolium*. The herb layer is diverse and made up of *Adiantum pedatum, Asarum canadense, Actaea racemosa, Cardamine* spp., *Hepatica nobilis var. obtusa, Hydrophyllum virginianum, Elymus hystrix, Osmorhiza* spp., *Trillium grandiflorum, Viola* spp., *Dryopteris marginalis, Botrychium virginianum, Anemone quinquefolia, Geranium maculatum, Caulophyllum thalictroides, Sanguinaria canadensis, Claytonia virginica, Allium tricoccum, Cardamine concatenata, Arisaema triphyllum*, and *Laportea canadensis*. More eastern stands in Kentucky contain *Aesculus flava, Aesculus glabra*, or *Tilia americana var. heterophylla* (Campbell 2001). In 15 plot-sampled Virginia stands, *Acer saccharum* and *Tilia americana* (including both *var. americana* and *var. heterophylla*) are consistently the most important canopy trees in mixed stands with *Fraxinus americana, Carya cordiformis, Quercus rubra*, and *Liriodendron tulipifera* (lower elevations only). Minor canopy associates vary with site conditions and geography. South of the James River, *Aesculus flava* is an occasional canopy tree. On higher and cooler sites, *Betula lenta, Fagus grandifolia*, and *Tsuga canadensis* may be present. *Juglans nigra* and *Ulmus rubra* occur occasionally at lower elevations. Understory layers usually contain a good representation of the canopy species, particularly *Acer saccharum*. The shrub layer is typically sparse to absent and no shrub species attained a constancy >47% or mean cover >5% in plots. The herb layer is lush and often exhibits patch dominance by a small number of species, particularly the spring-flowering forbs *Caulophyllum thalictroides* and *Osmorhiza claytonii*. Other characteristic aestival herbs include *Arisaema triphyllum, Asarum canadense, Dicentra* spp., *Galearis spectabilis, Hydrophyllum virginianum, Maianthemum racemosum, Podophyllum peltatum, Prosartes lanuginosa (= Disporum lanuginosum), Sanguinaria canadensis, Trillium grandiflorum, Uvularia grandiflora*, and *Viola canadensis*. The summer aspect is often dominated by large colonies of *Actaea racemosa, Impatiens pallida*, and/or *Laportea canadensis*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*, *Fraxinus americana*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Herb (field)	Flowering forb	*Aconitum reclinatum*, *Angelica triquinata*, *Impatiens pallida*, *Laportea canadensis*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Cornus alternifolia*, *Hamamelis virginiana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer pensylvanicum*, *Acer saccharum*, *Aconitum reclinatum*, *Angelica triquinata*, *Betula alleghaniensis*, *Fraxinus americana*, *Hydrophyllum virginianum*, *Impatiens pallida*, *Laportea canadensis*, *Quercus rubra*, *Tilia americana*
Global: *Acer saccharum*, *Actaea racemosa*, *Adiantum pedatum*, *Asarum canadense*, *Carya cordiformis*, *Caulophyllum thalictroides*, *Cornus alternifolia*, *Dicentra cucullaria*, *Fraxinus americana*, *Hamamelis virginiana*, *Hydrophyllum virginianum*, *Impatiens pallida*, *Laportea canadensis*, *Lindera benzoin*, *Liriodendron tulipifera*, *Osmorhiza claytonii*, *Sanicula trifoliata*, *Tilia americana*, *Uvularia grandiflora*, *Viola canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Aconitum reclinatum* (G3, regional endemic), *Rubus idaeus* ssp. *strigosus* (G5T5, VA state-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (High/Medium), *Barbarea vulgaris* (Low/Insignificant)
Global: Vulnerable Plants: *Aconitum reclinatum* (G3), *Panax quinquefolius* (G3G4, under collection pressure)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (28-Sep-2001). This unit has a fairly wide geographic range, within which it is regularly distributed as a small- to large-patch vegetation type in suitably fertile habitats. Because of excellent site conditions for tree growth, stands are very vulnerable to logging and are further threatened by shade-tolerant exotic weeds.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Liriodendron tulipifera - Fraxinus americana / Staphylea trifolia* Forest (CEGL006201)
- *Aesculus flava - Acer saccharum - (Tilia americana var. heterophylla) / Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695)
- *Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest (CEGL007710)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: In extreme southwestern Virginia, this community type is gradational to Southern Appalachian Rich Cove Forest (Montane Calcareous Type) (CEGL007695) of high-elevation coves in the Southern Appalachians. However, this association (CEGL006237) may be distinguished by generally occurring at much lower elevations, having lower species richness, and lacking (or nearly lacking) a number of primarily southern species prominent in CEGL007695, including *Actaea podocarpa, Aesculus flava, Hydrophyllum canadense, Phacelia fimbriata, Phlox stolonifera, Sanicula odorata, Stachys nuttallii (= Stachys cordata)*, and *Trillium sulcatum*. A few occurring frequently in CEGL006237 (especially its high-elevation subtype), including *Aconitum reclinatum, Betula alleghaniensis, Piptatherum racemosum*, and *Sanicula trifoliata*, are absent or uncommon in CEGL007695.

CEGL006237 and CEGL007695 are virtual "sister" associations. The principal difference is that CEGL007695 has *Aesculus flava* as a prominent tree (absent in CEGL006237) and a few distinctly Southern Appalachian herbs. Giles County, Virginia, is getting close to the northern limit *Aesculus flava*, so this area is likely a transition zone where stands could go either way. Classify as CEGL007695 if buckeye is present, or as CEGL006237 if not. All plots and observation points were sampled in the Central Appalachian project area.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: Note that the global description lists 14 different tree species in addition to *Acer saccharum*. It is the nature of such mixed cove forests that individual species abundances vary from place to place, even over short spatial scales. So, as a rule of thumb, don't be too concerned about *Acer saccharum* being merely present or minor if the environmental setting and overall floristics of the stand fits the type.
Global Classification Comments: Despite considerable compositional variation, this unit appears to be a widespread and robust vegetation type. Damman and Kershner (1977) describe similar vegetation from gneissic areas of western Connecticut, with key species including *Acer saccharum, Tilia americana, Fraxinus americana, Liriodendron tulipifera, Lindera benzoin, Carpinus caroliniana, Ulmus rubra, Carya cordiformis, Osmorhiza claytonii, Asarum canadense, Caulophyllum thalictroides, Hepatica nobilis var. obtusa (= Hepatica americana), Galearis spectabilis, Viola pubescens*, and *Deparia acrostichoides*. The Sugar Maple - Basswood - Tulip Poplar Community described by Martin (1975) from southeastern Kentucky, and the *Acer saccharum - Liriodendron tulipifera - Fraxinus americana* Community described by Andreu and Tukman (1995) from the Tellico Lake area of eastern Tennessee are similar, but not fully comparable because only woody vegetation was analyzed in these studies.

In extreme southwestern Virginia, this community type is gradational to *Aesculus flava - Acer saccharum - (Fraxinus americana, Tilia americana var. heterophylla) / Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695) of high-elevation coves in the Southern Appalachians. However, CEGL006237 may be distinguished by generally occurring at much lower elevations, having lower species richness, and lacking (or nearly lacking) a number of primarily southern species prominent in CEGL007695, including *Actaea podocarpa, Aesculus flava, Hydrophyllum canadense, Phacelia fimbriata, Phlox stolonifera, Sanicula odorata, Stachys nuttallii (= Stachys cordata)*, and *Trillium sulcatum*. A few occurring frequently in CEGL006237 (especially its high-elevation subtype), including *Aconitum reclinatum, Betula alleghaniensis, Piptatherum racemosum*, and *Sanicula trifoliata*, are absent or uncommon in CEGL007695.

The exotic weed *Alliaria petiolata* is a rampant invader of some stands of this vegetation on the Northern Blue Ridge.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled at Kelly Knob in Virginia, and at Hawksbill Mountain and Stony Man in Shenandoah National Park. It is common from Giles County, Virginia, north to Pennsylvania.

Global Range: This forest is found in the High Alleghenies, Western Allegheny Plateau, Central Appalachians, and Cumberlands from New York and New Jersey south to West Virginia, Virginia, and eastern Kentucky.
Nations: US
States/Provinces: KY, MD, NJ, NY, OH?, PA, VA:S3, WV?
TNC Ecoregions: 49:C, 50:C, 59:C, 61:P
USFS Ecoregions (1994/95): 212F:CC, 212G:CC, 221D:CC, 221Ea:CCC, 221Ee:CCP, 221Fa:CCC, 221Fb:CCC, 231A:CC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CC?, M221Ce:CCC, M221Da:CCC, M221Db:CC?, M221Dc:CC?
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Fort Necessity, Shenandoah); USFS (Daniel Boone, George Washington, Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 plots; 2 observation points; 16 accuracy assessment points): APPA.0213, APPA.0215, APPA.0217, APPA.1176, APPA.1230, APPA_AA_0123, APPA_AA_0179, APPA_AA_0272, APPA_AA_0368, APPA_AA_0422, APPA_AA_0742, APPA_AA_0750, APPA_AA_0807, APPA_AA_0886, APPA_AA_0935, APPA_AA_0973, APPA_AA_1079, APPA_AA_1275, APPA_AA_1526, APPA_AA_1536, APPA_AA_1596.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming and P. Coulling
References: Anderson et al. 1998, Breden et al. 2001, CAP pers. comm. 1998, Campbell 2001, Coulling and Rawinski 1999, Eastern Ecology Working Group n.d., Edinger et al. 2002, Eyre 1980, Fike 1999, Fleming 1999, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Harrison 2004, Harrison 2011, Lundgren 2000, Martin 1975, ONHD unpubl. data, Perles et al. 2006a, Rawinski et al. 1996, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL007695] *Aesculus flava - Acer saccharum - (Tilia americana var. heterophylla) / Hydrophyllum canadense - Solidago flexicaulis* Forest

Translated Name: **Yellow Buckeye - Sugar Maple - (Appalachian Basswood) / Bluntleaf Waterleaf - Zigzag Goldenrod Forest**
Common Name: **Southern Appalachian Rich Cove Forest (Montane Calcareous Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava* Forest Alliance (A0235)

ELEMENT CONCEPT

Global Summary: This association includes forests of protected coves in the southern Appalachian Mountains of eastern Tennessee, western North Carolina, and southwest Virginia. This type extends peripherally into the Cumberland Mountains and Ridge and Valley of southwestern Virginia. These forests are associated with nutrient-rich soils and, often, mafic geologies, and occur on steep, middle to low protected slopes and coves at 610-1400 m (2000-4600 feet) elevation. Examples of this association have deciduous forest canopies dominated by either *Acer saccharum, Aesculus flava, Fraxinus americana, Halesia tetraptera var. monticola*, or *Tilia americana var. heterophylla*, or by various combinations of these species. Other common canopy species can include *Carya cordiformis* and *Quercus rubra*. A shrub stratum is very sparse or absent, and the herbaceous stratum is dense and luxurious, with high species richness. The defining feature of this association is the lush herbaceous flora with many calciphilic species indicative of high pH or circumneutral soils. Characteristic species include *Asarum canadense, Carex plantaginea, Cymophyllus fraserianus, Cystopteris protrusa, Deparia acrostichoides, Diplazium pycnocarpon, Dryopteris goldiana, Hepatica nobilis var. acuta, Hydrophyllum canadense, Osmorhiza claytonii, Prosartes lanuginosa (= Disporum lanuginosum), Solidago flexicaulis*, and *Viola canadensis*. The herbaceous stratum can have local dominance by *Laportea canadensis, Viola canadensis, Dryopteris intermedia, Actaea podocarpa (= Cimicifuga americana), Actaea racemosa (= Cimicifuga racemosa)*, and *Caulophyllum thalictroides*.

This forest lacks dominance by *Betula alleghaniensis* and *Fagus grandifolia*, and has an herbaceous flora indicative of high-base status soils. This association typically has a much more diverse herbaceous stratum than other deciduous cove forests of the Southern Blue Ridge.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This rich yellow buckeye - sugar maple forest of montane protected mid- to low-slope coves occurs at middle elevations (610-1,400 m [2,000-4,600 feet]) in the Southern Blue Ridge and at low to middle elevations (200-915 m [650-3,000 feet]) in the Northern Blue Ridge and adjacent Ridge and Valley. It was sampled at one location in Giles County, Virginia, in the Central Appalachian project area. The site is a moderate midslope cove with mesic sandy loam soil underlain by calcareous red siltstone of the Juniata Formation. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. Evidence of disturbance includes the presence of exotic plant species.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This montane cove forest was sampled at 11 locations in this section of the park at elevations ranging from 490 to 1,250 m (1,600-4,100 feet, mean = 3,261 feet). Sites are moderate to very steep mid and upper slopes with northern aspects. Soils are acidic, mesic, moderately well- to well-drained loam, silt loam and sandy loam. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. Very little evidence of disturbance was noted.
Global Environment: In the southern part of its range, this vegetation type occurs on protected, concave landforms, at elevations ranging from 610-1400 m (2000-4600 feet). It is associated with nutrient-rich soils and often with mafic substrates, occurring on steep, middle to lower, protected slopes and in coves. In Virginia, the type is restricted to an elevational range from about 760-1220 m (-2500-4000 feet). Virginia sites supporting this community are on strongly concave, moderately steep (mean = 17°) slopes with north to east aspects. Underlying bedrock includes igneous metamorphic formations in the Blue Ridge, and calcareous shale, calcareous mudstone, and calcareous sandstone in the Ridge and Valley and Cumberland Mountains. Surface cover of bedrock and boulders ranges from 0-35%. Dark, apparently fertile, loamy soils at plot sampling sites are moderately acidic (mean pH = 5.6) but have high levels of calcium, magnesium, manganese, and total base saturation.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This is an extremely diverse and rich montane Southern Appalachian cove forest that occupies sheltered landforms at middle elevations. The diverse canopy often contains a mixture of *Acer saccharum, Tilia americana var. heterophylla*, and *Aesculus flava*. *Carya cordiformis* and *Fraxinus americana* are constant but minor canopy associates *Prunus serotina* and *Magnolia acuminata* may also be present. Shrubs are sparse to absent. An exceedingly rich and lush herb layer is dominated by a profusion of spring ephemerals and other nutrient-demanding forbs. Indicator species include *Hydrophyllum canadense, Asplenium rhizophyllum, Asarum canadense, Cystopteris* sp., and *Hepatica nobilis var. acuta*. Other common herbs include *Caulophyllum thalictroides, Deparia acrostichoides, Dryopteris intermedia, Laportea canadensis*, and *Viola blanda var. blanda*. *Alliaria petiolata* is an abundant exotic.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is diverse, often with *Acer saccharum, Tilia americana var. heterophylla, Aesculus flava*, and *Fraxinus americana* all as part of canopy. *Liriodendron tulipifera* and *Prunus serotina* may also be present. Shrubs include *Halesia tetraptera var. monticola* and *Lindera benzoin*. The herbaceous layer is extremely diverse and rich. Common species include *Asplenium rhizophyllum, Asarum canadense, Cystopteris* spp., *Viola canadensis, Caulophyllum thalictroides, Deparia acrostichoides, Prosartes lanuginosa (= Disporum lanuginosum), Dryopteris intermedia, Dryopteris marginalis, Hepatica nobilis var. acuta, Hydrophyllum canadense, Impatiens pallida, Laportea canadensis, Osmorhiza claytonii, Polystichum acrostichoides, Solidago flexicaulis*, and *Sanguinaria canadensis*. This community also supports GA-state imperiled *Stachys latidens* and NC-state imperiled *Trillium simile* (regional endemic) and *Eupatorium steelei*.
Global Vegetation: This association represents forests of medium- to high-elevation protected coves in the southern Appalachian Mountains. Tree canopies are dominated by variable mixtures of *Acer saccharum, Aesculus flava, Fraxinus americana, Halesia tetraptera var. monticola*, and *Tilia americana var. heterophylla*. In the Great Smoky Mountains of North Carolina and Tennessee, relative dominance of canopy species varies from site to site, with some stands strongly dominated by *Halesia tetraptera var. monticola*. Other common canopy species are *Carya cordiformis* and *Quercus rubra*. The shrub layer is very sparse or absent, but the herb layer is dense and luxuriant, with relatively high species richness. A defining feature of this association is the lush herbaceous flora with many calciphilic species indicative of high pH or base-rich soils. Characteristic herbs include *Asarum canadense, Carex plantaginea, Cymophyllus fraserianus, Cystopteris protrusa, Deparia acrostichoides, Diplazium pycnocarpon, Dryopteris goldiana, Hepatica nobilis var. acuta, Hydrophyllum canadense, Osmorhiza claytonii, Prosartes*

lanuginosa (= Disporum lanuginosum), Solidago flexicaulis, and *Viola canadensis*. The herb layer can also have local dominance by *Laportea canadensis, Dryopteris intermedia, Actaea podocarpa (= Cimicifuga americana), Actaea racemosa (= Cimicifuga racemosa), Ageratina altissima*, and *Caulophyllum thalictroides*. This association typically has a much more diverse herbaceous stratum than other deciduous cove forests of the Southern Blue Ridge. Virginia stands of this association entirely lack *Halesia tetraptera var. monticola* and are dominated by *Acer saccharum, Tilia americana var. heterophylla, Fraxinus americana*, and *Aesculus flava*. The most abundant herbs recorded in Virginia plots are *Laportea canadensis, Actaea racemosa, Caulophyllum thalictroides, Impatiens pallida, Trillium sulcatum, Hydrophyllum canadense, Hydrophyllum macrophyllum, Viola canadensis, Dicentra canadensis*, and *Delphinium tricorne*. Many additional herbs occur at low cover. Species richness in plots south of Virginia ranges from 35-94 taxa (mean = 58) per 1000-m2 plot (n = 30 plots). Species richness in 13 400-m2 plots from Virginia ranges from 33-60 taxa (mean = 46).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Aesculus flava*, *Fraxinus americana*, *Tilia americana* var. *heterophylla*
Herb (field)	Flowering forb	*Asarum canadense*, *Hydrophyllum canadense*
Herb (field)	Fern (Spore-bearing forb)	*Asplenium rhizophyllum*, *Cystopteris* sp.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Aesculus flava*, *Fraxinus americana*, *Tilia americana* var. *heterophylla*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Aesculus flava*, *Fraxinus americana*, *Halesia tetraptera* var. *monticola*, *Tilia americana* var. *heterophylla*
Herb (field)	Flowering forb	*Asarum canadense*, *Hydrophyllum canadense*
Herb (field)	Fern (Spore-bearing forb)	*Asplenium rhizophyllum*, *Cystopteris* sp.

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Aesculus flava*, *Caulophyllum thalictroides*, *Deparia acrostichoides*, *Laportea canadensis*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Aesculus flava*, *Caulophyllum thalictroides*, *Deparia acrostichoides*, *Fraxinus americana*, *Laportea canadensis*, *Osmorhiza claytonii*
Global: *Actaea podocarpa*, *Aesculus flava*, *Caulophyllum thalictroides*, *Deparia acrostichoides*, *Diphylleia cymosa*, *Impatiens pallida*, *Phacelia fimbriata*, *Sanicula odorata*, *Stachys nuttallii*, *Trillium sulcatum*, *Viola pubescens*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium); **Other Plants**: *Hepatica nobilis* var. *acuta* (G5T5)
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Cladrastis kentukea* (G4, NC state-imperiled), *Eupatorium steelei* (G4, NC state-imperiled), *Solidago flexicaulis* (G5, NC state-imperiled), *Stachys latidens* (G4G5, GA state-imperiled), *Stellaria corei* (G4, TN state-imperiled), *Thalictrum coriaceum* (G4, NC state-imperiled), *Trillium simile* (G3, NC state-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (High/Medium, invasive/exotic), *Viburnum lantana* (invasive/exotic)
Global: Vulnerable Plants: *Aconitum reclinatum* (G3), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Cardamine flagellifera* (G3), *Coreopsis latifolia* (G3), *Micranthes caroliniana* (G3), *Phacelia fimbriata* (G4, VA state-rare), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rudbeckia laciniata* var. *humilis* (G5T3?), *Silene ovata* (G3, Southern Blue Ridge endemic), *Trillium rugelii* (G3), *Trillium simile* (G3); **Other Plants**: *Hepatica nobilis* var. *acuta* (G5T5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (20-Feb-2010). This community is naturally uncommon within its range due to specific habitat requirements. It only occurs in protected, concave topographic positions over high-base status soils in the Southern Blue Ridge, and adjacent parts of the Ridge and Valley and Cumberland Mountains - all regions

with predominantly nutrient-poor (acidic) soils. Although relatively secure and not highly threatened today, most remaining examples of this community have been affected by past logging, thus much of the remaining acreage is not of high quality.

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharum - Fraxinus americana - Tilia americana - Liriodendron tulipifera / Actaea racemosa* Forest (CEGL006237) is related but a more northern and western type usually dominated strongly by sugar maple; it also occurs at lower elevations and lacks *Aesculus flava*.
- *Aesculus flava - Betula alleghaniensis - Acer saccharum / Caulophyllum thalictroides - Actaea podocarpa* Forest (CEGL004973) is a higher-elevation, rich northern hardwood forest that always contains a substantial component of *Betula alleghaniensis* and/or *Fagus grandifolia*.
- *Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest (CEGL007710) is a similar rich cove forest of the same region that occurs at somewhat lower elevations and in less calcareous soils, and has an abundance of *Liriodendron tulipifera* in the overstory.
- *Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Cystopteris bulbifera - Asarum canadense* Forest (CEGL006472) is a rich, bouldery forest of low-elevation limestone and dolomite valleys, coves and gorges; contains a substantial component of low-elevation species and obligate calciphiles absent from CEGL007695.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Only one plot occurs in the southern Central Appalachians in Giles County, Virginia. This community is characterized by a mixed canopy of *Aesculus flava, Acer saccharum*, and *Tilia americana var. heterophylla*. This is a "montane" type, both in elevation and the overwhelming abundance of *Acer saccharum* and *Aesculus flava*, which may constrain the competitiveness of *Liriodendron* (Fleming and Patterson 2009a).
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: This association (CEGL007695) and Central Appalachian Rich Cove Forest (CEGL006237) are virtual "sister" associations. The principal difference is that CEGL007695 has *Aesculus flava* as a prominent tree (absent in CEGL006237) and a few distinctly Southern Appalachian herbs. Giles County, Virginia, is getting close to the northern limit of *Aesculus flava*, so this area is likely a transition zone where stands could go either way. Classify as CEGL007695 if buckeye is present, or as CEGL006237 if not.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Mean pH of this type (5.2) is strongly acidic, while calcium levels are only moderately high. Overall mean soil chemistry is similar to that of Southern Appalachian Rich Cove Forest (Typic Type) (CEGL007710) and does not explain the compositional separation of these units. This association (CEGL007695) is clearly a more "montane" type, and both elevation and the overwhelming abundance of *Acer saccharum* and *Aesculus flava* may constrain the competitiveness of *Liriodendron tulipifera*. This association does not list tuliptree as a component, but it is found within the elevational range of tuliptree.
Global Classification Comments: This association was originally defined for the richest cove forests in the Great Smoky Mountains and may need revision to apply more generally to similar forests in the Southern Blue Ridge. In the Smokies, relative dominance of canopy species varies among examples of this association. Some examples may have canopies strongly dominated by *Halesia tetraptera var. monticola*, while others have major canopy dominance by either *Acer saccharum, Aesculus flava, Tilia americana var. heterophylla*, or *Fraxinus americana*. Deciduous cove forests are perhaps the most complex group of communities to classify in the Southern Blue Ridge, due to a combination of wide environmental range, high species richness, and high biogeographic variability. The recognition of associations based on fertility and elevation is provisional and will likely need further refinement.

In a regional Southern Appalachian classification (1134 plots from Georgia, North Carolina, Tennessee, Virginia) for the Appalachian Trail project (Fleming and Patterson 2009a), 40 plots were classified as this association. Soils collected from these plots are generally strongly or moderately acidic (perhaps influenced by slow organic matter decomposition), but have high calcium and magnesium concentrations consistent with weathering from mafic and other base-rich rocks. The most constant ($\geq$70%) species with mean cover <1% in the 40 analyzed plots are *Acer saccharum, Polystichum acrostichoides, Laportea canadensis, Tilia americana var. heterophylla, Aesculus flava, Caulophyllum thalictroides, Fraxinus americana, Actaea racemosa, Prosartes lanuginosa, Viola canadensis, Osmorhiza claytonii, Dryopteris marginalis, Dryopteris intermedia, Hydrophyllum canadense,*

Impatiens pallida, and *Carya cordiformis*. The most diagnostic species (relative to similar types) are *Hydrophyllum canadense, Caulophyllum thalictroides, Laportea canadensis, Viola canadensis var. canadensis, Astilbe biternata, Tilia americana var. heterophylla, Solidago flexicaulis*, and *Aesculus flava*. In both the Appalachian Trail analysis and a subsequent 1300-plot analysis of all Virginia montane upland forest and woodland vegetation (Fleming and Patterson 2009b), this type was clearly distinct from a group representing *Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest (CEGL007710), a somewhat lower-elevation rich cove forest with abundant *Liriodendron tulipifera*. The latter is infrequent and rarely attains significant cover in this association (CEGL007695), which can be generally characterized as a "sugar maple-buckeye-basswood" forest.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: These rich forests occur in southwestern Virginia, and more often south into the Southern Blue Ridge. One plot was sampled in the southern Central Appalachians at Angels Rest in Giles County, Virginia.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community occurs in coves throughout the study area but only rarely intersects the trail corridor. It was sampled in Chattahoochee National Forest in Georgia, in Nantahala National Forest at Nantahala Gorge (The Jump Up), Runaway Knob and elsewhere in North Carolina, in Tennessee, and at Lost Mountain, Virginia.
Global Range: This association occurs in the southern Appalachian Mountains of eastern Tennessee, western North Carolina and southwestern Virginia. It likely ranges into the Blue Ridge of Georgia and extends peripherally into Virginia's Cumberland Mountains and Ridge and Valley.
Nations: US
States/Provinces: AL:S2, GA, NC, TN, VA:S3
TNC Ecoregions: 50:C, 51:C, 59:C
USFS Ecoregions (1994/95): 221Ja:CCC, M221Aa:CCC, M221Bd:C??, M221Cc:CC?, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW, FSAH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 1 accuracy assessment point): APPA.0485, APPA_AA_0160.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (6 plots; 5 observation points; 9 accuracy assessment points): APPA.0147, APPA.0312, APPA.0559, APPA.0586, APPA.0620, APPA.0647, APPA.1105, APPA.1106, APPA.1108, APPA.1120, APPA.1133, APPA_AA_0044, APPA_AA_0353, APPA_AA_0601, APPA_AA_1138, APPA_AA_1146, APPA_AA_1182, APPA_AA_1192, APPA_AA_1363, APPA_AA_1553.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming and P. Coulling
References: ALNHP unpubl. data, Braun 1950, Eyre 1980, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, NatureServe Ecology - Southeastern U.S. unpubl. data, Patterson et al. 1999, Peet et al. unpubl. data, Rheinhardt and Ware 1984, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, VDNH 2003

[CEGL007710] *Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest

Translated Name: **Tuliptree - White Ash - (Yellow Buckeye) / Black Baneberry - Canadian Woodnettle Forest**
Common Name: **Southern Appalachian Rich Cove Forest (Typic Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava* Forest Alliance (A0235)

ELEMENT CONCEPT

Global Summary: This association represents deciduous forests of concave lower slopes and flats at middle elevations (610-1370 m [2000-4500 feet]) in the Southern Blue Ridge and at low to middle elevations (200-915 m [650-3000 feet]) in the Northern Blue Ridge and adjacent Ridge and Valley. The canopy is dominated by some mixture of rich-site mesophytic species such as *Fraxinus americana, Tilia americana var. heterophylla, Aesculus flava*, and *Magnolia acuminata*, occurring with more widely tolerant tree species such as *Liriodendron tulipifera, Acer rubrum, Tsuga canadensis*, and *Betula lenta*. In stands that have been impacted by the last cycle of industrial logging (70-80 years BP), *Liriodendron tulipifera* may dominate. The herbaceous stratum is diverse and often very lush. Typical herbaceous species include *Actaea racemosa (= Cimicifuga racemosa), Caulophyllum thalictroides, Prosartes lanuginosa (= Disporum lanuginosum), Aruncus dioicus, Adiantum pedatum, Collinsonia canadensis, Osmorhiza claytonii*, and *Laportea canadensis*. This association is distinguished by the absence or scarcity of calciphilic species, such as *Diplazium pycnocarpon, Asplenium rhizophyllum, Dryopteris goldiana, Aquilegia canadensis, Solidago flexicaulis, Deparia acrostichoides*, and *Cystopteris protrusa*, by generally occurring at elevations above 610 m (2000 feet) (200 m at the northern end of the range), and by lacking species typical of lower elevation forests.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This low-elevation, lower slope and cove rich tuliptree forest was sampled at 8 locations in the Central Appalachian project area. Sites range from gentle to steep mid and lower slopes and coves associated with sheltered and ravine settings. Soils range from rapidly drained to somewhat poorly drained and include clay loam. The unvegetated surface is typically dominated by leaf litter but may contain substantial to small amounts of exposed bedrock, large and small rocks, downed wood and/or bare soil. Evidence of disturbance includes the presence of exotic plant species.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This cove forest is found at elevations generally below 1,100 m (3,600 feet), the range of plots for this community is from 200 to 1,140 m (650-3,750 feet, mean = 2,415 feet). Sites range from moderate to steep mid and lower slopes on any aspect. Soils are variable but typically acidic but mesic moderately well- to well-drained loam. The unvegetated surface is usually dominated by leaf litter but sometimes there can be significant amounts exposed bedrock, large/small rock, downed wood and/or bare soil. Evidence of disturbance includes trails, past logging, hemlock/fir adelgid damage, and the presence of exotic plant species.

Global Environment: This association is characteristic of concave lower slopes and flats at middle elevations (610-1370 m [2000-4500 feet]) in the Southern Blue Ridge and at low to middle elevations (200-915 m [650-3000 feet]) in the Northern Blue Ridge and adjacent Ridge and Valley. At the northern end of the range in Virginia, maximum elevation decreases from about 760 m (2500 feet) in the Southern Blue Ridge to as low as 200 m (650 feet) at the extreme north end of the Blue Ridge in Clarke and Loudoun counties. In Virginia, stands occupy mesic sites underlain by base-rich substrates, including metabasalt (greenstone), pyroxene-bearing granites, amphibolite, calcareous sandstone, siltstone, shale, limestone, and dolomite. These sites are mostly situated on moderately steep (mean slope = 17°), straight or concave slopes with east to northeast aspects. Soils are deep, dark and fertile, with moderately high mean calcium and magnesium levels.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This low-elevation cove forest is dominated by *Liriodendron tulipifera* in the canopy (at least 50%, but usually close to 100% cover). *Fraxinus americana, Quercus rubra*, and *Tilia americana var. heterophylla* are canopy associates. *Acer saccharum, Acer rubrum, Betula lenta, Carya glabra*, and *Carya ovata* are minor canopy associates *Aesculus flava* is common south of the James River in Virginia. Low-elevation shrubs are absent from most stands but *Lindera benzoin* is common. Montane rich-site herbs such as *Laportea canadensis, Osmorhiza claytonia*, and *Caulophyllum thalictroides* usually among the patch-dominants of a lush and diverse herb layer. Common and/or abundant herbs from sampled plots include *Arisaema triphyllum, Actaea racemosa (= Cimicifuga racemosa), Cardamine angustata, Corydalis flavula, Circaea lutetiana ssp. canadensis, Galearis spectabilis, Polystichum acrostichoides, Sanguinaria*

canadensis, Viola pubescens and *Stellaria pubera*. In addition, this community also supports VA-state imperiled *Trillium cernuum*.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy of this cove forest is dominated by *Liriodendron tulipifera*, its coverage highly variable, often 40%, but sometimes close to 100%. Additional tree species may include *Acer* spp., *Aesculus flava, Betula lenta, Carya glabra, Carya cordiformis, Fraxinus americana, Halesia tetraptera var. monticola, Magnolia acuminata, Quercus rubra*, and *Tilia americana var. heterophylla*. Common shrubs include *Lindera benzoin* and *Acer pensylvanicum*. Herb cover is often quite dense (up to 100%); common species include *Adiantum pedatum, Arisaema triphyllum, Botrychium virginianum, Actaea racemosa (= Cimicifuga racemosa), Galearis spectabilis, Galium triflorum, Laportea canadensis, Osmorhiza claytonii, Phegopteris hexagonoptera, Phryma leptostachya, Polygonatum biflorum, Polystichum acrostichoides, Sanicula canadensis, Sanguinaria canadensis, Stellaria pubera*, and *Trillium vaseyi*. In addition, this community also supports several state-rare species: GA-state imperiled *Stachys latidens* and *Triosteum aurantiacum*; NC-state imperiled *Galium lanceolatum* and *Smilax hugeri*; and VA-state imperiled *Trillium cernuum*.

Global Vegetation: In the heart of its Southern Blue Ridge range, canopies of this community are dominated by variable mixtures of nutrient-demanding mesophytic species such as *Fraxinus americana, Tilia americana var. heterophylla*, and *Aesculus flava*, in association with more wide-ranging tree species such as *Liriodendron tulipifera, Acer rubrum, Tsuga canadensis*, and *Betula lenta*. Herb layers are diverse and often very lush. Typical herbaceous species include *Actaea racemosa (= Cimicifuga racemosa), Caulophyllum thalictroides, Aruncus dioicus, Adiantum pedatum, Collinsonia canadensis, Laportea canadensis, Osmorhiza claytonii*, and *Prosartes lanuginosa (= Disporum lanuginosum)*. In the Southern Blue Ridge, this association is distinguished by the scarcity of calciphilic species such as *Diplazium pycnocarpon, Asplenium rhizophyllum, Dryopteris goldiana, Aquilegia canadensis, Solidago flexicaulis, Deparia acrostichoides*, and *Cystopteris protrusa*; by generally occurring at elevations above 610 m (2000 feet); and by lacking species typical of lower elevation forests. Virginia examples are similar but lack *Aesculus flava* in areas north of the James River. *Liriodendron tulipifera, Fraxinus americana, Tilia americana* (both *var. heterophylla* and *var. americana*), and *Quercus rubra* are the most important canopy species. *Acer saccharum, Betula lenta, Carya glabra*, and *Carya cordiformis* are minor canopy associates. *Ulmus rubra* is a constant understory tree that occasionally reaches the overstory. Most occurrences have a patchy to moderately dense shrub layer dominated by *Lindera benzoin* (10-25% mean cover in 51 plots). The herbaceous flora is lush and forb-rich, at least early in the growing season. The most characteristic herbs in Virginia plot samples are *Actaea racemosa, Arisaema triphyllum, Circaea lutetiana ssp. canadensis, Sanguinaria canadensis, Stellaria pubera, Osmorhiza claytonii, Amphicarpaea bracteata, Adiantum pedatum, Asarum canadense, Galearis spectabilis, Ageratina altissima var. altissima, Laportea canadensis*, and *Trillium grandiflorum*. Species richness of 51 Virginia plots ranges from 29 to 98 taxa per 400 square meters (mean = 60).

Global Dynamics: The contemporary abundance of *Liriodendron tulipifera* in this association no doubt reflects the influence of past logging. However, it is likely that *Liriodendron* has always been a component of this vegetation, capable of maintaining a position in these mixed forests because of its rapid growth and superior ability to colonize light gaps caused by downfalls (Fowells 1965, Busing 1995). An abundance of *Acer saccharum* in the understory of some stands of this type also suggests that their composition is a temporary (though long-lasting) seral phase following extensive disturbances which favored *Liriodendron tulipifera*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Aesculus flava*, *Fraxinus americana*, *Liriodendron tulipifera*, *Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Flowering forb	*Actaea racemosa*, *Arisaema triphyllum*, *Circaea lutetiana* ssp. *canadensis*, *Stellaria pubera*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Aesculus flava*, *Fraxinus americana*, *Liriodendron tulipifera*, *Quercus rubra*, *Tilia americana* var. *heterophylla*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Aesculus flava*, *Betula lenta*, *Fraxinus americana*, *Liriodendron tulipifera*, *Tilia americana* var. *heterophylla*
Tree subcanopy	Broad-leaved deciduous tree	*Ulmus rubra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Actaea racemosa*, *Aesculus flava*, *Arisaema triphyllum*, *Circaea lutetiana* ssp. *canadensis*, *Fraxinus americana*, *Lindera benzoin*, *Liriodendron tulipifera*, *Quercus rubra*, *Stellaria pubera*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Actaea racemosa*, *Aesculus flava*, *Arisaema triphyllum*, *Botrychium virginianum*, *Fraxinus americana*, *Lindera benzoin*, *Liriodendron tulipifera*, *Osmorhiza claytonii*, *Polystichum acrostichoides*, *Quercus rubra*, *Sanguinaria canadensis*, *Tilia americana* var. *heterophylla*
Global: *Actaea racemosa*, *Adiantum pedatum*, *Ageratina altissima* var. *altissima*, *Amphicarpaea bracteata*, *Arisaema triphyllum*, *Asarum canadense*, *Circaea lutetiana* ssp. *canadensis*, *Fraxinus americana*, *Galearis spectabilis*, *Laportea canadensis*, *Osmorhiza claytonii*, *Sanguinaria canadensis*, *Tilia americana* var. *heterophylla*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Trillium cernuum* (G5, VA state-imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium)
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Galium lanceolatum* (G5, NC state-imperiled), *Smilax hugeri* (G4, NC state-imperiled), *Stachys latidens* (G4G5, GA state-imperiled), *Trillium cernuum* (G5, VA state-imperiled), *Trillium luteum* (G4, NC state-imperiled), *Triosteum aurantiacum* (G5, GA state-imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium, invasive/exotic), *Alliaria petiolata* (High/Medium, invasive/exotic), *Berberis thunbergii* (High/Medium, invasive/exotic), *Celastrus orbiculata* (High/Medium, invasive/exotic)
Global: Vulnerable Plants: *Aconitum reclinatum* (G3), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Cardamine flagellifera* (G3), *Carex ruthii* (G3), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Panax quinquefolius* (G3G4, under collection pressure), *Stachys clingmanii* (G2), *Trillium rugelii* (G3), *Tsuga caroliniana* (G3); **Other Plants**: *Stellaria pubera* (G5), *Trillium grandiflorum* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (20-Feb-2010). This community is somewhat uncommon due to specialized habitat requirements, but is fairly widespread throughout the Southern Appalachians and southern part of the Central Appalachians. It is secure throughout its range, but susceptible to impacts by logging due to its location in accessible topographic positions.

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharum - Fraxinus americana - Tilia americana - Liriodendron tulipifera / Actaea racemosa* Forest (CEGL006237) is the principal rich cove forest of the Central Appalachians, particularly in the Ridge and Valley and Allegheny Mountains; usually codominated by *Acer saccharum*.
- *Aesculus flava - Acer saccharum - (Tilia americana var. heterophylla) / Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695) is a similar rich cove forest of the same region that occurs at somewhat higher elevations and in more calcareous soils, and has an abundance of *Acer saccharum* in the overstory.
- *Betula alleghaniensis - Tilia americana var. heterophylla / Acer spicatum / Ribes cynosbati / Dryopteris marginalis* Forest (CEGL004982) is an obligate boulderfield forest of the Southern Appalachians.
- *Liriodendron tulipifera - Quercus rubra - Fraxinus americana / Asimina triloba / Actaea racemosa* Forest (CEGL006186) occurs at lower elevations and lacks many montane species.
- *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / (Magnolia tripetala)* Forest (CEGL005222) has a more western distribution.
- *Quercus rubra - Tilia americana var. heterophylla - (Halesia tetraptera var. monticola) / Collinsonia canadensis - Prosartes lanuginosa* Forest (CEGL007878) is strongly dominated by *Quercus rubra*.

- *Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Cystopteris bulbifera - Asarum canadense* Forest (CEGL006472) is a rich, bouldery forest of low-elevation limestone and dolomite valleys, coves, and gorges; contains a substantial component of low-elevation species and obligate calciphiles absent from CEGL007695.
- *Tilia americana var. heterophylla - Fraxinus americana / Sanguinaria canadensis - (Aquilegia canadensis, Asplenium rhizophyllum)* Forest (CEGL007711)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Although lacking *Aesculus flava* north of the James River in Virginia, this community type is well-represented and seems to have a remarkably consistent composition over nearly the entire length of the Blue Ridge in Virginia. These stands have all recovered from logging in the past, but remain threatened by future timber harvests because of excellent site productivity. Shade-tolerant, invasive exotics, especially *Alliaria petiolata*, pose a serious threat to the integrity of this community's herbaceous flora.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: Low-elevation *Liriodendron tulipifera* rich cove forests can be distinguished from successional *Liriodendron tulipifera* forests (i.e., Ruderal Tuliptree Forest (Rich Type) (CEGL007220), Ruderal Tuliptree Forest (Typic Type) (CEGL007221)) by the presence of other rich and mesophytic trees such as *Fraxinus americana, Tilia americana var. heterophylla, Aesculus flava*, and *Magnolia acuminata*. The principal compositional differences between Upper Piedmont-Northern Blue Ridge Basic Mesic Hardwood Forest (CEGL006186) and Southern Appalachian Rich Cove Forest (Typic Type) (CEGL007710), though subtle, are driven by differences in elevation, with CEGL006186 occurring much lower and being essentially a western Piedmont/very low elevation montane community.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: The pH of this type is strongly acidic (near 5.2), while calcium levels are only moderately high. Ordination studies suggest that differences in elevation and relative topographic position are significant. An abundance of *Acer saccharum* in the understory of some stands of this type also suggests that current composition of some stands is a temporary seral phase following extensive disturbances which favored *Liriodendron tulipifera*.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: Approximately one-third of this distribution is north of the range of *Aesculus flava*. Even in the large Southern Appalachian sample used in this regional analysis (48 plots [19 plots in AT corridor]), *Aesculus flava* is not very constant (40%) and attains >10% cover in only four plots. On the other hand, both *Tilia americana* (both vars. included) and especially *Fraxinus americana* are constant.
Global Classification Comments: Deciduous cove forests are perhaps the most complex group of communities to classify in the Southern Blue Ridge, due to a combination of wide environmental range, high species richness, and high biogeographic variability. The recognition of associations based on fertility and elevation is provisional and will likely need further refinement. This association is distinguished by the absence or scarcity of calciphilic species, such as *Diplazium pycnocarpon, Asplenium rhizophyllum, Dryopteris goldiana, Aquilegia canadensis, Solidago flexicaulis, Deparia acrostichoides*, and *Cystopteris protrusa*, by generally occurring at elevations above 610 m (2000 feet), and by lacking species typical of lower elevation forests.

In a regional Southern Appalachian analysis (1134 plots from Georgia, North Carolina, Tennessee, and Virginia) for the Appalachian Trail project, 48 plots were classified as this association (Fleming and Patterson 2009a). Compared to the related *Aesculus flava - Acer saccharum - (Tilia americana var. heterophylla) / Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695), this group has a significantly lower mean elevation (736 m [2415 feet] vs. 994 m [3261 feet] for CEGL007695), and is associated with soils of somewhat lower base status. The most constant (>70%) species with mean cover >1% in the 48 analyzed plots are *Liriodendron tulipifera, Fraxinus americana, Polystichum acrostichoides, Quercus rubra, Acer rubrum, Actaea racemosa, Tilia americana* (both *var. heterophylla* and *var. americana*), and *Amphicarpaea bracteata*. The most diagnostic species (relative to similar types) are *Lindera benzoin, Amphicarpaea bracteata, Liriodendron tulipifera, Actaea racemosa, Polystichum acrostichoides*, and *Galearis spectabilis*.

Although lacking *Aesculus flava* north of the James River, this community type is well-represented and seems to have a remarkably consistent composition over nearly the entire length of the Blue Ridge in Virginia. These stands have all recovered from logging in the past, but remain threatened by future timber harvests because of

excellent site productivity. Shade-tolerant, invasive exotics, especially *Alliaria petiolata*, pose a serious threat to the integrity of this community's herbaceous flora.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was observed along the AT from Reservoir Hollow in Clarke County in northern Virginia south to Quebec in Smyth County in southwestern Virginia. It continues south into the Southern Blue Ridge in southwestern Virginia. It was sampled in Virginia at Brushy Mountain, Jarman Gap, Kimberling Creek, Loft Mountain, Quebec, Reservoir Hollow, and Thompson Wildlife Management Area. There is also an occurrence at Harpers Ferry in Loudoun County, Virginia.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community occurs in coves ranging from northern Georgia to northern Virginia, but only rarely intersects the trail corridor. It was sampled in Georgia, North Carolina (including Birch Springs Shelter in Great Smoky Mountains National Park), Tennessee, and in Virginia near Comers Creek and Hurricane Creek.
Global Range: This association occurs in the southern and central Appalachian Mountains of eastern Tennessee, western North Carolina, northeastern Georgia, and Virginia. It appears to be most frequent on the Blue Ridge proper, with the northernmost occurrence at Harpers Ferry in Loudoun County, Virginia, but ranges into the adjacent Ridge and Valley and extreme northern part of the Cumberland Mountains in Virginia.
Nations: US
States/Provinces: GA, NC, TN, VA:S4, WV?
TNC Ecoregions: 50:C, 51:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, C&O Canal, Great Smoky Mountains, Harpers Ferry, Shenandoah); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, George Washington, Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW, FSAH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (6 plots; 2 observation points; 7 accuracy assessment points): APPA.0102, APPA.0234, APPA.0239, APPA.0331, APPA.0394, APPA.0395, APPA.1162, APPA.1178, APPA_AA_0225, APPA_AA_0827, APPA_AA_0932, APPA_AA_1115, APPA_AA_1285, APPA_AA_1397, APPA_AA_1601.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (8 plots; 3 observation points; 8 accuracy assessment points): APPA.0057, APPA.0182, APPA.0604, APPA.0616, APPA.0627, APPA.0646, APPA.0650, APPA.1017, APPA.1045, APPA.1107, APPA.1184, APPA_AA_0718, APPA_AA_0786, APPA_AA_0831, APPA_AA_0887, APPA_AA_1023, APPA_AA_1479, APPA_AA_1503, APPA_AA_1610.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming, P. Coulling, T. Govus
References: Busing 1995, Eyre 1980, Fleming 2002b, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2007b, Fleming pers. comm., Fowells 1965, Major et al. 1999, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 1998b, Schafale 1998b*, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, VDNH 2003, Young et al. 2006, Young et al. 2009

[CEGL007878] *Quercus rubra - Tilia americana var. heterophylla - (Halesia tetraptera var. monticola) / Collinsonia canadensis - Prosartes lanuginosa* Forest

Translated Name: **Northern Red Oak - Appalachian Basswood - (Mountain Silverbell) / Richweed - Yellow Fairybells Forest**
Common Name: **Southern Appalachian Red Oak Cove Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava* Forest Alliance (A0235)

ELEMENT CONCEPT

Global Summary: This community is a *Quercus rubra*-dominated rich forest of protected steep, rocky slopes at intermediate elevations (mostly 800-1400 m [2600-4600 feet]) in the Southern Appalachians. Its distribution is not completely known, but appears to be concentrated in the southern part of the Southern Blue Ridge, in southwestern North Carolina, eastern Tennessee, and possibly northern Georgia. This forest has a canopy dominated by *Quercus rubra* (25-50% cover) occurring with lesser amounts of *Tilia americana var. heterophylla, Fraxinus americana, Acer saccharum, Betula lenta*, and *Carya glabra*. *Halesia tetraptera var. monticola* is an important canopy associate over parts of the range, particularly in the Great Smoky Mountains. Other minor canopy and subcanopy trees include *Liriodendron tulipifera, Magnolia acuminata, Acer pensylvanicum, Acer rubrum, Aesculus flava, Carya cordiformis*, and *Prunus serotina*. The shrub stratum is open, made up of saplings from the canopy and subcanopy, with no clear dominant. Herbs are sparse to moderate in coverage, with relatively high species richness. Herbs with the highest coverages are *Collinsonia canadensis, Polystichum acrostichoides, Prosartes lanuginosa, Actaea racemosa, Thelypteris noveboracensis*, and *Impatiens pallida*. Other typical herbs are *Actaea pachypoda, Ageratina altissima var. roanensis, Agrostis* spp., *Arisaema triphyllum, Athyrium filix-femina ssp. asplenioides, Caulophyllum thalictroides, Desmodium nudiflorum, Dioscorea quaternata, Dryopteris marginalis, Galium lanceolatum, Laportea canadensis, Maianthemum racemosum, Phegopteris hexagonoptera, Polygonatum biflorum, Sanguinaria canadensis, Smilax herbacea, Solidago curtisii (= Solidago caesia var. curtisii), Tradescantia subaspera*, and *Viola cucullata*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This *Quercus rubra* cove forest occurs primarily at elevations primarily from 915 to 1,220 m (3,000-4,000 feet) sometimes higher (up to 1,430 m [4,700 feet]). Sites are somewhat steep sheltered slopes or coves with moderately well-drained loam soil. The unvegetated surface is dominated by leaf litter with some downed wood.

Global Environment: This community is found on protected steep, rocky slopes at intermediate elevations in the Southern Appalachians. The known elevational range is 600-1580 m (2000-5200 feet), but most stands occur between 800 and 1400 m (2600-4600 feet). The type is most commonly associated with middle-slope sites that have moderate to high surficial rock cover, including sideslopes and the upper parts of coves. It is also known from more exposed, rocky, convex upper slopes and ridge spurs. The mean aspect of 35 plots samples is 41° (northeast). Soil samples collected from plots are strongly acidic with notably high organic matter content, but have higher magnesium and calcium levels than most other Southern Appalachian soils. Soil chemistry data suggests that mafic bedrock underlies at least some of the sites occupied by this association.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This mesic forest occurs in sheltered coves and has a canopy with *Quercus rubra* ranging from 10-25% cover (a significant component but not dominant) with *Fraxinus americana* and/or *Tilia americana var. heterophylla*; it may also contain *Halesia* spp., *Betula alleghaniensis, Acer saccharum, Aesculus flava, Fagus grandifolia*, and *Carya ovalis*. Shrubs are very sparse. The rich and diverse herbaceous layer may include *Caulophyllum thalictroides, Collinsonia canadensis*, and *Thelypteris noveboracensis*. This community also supports TN-state imperiled *Stachys clingmanii* (also considered globally imperiled) and *Ageratina altissima var. roanensis*.

Global Vegetation: This forest has a canopy dominated by *Quercus rubra* (25-50% cover) occurring with lesser amounts of *Tilia americana var. heterophylla, Fraxinus americana, Acer saccharum, Betula lenta*, and *Carya glabra*. *Halesia tetraptera var. monticola* is an important canopy associate over parts of the range, particularly in the Great Smoky Mountains. Other minor canopy and subcanopy trees include *Liriodendron tulipifera, Magnolia acuminata, Acer pensylvanicum, Acer rubrum, Aesculus flava, Carya cordiformis*, and *Prunus serotina*. The shrub stratum is open, made up of saplings from the canopy and subcanopy, with no clear dominant. Herbs are sparse to moderate in cover, with relatively high species richness. Herbs with the highest covers are *Collinsonia canadensis, Polystichum acrostichoides, Prosartes lanuginosa, Actaea racemosa, Thelypteris noveboracensis*, and *Impatiens pallida*. Other typical herbs are *Actaea pachypoda, Ageratina altissima var. roanensis, Agrostis* spp., *Arisaema*

triphyllum, Athyrium filix-femina ssp. asplenioides, Caulophyllum thalictroides, Desmodium nudiflorum, Dioscorea quaternata, Dryopteris marginalis, Galium lanceolatum, Laportea canadensis, Maianthemum racemosum, Phegopteris hexagonoptera, Polygonatum biflorum, Sanguinaria canadensis, Smilax herbacea, Solidago curtisii (= Solidago caesia var. curtisii), Tradescantia subaspera, and *Viola cucullata*. Many other herbs occur at low cover and constancy. Mean species richness of 35 plots is 67 taxa per 1000 square meters.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Herb (field)	Flowering forb	*Collinsonia canadensis*
Herb (field)	Fern (Spore-bearing forb)	*Polystichum acrostichoides*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Herb (field)	Flowering forb	*Collinsonia canadensis*
Herb (field)	Fern (Spore-bearing forb)	*Polystichum acrostichoides*, *Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer saccharum*, *Collinsonia canadensis*, *Halesia tetraptera* var. *monticola*, *Quercus rubra*, *Tilia americana* var. *heterophylla*
Global: *Collinsonia canadensis*, *Prosartes lanuginosa*, *Quercus rubra*, *Tilia americana* var. *heterophylla*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4, TN state-imperiled), *Castanea dentata* (G4, TN state-imperiled), *Stachys clingmanii* (G2, globally imperiled & TN-state critically imperiled)
Global: Vulnerable Plants: *Stachys clingmanii* (G2); **Other Plants**: *Halesia tetraptera* var. *monticola* (G5T5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (3-Sep-2002). The conservation status of this community has not yet been fully assessed.

RELATED CONCEPTS

Global Similar Types:

- *Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest (CEGL007710) is a mesophytic, mixed cove forest with a lusher, richer herb layer and lacking a substantial component of *Quercus rubra*.
- *Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest (CEGL007692) occurs mostly on non-rocky, upper slopes and broad ridgetops and has a substantial component of *Quercus alba*.
- *Quercus rubra - Acer saccharum - Tilia americana var. heterophylla - Aesculus flava - (Cladrastis kentukea)* Forest (CEGL007698)
- *Quercus rubra - Fraxinus americana - Acer saccharum / Actaea racemosa - Caulophyllum thalictroides* Forest (CEGL004256) is a similar Southern Appalachian forest occurring at higher average elevation and only weakly dominated by *Quercus rubra* and with abundant *Acer saccharum, Fraxinus americana*, and *Carya* spp.; also contains some higher-elevation species such as *Betula alleghaniensis, Ageratina altissima var. roanensis*, and *Eurybia chlorolepis*.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Moderately high Mg and base saturation in soil samples suggests base-rich substrates.
Global Classification Comments: This association may represent a subset of *Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest (CEGL007692), Appalachian Montane Oak

- Hickory Forest (Rich Type), or may be transitional between it and *Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest (CEGL007710), Southern Appalachian Cove Forest (Typic Montane Type). More regional information is needed to assess the distinctiveness of this type. It is described from a small number of samples from Great Smoky Mountains National Park. In a regional analysis for the Appalachian Trail project and a follow-up comparative analysis with *Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest (CEGL007692), 35 plots from North Carolina and Tennessee were classified as this type (Fleming and Patterson 2009a). These analyses demonstrated that this type is distinct from CEGL007692 and has a wider distribution on the Southern Blue Ridge than previously documented.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Plots analyzed are concentrated in the southern part of the study area, from the Nantahala Mountains to the Great Smoky Mountains. This community was sampled in Tennessee, including at Big Abrams Gap in Great Smoky Mountains National Park.
Global Range: This community is found in the Southern Blue Ridge of Tennessee, North Carolina, and possibly Georgia.
Nations: US
States/Provinces: GA?, NC, TN
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAMO
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 1 observation point; 4 accuracy assessment points): APPA.0094, APPA.0185, APPA.1075, APPA_AA_0614, APPA_AA_1266, APPA_AA_1284, APPA_AA_1334.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson and G.P. Fleming
References: Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

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[CEGL006472] *Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Cystopteris bulbifera - Asarum canadense* Forest

Translated Name: **Appalachian Basswood - Yellow Buckeye - Sugar Maple / Bulblet Bladderfern - Canadian Wild Ginger Forest**
Common Name: **Southern Appalachian Limestone Rich Cove Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava* Forest Alliance (A0235)

ELEMENT CONCEPT

Global Summary: This association is currently known only from carbonate rock districts in the west-central and southwestern Virginia portions of the Ridge and Valley province, extending into peripheral areas on the flanks of the Southern Blue Ridge and Cumberland Mountains. Occurrences in limestone valleys of West Virginia, Kentucky, and Tennessee seem likely. Sites are restricted to mesic, fertile slopes underlain by limestone or dolomite, small outcrops, and loose talus which is often exposed. Habitats are usually situated on lower to middle slopes subtending streams in low-elevation (<700 m [2200 feet]) montane valleys, coves, and gorges. Slopes are steep to extremely steep (mean = 33°), usually with north to east aspects. Bedrock outcrops are frequent, and significant subsurface lateral seepage may occur seasonally at some sites. Substrate varies from site to site, but generally consists of a mosaic of deep colluvial soil and fine talus or scree that is somewhat to very loose and unstable. Soils collected from plot samples are circumneutral, with very high calcium, magnesium, and total base saturation levels. Stands have a

variable overstory composition, with *Tilia americana var. heterophylla, Aesculus flava, Acer saccharum*, and *Fraxinus americana* consistently important. Other less constant or abundant trees that may be important in some stands include *Ulmus rubra, Carya cordiformis, Liriodendron tulipifera, Quercus muehlenbergii, Quercus rubra, Acer nigrum, Thuja occidentalis*, and *Celtis occidentalis*. On several unusually sheltered, north-facing slopes, *Tsuga canadensis* is a codominant in the canopy mix. The understory and shrub layers of this community tend to be open or sparse, but patches of *Staphylea trifolia* and *Lindera benzoin* are frequent, along with climbing lianas of *Aristolochia macrophylla*. The herb layer is lush and diverse, with an array of patch-dominants that vary both among and within stands. On rockier substrates, *Cystopteris bulbifera* is consistently abundant, often covering up to 50% of an individual plot sample. More-or-less constant herbs that achieve >10% in one or more plots include *Asarum canadense, Solidago flexicaulis, Osmorhiza claytonii, Actaea racemosa, Caulophyllum thalictroides, Laportea canadensis, Impatiens pallida, Polymnia canadensis, Hydrophyllum canadense, Jeffersonia diphylla, Thalictrum dioicum, Viola canadensis, Phacelia bipinnatifida, Dicentra canadensis, Dicentra cucullaria, Trillium grandiflorum, Delphinium tricorne, Stellaria corei*, and *Meehania cordata*. Other characteristic herbs that usually occur at low cover are *Arisaema triphyllum, Sedum ternatum, Cardamine concatenata, Polystichum acrostichoides, Hepatica nobilis var. acuta (= Hepatica acutiloba), Mitella diphylla, Asplenium rhizophyllum, Adiantum pedatum, Uvularia grandiflora, Prosartes lanuginosa, Prosartes maculata, Podophyllum peltatum, Carex albursina, Hybanthus concolor, Trillium sulcatum, Synandra hispidula*, and *Stylophorum diphyllum*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This low-elevation (<700 m [2,200 feet]) rich forest occurs on limestone or dolomite talus and boulders in montane valleys, coves, gorges, or steep fertile slopes with many obligate calciphiles. The single sampled site occurs on carbonate rock in the west-central and southwestern Virginia portions of the Ridge and Valley province. It is a mesic ravine with large rocks and dense leaf litter. Evidence of disturbance includes the presence of exotic plant species.

Global Environment: Sites for this community are restricted to mesic, fertile slopes underlain by limestone or dolomite, small outcrops, and loose talus which is often exposed. Habitats are usually situated on lower to middle slopes subtending streams in low-elevation (<700 m [2200 feet]) montane valleys, coves, and gorges. Slopes are steep to extremely steep (mean = 33°), usually with north to east aspects. Bedrock outcrops are frequent, and significant subsurface lateral seepage may occur seasonally at some sites. Substrate varies from site to site, but generally consists of a mosaic of deep colluvial soil and fine talus or scree that is somewhat to very loose and unstable. At sites where fine bouldery colluvium is abundant, there is often a mantle of colluvial soil covering the rocks; in places where large, coarse talus is abundant, soils are primarily interstitial. Overall, exposed rock cover averages about 32% in 16 plot samples. High cover of bryophytes and mesophytic lichens is characteristic on exposed rocks. Soils collected from plot samples indicate very high fertility, with a mean pH of 7.0, 100% mean total base saturation, and very high mean concentrations of calcium (3894 ppm) and magnesium (848 ppm).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy of this low-elevation limestone rich forest is dominated by *Tilia americana var. heterophylla, Acer saccharum, Fraxinus americana*, and/or *Aesculus flava*. Patches of *Staphylea trifolia* and *Lindera benzoin* are frequent in the shrub layer along with climbing lianas of *Aristolochia macrophylla*. Many obligate calciphiles make this association unique. *Cystopteris bulbifera* is consistently abundant in the herb layer; other common herbs include *Caulophyllum thalictroides, Collinsia verna* (VA-state imperiled), and *Trillium sessile*. A total of 43 herbs were recorded from the single sampled plot.

Global Vegetation: Stands have a variable overstory composition, with *Tilia americana var. heterophylla, Aesculus flava, Acer saccharum*, and *Fraxinus americana* consistently important. Other less constant or abundant trees that may be important in some stands include *Ulmus rubra, Carya cordiformis, Liriodendron tulipifera, Quercus muehlenbergii, Quercus rubra, Acer nigrum, Thuja occidentalis*, and *Celtis occidentalis*. On several unusually sheltered, north-facing slopes, *Tsuga canadensis* is a codominant in the canopy mix. The understory and shrub layers of this community tend to be open or sparse, but patches of *Staphylea trifolia* and *Lindera benzoin* are frequent, along with climbing lianas of *Aristolochia macrophylla*. The herb layer is lush and diverse, with an array of patch-dominants that vary both among and within stands. On rockier substrates, *Cystopteris bulbifera* is consistently abundant, often covering up to 50% of an individual plot sample. More-or-less constant herbs that achieve >10% in one or more plots include *Asarum canadense, Solidago flexicaulis, Osmorhiza claytonii, Actaea racemosa, Caulophyllum thalictroides, Laportea canadensis, Impatiens pallida, Polymnia canadensis, Hydrophyllum canadense, Jeffersonia diphylla, Thalictrum dioicum, Viola canadensis, Phacelia bipinnatifida, Dicentra canadensis, Dicentra cucullaria, Trillium grandiflorum, Delphinium tricorne, Stellaria corei*, and

Meehania cordata. Other characteristic herbs that usually occur at low cover are *Arisaema triphyllum, Sedum ternatum, Cardamine concatenata, Polystichum acrostichoides, Hepatica nobilis var. acuta (= Hepatica acutiloba), Mitella diphylla, Asplenium rhizophyllum, Adiantum pedatum, Uvularia grandiflora, Prosartes lanuginosa, Prosartes maculata, Podophyllum peltatum, Carex albursina, Hybanthus concolor, Trillium sulcatum, Synandra hispidula*, and *Stylophorum diphyllum*. Species richness of 24 plot-sampled stands ranges from 21 to 95 taxa per 400 square meters (mean = 58).

Global Dynamics: Distinguishing features of this community are its restriction to areas underlain by carbonate rocks (limestone and dolomite); its affiliation with steep, mesic, often bouldery/gravelly habitats in valleys, gorges, and coves; the infrequency of *Quercus* spp.; and the abundance of *Cystopteris bulbifera* and other obligate calciphiles, along with a generally lush and diverse herb layer with variable patch-dominance by several nutrient-demanding forbs. Although the mean species richness is comparable to that of many other rich cove and slope forests, the herbaceous cover of this type may be locally less dense where very rocky substrates prevail. However, due to the relatively rapid weathering of carbonate minerals and extremely fertile soils, even these microhabitats are typically well-vegetated with herbaceous plants, among which lithophytes such as *Cystopteris bulbifera, Asplenium rhizophyllum, Sedum ternatum*, and *Mitella diphylla* are prominent.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Aesculus flava*, *Fraxinus americana*, *Tilia americana* var. *heterophylla*
Herb (field)	Fern (Spore-bearing forb)	*Cystopteris bulbifera*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Aesculus flava*, *Fraxinus americana*, *Tilia americana* var. *heterophylla*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*, *Staphylea trifolia*
Herb (field)	Liana	*Aristolochia macrophylla*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer saccharum*, *Aesculus flava*, *Aristolochia macrophylla*, *Fraxinus americana*, *Lindera benzoin*, *Staphylea trifolia*, *Tilia americana* var. *heterophylla*

Global: *Acer saccharum*, *Aesculus flava*, *Aristolochia macrophylla*, *Cystopteris bulbifera*, *Fraxinus americana*, *Lindera benzoin*, *Staphylea trifolia*, *Tilia americana* var. *heterophylla*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Collinsia verna* (G5, VA state-imperiled); **Invasive/Exotic Plants**: *Rosa multiflora* (Medium/Low), *Stellaria media* ssp. *media*, *Veronica hederifolia*

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (31-May-2007). The known distribution of this community is restricted to a small portion of the Central Appalachian / Ridge and Valley region. However, within that area the type is frequent and occasionally forms large patches. There are probably more than 100 occurrences within the known range and potentially many more.

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharum - Liriodendron tulipifera - Fraxinus americana / Staphylea trifolia* Forest (CEGL006201) of steep, rocky ephemeral creek bottoms on calcareous sandstone and shale in the Cumberland Mountains and Southern Ridge and Valley.
- *Acer saccharum - Tilia americana / Staphylea trifolia / Dryopteris marginalis - (Impatiens pallida)* Forest (CEGL006471) of more northern distribution in the Central Appalachians and Piedmont; an obligate boulderfield community that occupies boulder and talus slopes weathered from a variety of calcium-bearing sedimentary, metasedimentary and igneous rocks.

- *Aesculus flava - Acer saccharum - (Tilia americana var. heterophylla) / Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695) of fertile, sometimes rocky montane coves at higher elevations (610-1400 m [2000-4600 feet]) in the Southern Appalachians.
- *Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest (CEGL007710) of fertile, sometimes rocky montane coves and slopes, mostly at higher elevations (305-1375 m [1000-4500 feet]) on the Southern and Northern Blue Ridge and immediately adjacent Ridge and Valley.
- *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / (Magnolia tripetala)* Forest (CEGL005222) is a very similar community of fertile slopes in the western part of the Central Appalachians, the Western Allegheny Plateau, and Cumberland Plateau regions; possibly not as rich, nor restricted to sites underlain by carbonate rocks.
- *Tilia americana var. heterophylla - Fraxinus americana / Sanguinaria canadensis - (Aquilegia canadensis, Asplenium rhizophyllum)* Forest (CEGL007711) of steep, protected, fertile coves and slopes at low elevations (<610 m [2000 feet]) in the Southern Appalachians and adjacent upper Piedmont.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This association encompasses very rich forests of low-elevation coves and river-fronting slopes on limestone and dolomite of the Ridge and Valley province.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: Ordination studies demonstrate that it is separated from the more montane cove forests of this analysis at the high end of substrate and soil fertility gradients, where it is correlated with high pH, Ca, Mg, B, base saturation, and boulder cover. It contains a number of low-elevation, calciphilic species that are absent from, or uncommon in, the other rich cove types of the region, e.g., *Cystopteris bulbifera, Staphylea trifolia, Jeffersonia diphylla, Quercus muehlenbergii, Polymnia canadensis*, etc. (Fleming and Patterson 2009a).
Global Classification Comments: Virginia Natural Heritage have now inventoried and sampled many examples of this community in southwest Virginia, and although most sites are rocky, it is not always a "talus" forest but more of a general rich cove forest. Virginia has changed their state name to Southern Appalachian Limestone Rich Cove Forest. The classification was initially supported by analysis of data from eight plots as part of the National Capital Region Parks project. During this project, these plots were examined in a regional (Virginia, Maryland, West Virginia) dataset, along with other plots representing rich talus forest vegetation. The analysis supported this type as distinct from other Central Appalachian rich boulderfields. In a more recent regional analysis for the Appalachian Trail vegetation mapping project (1134 Southern Appalachian plots) (Fleming and Patterson 2009a) and a Virginia statewide analysis of upland montane forests and woodlands (1300 plots) (Fleming and Patterson 2009b), this association was represented by 24 plots from southwestern Virginia. Through extensive field work and these analyses, this type is currently treated as a concept that encompasses a range of substrate conditions, from boulderfields to deep soils.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs near the AT only along the New River at Bluff City, in Giles County, Virginia.
Global Range: The type is currently known only from carbonate rock districts in the west-central and southwestern Virginia portions of the Ridge and Valley province, extending into peripheral areas on the flanks of the Southern Blue Ridge and Cumberland Mountains. Since similar limestone valleys are found in adjacent areas of West Virginia, Kentucky, and Tennessee, occurrences in those states seem likely. Similar vegetation has been observed in southeastern West Virginia (D.P. Walton pers. comm.).
Nations: US
States/Provinces: VA:S3, WV
TNC Ecoregions: 50:C, 51:C, 59:C
USFS Ecoregions (1994/95): 221Ja:CCC, M221Aa:CCC, M221Ab:CCC, M221Ce:C??, M221Db:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians]); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FRVL
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 2 accuracy assessment points): APPA.0484, APPA_AA_0938, APPA_AA_1331.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d., Fleming 1999, Fleming 1999*, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004

A3304 *Tsuga canadensis - Liriodendron tulipifera* Forest Alliance

Alliance Summary Description: Forests in this alliance are acidic cove forests dominated by *Tsuga canadensis*, occurring with various hardwood species of mesic forests, including *Betula lenta, Fagus grandifolia, Fraxinus americana, Halesia tetraptera, Liriodendron tulipifera, Magnolia acuminata, Quercus rubra*, and *Tilia americana var. heterophylla*, and others. Common shrubs are *Kalmia latifolia, Leucothoe fontanesiana*, and *Rhododendron maximum*. Herbaceous cover is typically sparse and includes acid-loving species such as *Galax urceolata, Goodyera pubescens, Hexastylis* sp., *Polystichum acrostichoides, Thelypteris noveboracensis*, and *Tiarella cordifolia*. They are found primarily in the Southern Blue Ridge, but also ranging into widely scattered areas of the Interior Low Plateau and Cumberlands, where stands containing *Tsuga canadensis* may be notably disjunct from its main range in the north. These forests occur in deep coves, moist flats, and ravines but are occasionally found along larger stream bottoms, typically at elevations below 1068 m (3500 feet).

[CEGL007543] *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest

Translated Name: **Tuliptree - Sweet Birch - Eastern Hemlock / Great Laurel Forest**
Common Name: **Southern Appalachian Acidic Cove Forest (Typic Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Tsuga canadensis - Liriodendron tulipifera* Forest Alliance (A3304)

ELEMENT CONCEPT

Global Summary: This association includes hemlock-hardwood forests and acidic cove forests of lower to intermediate elevations in the Southern Blue Ridge, upper Piedmont, Cumberlands, and adjacent areas, ranging from southwestern Virginia and southern West Virginia, south and west to northwestern Georgia. The concept for this association is intended to be broad and cover both mixed stands of evergreen and deciduous hardwoods as well as stands dominated exclusively by deciduous trees in mesic, acidic environments. These communities occur at low to middle elevations (200-1060 m [650-3500 feet]), generally in coves, gorges or sheltered slopes, over acidic soils. The canopy is usually dominated by *Liriodendron tulipifera* or *Betula lenta* mixed with *Tsuga canadensis*, but substantial portions may be comprised mainly of *Tsuga canadensis* and the occasional *Acer rubrum*, while other sites may have little or no *Tsuga* in the canopy. Other deciduous species more typical of "rich" coves may occur as scattered individuals, including *Tilia americana var. heterophylla, Acer saccharum, Fraxinus americana*, and *Fagus grandifolia*. Other canopy/subcanopy species often include *Quercus alba, Quercus rubra, Magnolia fraseri*, and *Pinus strobus*. *Rhododendron maximum* is usually dominant in the shrub stratum, often forming impenetrable thickets. South of Virginia, woody associates may also include *Ilex opaca var. opaca, Calycanthus floridus, Halesia tetraptera var. tetraptera*, and *Leucothoe fontanesiana*. Herbaceous cover is sparse but can be diverse and is composed of acid-loving species. Typical herbs include *Polystichum acrostichoides, Dryopteris intermedia, Dennstaedtia punctilobula, Goodyera pubescens, Mitchella repens, Thelypteris noveboracensis, Galax urceolata, Viola rotundifolia*, and *Tiarella cordifolia*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This acidic cove forest is found at lower elevations (400-1,160 m [1,300-3,800 feet]) along lower slopes, creeks and in ravines. It was sampled at 8 locations in the southern Central Appalachian project area. Sites range from alluvial flats to mostly mid- and lower-slope coves. Soils are mesic silt loam, sandy loam and clay loam. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. In Virginia, the *Tsuga canadensis* component is being severely affected by hemlock woolly adelgid-related mortality.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This acidic cove forest is found at lower elevations (400-1,160 m [1,300-3,800 feet]) than other cove forests. Sites cover a full range of topography, including alluvial flats as well as moderate to very steep lower to upper slopes. Soils are likewise variable, the most common being moderately well- to well-drained loam, clay loam, sandy loam, and silt loam. The unvegetated surface is dominated by leaf litter with some downed wood and occasional large/small rocks and bare soil. Evidence of disturbance includes past logging, erosion, trails, and hemlock/fir adelgid and pine bark beetle damage.

Global Environment: This association is typically found at lower to intermediate elevations (200-1060 m [650-3500 feet]) in the Southern Appalachians and adjacent foothills as well as nearby plateau/gorge systems in West Virginia. Habitats are mesic and located on gentle to steep, lower slopes along creeks in ravines, in coves or gorges, and in concave positions on protected slopes with cool aspects and acidic soils. In situations where midslopes are in protected north-facing positions, this community can range very high up straight or even convex slopes. The type often occurs in linear patches along stream bottoms and in steep ravines in complexes with rich cove communities. Although frequently associated with streams, it is not a wetland. Soils collected from plots are extremely acidic (mean pH = 4.0) and infertile, with high iron and aluminum levels and very low total base saturation. Where present, they are usually well-drained sandy loam, silt loam, loam, clay loam, or clay. The degree of soil development is highly variable. Some stands have relatively deep colluvial or residual soils, while others have a substrate of deeply piled boulders with sparse interstitial, organic soils.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This cove forest has a variable canopy that is codominated by a mixture of *Liriodendron tulipifera, Betula lenta, Tsuga canadensis, Pinus strobus, Acer rubrum, Quercus rubra*, and/or *Quercus alba*. The relative proportion of *Tsuga canadensis* may vary greatly, with some sites having little or none in the canopy. *Rhododendron maximum* is the dominant shrub; *Acer pensylvanicum* and *Hamamelis virginiana* are also common shrubs. *Smilax rotundifolia* is a common vine. Common in the herb layer are *Mitchella repens, Polystichum acrostichoides*, and *Thelypteris noveboracensis*. Characteristic herbs include *Anemone quinquefolia var. quinquefolia, Carex laxiculmis var. laxiculmis, Viola blanda var. blanda*.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is dominated by species associated with acidic geology, such as *Liriodendron tulipifera, Betula lenta*, and *Tsuga canadensis*, and lacking those of nutrient-rich sites such as *Tilia americana, Fraxinus americana*, or *Aesculus flava*. Other common tree species are *Pinus strobus, Quercus alba, Quercus prinus*, and *Quercus rubra*. The herbaceous layer is usually dominated by ferns, with low to moderately high diversity and lacking species indicative of nutrient-rich soils. *Rhododendron maximum* dominates the sparse to dense shrub layer; other shrubs may include *Acer pensylvanicum, Amelanchier arborea, Hamamelis virginiana, Kalmia latifolia*, and *Pyrularia pubera*. The herbaceous layer is usually dominated by ferns, such as *Dennstaedtia punctilobula, Polystichum acrostichoides*, and *Thelypteris noveboracensis*, with low to moderately high diversity and lacking species indicative of nutrient-rich soils. Typical forbs include *Arisaema triphyllum, Eurybia divaricata, Goodyera pubescens, Medeola virginiana, Mitchella repens, Polygonatum biflorum, Solidago curtisii, Viola hastata*, and *Viola rotundifolia*.

Global Vegetation: This association encompasses hemlock-hardwood forests and acidic cove forests with canopies dominated by mixtures of *Tsuga canadensis, Liriodendron tulipifera, Betula lenta, Quercus rubra*, and *Acer rubrum*. The concept for this association is intended to be broad and cover both mixed stands of evergreen and deciduous hardwoods as well as stands dominated exclusively by deciduous trees. Presumably because of past logging, *Tsuga canadensis* is absent or confined to the understory in some stands, which have mixed canopies of *Liriodendron tulipifera, Betula lenta, Acer rubrum, Magnolia acuminata, Quercus rubra*, and/or *Nyssa sylvatica*. Other deciduous species more typical of fertile coves, including *Tilia americana var. heterophylla, Acer saccharum, Fraxinus americana*, and *Fagus grandifolia*, may occur as scattered individuals. Minor overstory and understory species include *Quercus alba, Quercus prinus, Magnolia fraseri, Magnolia tripetala, Oxydendrum arboreum, Prunus serotina*, and *Pinus strobus*. *Rhododendron maximum* is scattered to dominant in the shrub stratum often forming nearly impenetrable colonies. *Kalmia latifolia* is also a typical, but less abundant, shrub. In the southern

portion of this type's range, *Calycanthus floridus, Halesia tetraptera*, and *Leucothoe fontanesiana* may be common; these are lacking in Virginia and West Virginia occurrences, where *Hamamelis virginiana* and *Acer pensylvanicum* may be minor associates. Herbaceous cover is sparse but can be diverse and is composed of acid-loving species. Frequent low-cover species of this layer include *Arisaema triphyllum, Chimaphila maculata, Dioscorea quaternata, Dryopteris intermedia, Dryopteris marginalis, Eurybia divaricata (= Aster divaricatus), Galax urceolata, Gaultheria procumbens, Goodyera pubescens, Hexastylis* spp., *Luzula echinata, Monotropa uniflora, Medeola virginiana, Mitchella repens, Polypodium virginianum, Polystichum acrostichoides, Thelypteris noveboracensis, Tiarella cordifolia, Viola blanda*, and *Waldsteinia fragarioides*. The spectacular sedge *Cymophyllus fraserianus* is often associated with this forest. Bryophytes identified in West Virginia plots include *Leucobryum glaucum, Thuidium delicatulum, Hypnum imponens, Bazzania trilobata, Dicranum scoparium, Dicranum fulvum, Brotherella recurvans*, and *Polytrichum pallidisetum*.

Global Dynamics: In Virginia, the hemlock component of many stands has been devastated by outbreaks of hemlock woolly adelgid, resulting in extensive damage and mortality to the mature overstory trees.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula lenta*, *Liriodendron tulipifera*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*
Herb (field)	Flowering forb	*Mitchella repens*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*, *Dryopteris marginalis*, *Polystichum acrostichoides*, *Thelypteris noveboracensis*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Betula lenta*, *Liriodendron tulipifera*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula lenta*, *Liriodendron tulipifera*
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron maximum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Betula lenta*, *Liriodendron tulipifera*, *Rhododendron maximum*, *Tsuga canadensis*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Betula lenta*, *Dennstaedtia punctilobula*, *Liriodendron tulipifera*, *Medeola virginiana*, *Mitchella repens*, *Polystichum acrostichoides*, *Quercus rubra*, *Rhododendron maximum*, *Thelypteris noveboracensis*, *Tsuga canadensis*

Global: *Acer rubrum*, *Betula lenta*, *Dryopteris intermedia*, *Dryopteris marginalis*, *Galax urceolata*, *Leucothoe fontanesiana*, *Liriodendron tulipifera*, *Luzula echinata*, *Mitchella repens*, *Polystichum acrostichoides*, *Quercus rubra*, *Rhododendron maximum*, *Thelypteris noveboracensis*, *Tiarella cordifolia*, *Tsuga canadensis*, *Waldsteinia fragarioides*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Rhododendron minus* (G4, TN state-imperiled); **Invasive/Exotic Plants**: *Stellaria media* (Low, invasive/exotic)

Global: Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Betula uber* (G1Q), *Botrychium jenmanii* (G3G4), *Diervilla rivularis* (G3), *Hexastylis contracta* (G3), *Hexastylis naniflora* (G3), *Hexastylis rhombiformis* (G3), *Isotria medeoloides* (G2?), *Malaxis bayardii* (G1G2), *Monotropsis odorata* (G3), *Prenanthes roanensis* (G3), *Scutellaria saxatilis* (G3), *Shortia galacifolia* var. *brevistyla* (G3T2), *Shortia galacifolia* var. *galacifolia* (G3T2T3), *Trillium persistens* (G1G2), *Trillium pusillum* var. 1 (G3T2Q), *Trillium rugelii* (G3), *Vaccinium hirsutum* (G3), *Waldsteinia lobata* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (27-Sep-2004). Within its range, this community type occurs extensively in suitable mesic habitats. Occurrences are subject to compositional modification by outbreaks of hemlock woolly adelgid (*Adelges tsugae*), an exotic insect pest that causes decline and eventual mortality of *Tsuga canadensis*.

RELATED CONCEPTS

Global Similar Types:

- *Acer rubrum var. rubrum - Betula lenta - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Ruderal Forest (CEGL008558)
- *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861)
- *Pinus strobus - Tsuga canadensis / Rhododendron maximum - (Leucothoe fontanesiana)* Forest (CEGL007102)
- *Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest (CEGL006286)
- *Tsuga canadensis - (Fagus grandifolia, Tilia americana var. heterophylla) / Magnolia tripetala* Forest (CEGL008407)
- *Tsuga canadensis - Fagus grandifolia - Acer saccharum / (Hamamelis virginiana, Kalmia latifolia)* Forest (CEGL005043)
- *Tsuga canadensis - Halesia tetraptera - Magnolia fraseri / Rhododendron maximum / Dryopteris intermedia* Forest (CEGL007693)
- *Tsuga canadensis - Liriodendron tulipifera - Platanus occidentalis / Rhododendron maximum - Xanthorhiza simplicissima* Wet Forest (CEGL007143)
- *Tsuga canadensis - Quercus prinus - Liriodendron tulipifera / Kalmia latifolia - (Rhododendron catawbiense)* Forest (CEGL008512)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: The most constant species (≥64%), in order of descending constancy, are *Rhododendron maximum, Tsuga canadensis, Betula lenta, Acer rubrum, Liriodendron tulipifera, Quercus rubra, Mitchella repens, Polystichum acrostichoides*, and *Hamamelis virginiana*. Variable species richness is probably influenced by somewhat variable soil fertility and the variation in cover/density of evergreen *Rhododendron* shrub colonies. High canopy compositional variation may occur due to dramatic changes currently happening in this community as a result of hemlock losses.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This represents the typical acidic cove forest of the Southern Appalachians. Variable richness is probably influenced by somewhat variable soil fertility and especially variation in cover/density of evergreen *Rhododendron* shrub colonies.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: In Virginia, at least, the *Tsuga* component is being severely affected by adelgid-related mortality. If trends continue, this species may have to be made a parenthetical nominal in the future.
Global Classification Comments: Deciduous trees more typical of "rich" coves, such as *Aesculus flava, Tilia americana var. heterophylla*, and *Acer saccharum*, are present in this forest only as minor components, if at all. Likewise, rich-site herbs, such as *Actaea racemosa (= Cimicifuga racemosa), Caulophyllum thalictroides, Actaea pachypoda*, and *Adiantum pedatum*, are absent or nearly so. This forest is distinguished from "northern hardwood forests" by the lack of or near absence of *Fagus grandifolia, Betula alleghaniensis, Aesculus flava*, and the presence of low-elevation species, such as *Betula lenta* and *Liriodendron tulipifera*, and generally by a more depauperate herb layer. There is much variability in species composition in the 43 plots classified as this association from the Appalachian Trail region (Fleming and Patterson 2009a), but constancy of the nominal species was quite high (≥84%). The most constant species (≥64%), in order of descending constancy, are *Rhododendron maximum, Tsuga canadensis, Betula lenta, Acer rubrum, Liriodendron tulipifera, Quercus rubra, Mitchella repens, Polystichum acrostichoides*, and *Hamamelis virginiana*. Species richness in 400-m2 plots ranges from 11 to 72 species per plot. This variable richness is probably influenced by somewhat variable soil fertility and the variation in cover/density of evergreen *Rhododendron* shrub colonies. An interesting example from the Piedmont/Blue Ridge transition of Georgia (Cedar Creek Canyon, Chattahoochee National Forest) has high coverage of *Rhododendron minus* and other foothills/Piedmont species such as *Liquidambar styraciflua* and *Aesculus sylvatica*.

In the 900- to 1060-m (3000-3500 feet) elevational range, the type becomes transitional to *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861),

which lacks lower-elevation species such as *Liriodendron tulipifera* and *Galax urceolata*, and contains many species characteristic of higher elevations and northern latitudes.

Similar vegetation has been observed in coves of the Cumberland Mountains of southwestern Virginia (e.g., Clinch Ranger District: Dark Hollow, Roaring Branch, Pick Breeches and Flannery Ridges,) but comprehensive data are needed to determine whether these stands are part of this forest types or transitional to *Tsuga canadensis - (Fagus grandifolia, Tilia americana var. heterophylla) / Magnolia tripetala* Forest (CEGL008407). The latter unit apparently has an extensive distribution in the Cumberland Plateau of Kentucky and Tennessee, the Southern Ridge and Valley of Tennessee, and the Central Appalachians of West Virginia and southwestern Pennsylvania.

Element Distribution

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from Roanoke, Virginia, in the southern Central Appalachians south to Georgia in the Southern Blue Ridge. It was sampled in Virginia at Bluff City North, Brushy Mountain / Dismal Creek, Iron Spring Branch, Lick Creek, Pearis Mountain West, Pine Swamp Branch, and Vaught Branch.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is frequent in coves along and near the AT throughout the Southern Blue Ridge and Cumberlands and into southwestern Virginia. It was sampled in Chattahoochee National Forest in Georgia, in North Carolina and Tennessee, and at Feathercamp Ridge, Holston Mountain, Lost Mountain, and Whitetop Laurel Creek in Virginia.
Global Range: This community occurs in the Southern Blue Ridge and Cumberlands and peripherally in the upper Piedmont and southern Central Appalachians, ranging from southwestern Virginia and southeastern West Virginia south and west to northwestern Georgia.
Nations: US
States/Provinces: GA, NC:S4, SC, TN, VA:S4S5, WV:S5
TNC Ecoregions: 50:C, 51:C, 52:C, 59:C
USFS Ecoregions (1994/95): 221Hc:CCC, 221He:CCC, 231Aa:CCC, 231Ad:CCC, M221Aa:CCC, M221Ab:CCC, M221Be:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCP, M221Cd:CCC, M221Ce:CCC, M221Da:CC?, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Bluestone, Carl Sandburg Home, Gauley River, Great Smoky Mountains, New River Gorge, Obed River); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Monongahela, Nantahala, Pisgah, Sumter, Sumter (Mountains))

Element Sources

Appalachian National Scenic Trail Map-Class Code: FCHW, FSAH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (7 plots; 1 observation point; 3 accuracy assessment points): APPA.0098, APPA.0400, APPA.0493, APPA.0494, APPA.0500, APPA.0994, APPA.1020, APPA.1150, APPA_AA_0031, APPA_AA_0420, APPA_AA_1599.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (17 plots; 8 observation points; 29 accuracy assessment points): APPA.0254, APPA.0256, APPA.0262, APPA.0266, APPA.0412, APPA.0551, APPA.0580, APPA.0581, APPA.0613, APPA.0618, APPA.0626, APPA.0628, APPA.0629, APPA.0630, APPA.0639, APPA.0651, APPA.1004, APPA.1077, APPA.1086, APPA.1097, APPA.1102, APPA.1134, APPA.1135, APPA.1167, APPA.1170, APPA_AA_0061, APPA_AA_0142, APPA_AA_0221, APPA_AA_0248, APPA_AA_0283, APPA_AA_0379, APPA_AA_0581, APPA_AA_0626, APPA_AA_0698, APPA_AA_0792, APPA_AA_0834, APPA_AA_0856, APPA_AA_0921, APPA_AA_0948, APPA_AA_0960, APPA_AA_1025, APPA_AA_1065, APPA_AA_1109, APPA_AA_1140, APPA_AA_1156, APPA_AA_1193, APPA_AA_1306, APPA_AA_1324, APPA_AA_1349, APPA_AA_1376, APPA_AA_1379, APPA_AA_1474, APPA_AA_1520, APPA_AA_1563.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson, G. Fleming, P. Coulling, T. Govus, S.C. Gawler
References: Allard 1990, Eyre 1980, Fleming 2002b, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Gettman 1974, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Newell and Peet 1995, Patterson 1994, Patterson et al. 1994, Peet et al. unpubl. data, Perez pers. comm., Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schmalzer and

DeSelm 1982, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2008, Vanderhorst et al. 2010, WVNHP unpubl. data b, White 2003, Wood 1999

[CEGL008405] *Liriodendron tulipifera - Pinus strobus - (Tsuga canadensis) / Carpinus caroliniana / Amphicarpaea bracteata* Forest

Translated Name: **Tuliptree - Eastern White Pine - (Eastern Hemlock) / American Hornbeam / American Hog-peanut Forest**

Common Name: **Central Appalachian Montane Small-Stream Floodplain Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Tsuga canadensis - Liriodendron tulipifera* Forest Alliance (A3304)

Element Concept

Global Summary: This association comprises small-stream floodplain forests of the shale lowlands of Virginia's Ridge and Valley and parts of the Northern Blue Ridge. Sites encompass the bottoms and toeslope terraces of small, high-order, more-or-less high-gradient mountain streams at elevations less than 760 m (2500 feet). *Liriodendron tulipifera* and *Pinus strobus* are the most constant and abundant canopy trees, but *Tsuga canadensis, Quercus alba*, and *Betula lenta* are locally codominant. Many additional species occur as minor canopy or understory trees. *Carpinus caroliniana* and *Cornus florida* are dominant in the shrub layer. It has an extremely diverse though not particularly dense herbaceous stratum, with a mixture of wetland and upland species.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This small-stream floodplain forest occurs in the shale lowlands of Virginia's Ridge and Valley and parts of the Northern Blue Ridge. It was sampled at two locations in the park, both in the Central Appalachian project area. One site is a somewhat steep, north-facing slope with moderately well-drained soil; the other is a flat floodplain along Craig Creek on sandy clay alluvium weathered from shale. The unvegetated surface at the first site is a mix of exposed bedrock, large rocks, litter/duff, downed wood, and bare soil, while the other is dominated by litter/duff with some small rocks, downed wood, and bare soil. The first stand is described as an old-growth forest of ice- and wind-deformed trees. Other evidence of disturbance includes the presence of exotic species.

Global Environment: Sites encompass the bottoms and toeslope terraces of small, high-order, more-or-less high-gradient mountain streams at elevations less than 760 m (2500 feet). Hydrologic regime is probably similar to that reported for Passage and Mill creeks in the Massanutten Mountains, where annual water table fluctuations are dramatic and small-scale fluvial landforms greatly influence species distributions (Hupp 1982, 1986, Olson and Hupp 1986). The lowest terraces of these narrow bottoms are probably flooded briefly once a year, while higher terraces are inundated only during rare, catastrophic floods. Slope ranges from 0-10° and aspect is variable. Microtopography is complex and includes floodplains, terraces, fans at tributary hollow mouths, and various bank features. Coarse woody debris, boulders, and cobbles transported by flood events are usually prominent components of the surface substrate. Soils are highly variable and range from well-drained to poorly drained. Soils collected from plot-sampled stands were strongly acidic (mean pH = 5.2) with moderately low base status.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is typically dominated by *Liriodendron tulipifera* and *Pinus strobus*, with *Tsuga canadensis, Betula lenta*, and *Quercus alba* as associates. Other tree species may include *Acer rubrum, Acer saccharum, Carya ovata, Fraxinus americana, Platanus occidentalis*, and *Quercus velutina*. Common and/or abundant shrubs include *Carpinus caroliniana, Cornus florida*, and *Lindera benzoin*. Common vines include *Smilax rotundifolia, Parthenocissus quinquefolia* and *Toxicodendron radicans*. The diverse herb layer (up to 50 species have been recorded from a single plot) is dominated by *Amphicarpaea bracteata* and *Eurybia divaricata*. *Mitchella repens, Carex digitalis, Dichanthelium dichotomum var. dichotomum, Polystichum acrostichoides*, and *Dioscorea quaternata* are also common herbs.

Global Vegetation: Microtopographic diversity supports a wide range of mesophytic and wetland species, and contributes to notably high species richness (range = 46 to 122 taxa per 400 m2; mean = 73) in plot-sampled stands. *Liriodendron tulipifera* and *Pinus strobus* are the most constant and abundant canopy trees, but *Tsuga canadensis, Quercus alba*, and *Betula lenta* are locally codominant. Many additional species occur as minor canopy or

understory trees, including *Acer rubrum, Carya alba, Carya ovata, Carya cordiformis, Fraxinus americana, Juglans nigra, Magnolia acuminata, Platanus occidentalis, Quercus rubra*, and *Ulmus americana*. *Carpinus caroliniana* and *Cornus florida* are dominant in the shrub layer, frequently extending into the lowest (6-10 m tall) tree layer. Other characteristic shrubs are *Lindera benzoin, Hamamelis virginiana, Ostrya virginiana, Viburnum prunifolium, Viburnum acerifolium*, and *Asimina triloba*. Climbing lianas, including *Parthenocissus quinquefolia, Toxicodendron radicans, Smilax rotundifolia*, and *Vitis* spp., are often common. The herb layer is usually very diverse although not particularly dense or lush. Some of the more constant species in plot-sampled stands include *Amphicarpaea bracteata, Botrychium virginianum, Polystichum acrostichoides, Geranium maculatum, Eurybia divaricata (= Aster divaricatus), Desmodium nudiflorum, Actaea racemosa (= Cimicifuga racemosa), Galium triflorum, Stellaria pubera*, and *Arisaema triphyllum*. Herbs that are associated with more frequently flooded streambanks and other wet microhabitats include *Carex torta, Dichanthelium clandestinum, Glyceria striata, Impatiens capensis, Leersia virginica, Lycopus virginicus, Ranunculus recurvatus, Thalictrum pubescens, Verbesina alternifolia*, and *Viola cucullata*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera*
Tall shrub/sapling	Broad-leaved deciduous tree	*Carpinus caroliniana*, *Cornus florida*
Herb (field)	Liana	*Amphicarpaea bracteata*
Herb (field)	Flowering forb	*Eurybia divaricata*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera*
Tall shrub/sapling	Broad-leaved deciduous tree	*Carpinus caroliniana*, *Cornus florida*
Herb (field)	Flowering forb	*Eurybia divaricata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Amphicarpaea bracteata*, *Carpinus caroliniana*, *Cornus florida*, *Eurybia divaricata*, *Liriodendron tulipifera*, *Pinus strobus*, *Tsuga canadensis*
Global: *Amphicarpaea bracteata*, *Carex torta*, *Carpinus caroliniana*, *Clintonia umbellulata*, *Cornus florida*, *Goodyera pubescens*, *Liriodendron tulipifera*, *Pinus strobus*, *Viola hirsutula*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Elaeagnus umbellata* var. *parvifolia*, *Glechoma hederacea* (Low), *Microstegium vimineum* (High/Medium), *Prunus avium* (High/Low)
Global: Vulnerable Plants: *Anemone quinquefolia* var. *minima* (G5T3), *Tsuga caroliniana* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (1-Oct-2001). Although patch sizes are small, there are likely to be several hundred occurrences of this community type in Virginia alone.

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharum - Liriodendron tulipifera / Galium concinnum - Carex laxiculmis* Forest (CEGL006473)
- *Liriodendron tulipifera - Pinus strobus - Tsuga canadensis - Quercus rubra / Polystichum acrostichoides* Forest (CEGL006304) is an upland forest of acidic coves.
- *Liriodendron tulipifera - Platanus occidentalis - Betula lenta / Lindera benzoin / Circaea lutetiana ssp. canadensis* Floodplain Forest (CEGL006255) is a richer and more diverse small-stream floodplain forest of base-rich alluvium in the Northern Blue Ridge.
- *Tsuga canadensis - Liriodendron tulipifera - Platanus occidentalis / Rhododendron maximum - Xanthorhiza simplicissima* Wet Forest (CEGL007143) lacks abundant tulip poplar.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This type is a small-stream floodplain forest of metashale and shale landscapes in the Central Appalachians.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: In three studies of national forest landscapes conducted by Virginia Division of Natural Heritage ecologists (Fleming and Moorhead 1996, Rawinski et al. 1996, Fleming and Moorhead 2000), vegetation of small-stream floodplains had the highest species richness of any classified community type, as well as the single plot with the highest richness recorded in the Virginia mountains (Plot PM28, Peters Mountain, Alleghany County, n=122). Twelve plots were classified as this association in the Appalachian Trail classification study (Fleming and Patterson 2009a).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This forest association occurs on the shale lowlands of Virginia's Ridge and Valley and parts of the Northern Blue Ridge. It was sampled in Virginia along Jennings Creek in Botetourt County and along Craig Creek in Craig County.
Global Range: This community is widely but locally distributed in the Blue Ridge and Ridge and Valley regions of northwestern and west-central Virginia. Occurrences in Maryland, Pennsylvania, and West Virginia are likely.
Nations: US
States/Provinces: VA:S3, WV?
TNC Ecoregions: 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ab:CCC, M221Da:CCC, M221Db:CC?
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 plots; 2 accuracy assessment points): APPA.0344, APPA.0403, APPA_AA_0688, APPA_AA_0942.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming and P. Coulling
References: Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Hupp 1982, Hupp 1986, Olson and Hupp 1986, Rawinski et al. 1996, Southeastern Ecology Working Group n.d.*

[CEGL006304] *Liriodendron tulipifera - Pinus strobus - Tsuga canadensis - Quercus rubra / Polystichum acrostichoides* Forest

Translated Name: **Tuliptree - Eastern White Pine - Eastern Hemlock - Northern Red Oak / Christmas Fern Forest**
Common Name: **Central Appalachian Acidic Cove Forest (White Pine - Hemlock - Mixed Hardwoods Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Tsuga canadensis - Liriodendron tulipifera* Forest Alliance (A3304)

ELEMENT CONCEPT

Global Summary: This mixed hardwood - white pine - hemlock cove forest is widely but locally distributed in the southern part of the Central Appalachians in Virginia, West Virginia, and Maryland. It occurs on the lower slopes and bottoms of ravines and coves at lower elevations, generally below 915 m (3000 feet). Sites may be underlain by bedrock or colluvial and alluvial deposits of various sedimentary and metasedimentary rocks, granitic rocks, or metabasalt. Habitats are generally mesic with acidic soils of moderate or intermediate fertility. The overstory is codominated by variable mixtures of *Liriodendron tulipifera, Pinus strobus, Tsuga canadensis, Quercus rubra*, and *Quercus alba*. This forest generally has a moderate to strong evergreen component, but *Pinus strobus* varies from

widely scattered to codominant, and *Tsuga canadensis* has been greatly reduced by recent outbreaks of the hemlock woolly adelgid and may be restricted to the understory. Less frequent overstory associates include *Acer rubrum, Betula lenta, Carya* spp., *Fagus grandifolia, Fraxinus americana, Nyssa sylvatica*, and *Quercus prinus*. Characteristic understory species include *Acer pensylvanicum, Amelanchier arborea, Cercis canadensis, Cornus florida, Ostrya virginiana, Oxydendrum arboreum, Viburnum acerifolium, Rubus* spp., *Corylus americana, Hamamelis virginiana, Hydrangea arborescens*, and *Lindera benzoin*. The herb layer is usually patchy to moderately dense. Frequent patch-dominants include *Amphicarpaea bracteata, Dennstaedtia punctilobula, Eurybia divaricata*, and *Polystichum acrostichoides*. Other constant but low-cover herbs include *Botrychium virginianum, Desmodium nudiflorum, Dioscorea quaternata, Galium triflorum, Maianthemum racemosum ssp. racemosum, Mitchella repens*, and *Stellaria pubera*. Many additional herbs occur at low constancy.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This acidic cove forest occurs on the lower slopes and bottoms of ravines and coves at lower elevations, generally below 915 m (3,000 feet). It was sampled once in the park at 331 m elevation on a somewhat steep, broad south-facing lower slope on shale with well-drained soil. The unvegetated surface is dominated by leaf litter with some downed wood, small rocks and bare soil. Evidence of disturbance includes the presence of exotic plant species, logging, and damage from pine bark beetle and hemlock woolly adelgid.

Global Environment: This community occurs at lower elevations, generally below 915 m (3000 feet), on the lower slopes and bottoms of ravines and coves, extending to upper slopes, ridgetops, and rolling plateaus on parts of the Cumberland Plateau. Sites may be underlain by bedrock or colluvial and alluvial deposits of various metasedimentary rocks, granitic rocks, or metabasalt. Habitats are generally mesic with acidic soils of moderate or intermediate fertility. Soils are mostly well-drained, dry to moist sandy loam, sandy clay loam, silt loam, loam, and silty clay.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Tsuga canadensis* and *Pinus strobus* codominate the canopy. Canopy associates include *Quercus rubra, Quercus prinus*, and/or *Quercus alba*. *Liriodendron tulipifera* is often present. *Acer rubrum, Acer pensylvanicum, Amelanchier arborea, Cercis canadensis*, and/or *Cornus florida* are common tall shrubs and small trees. *Rhododendron maximum* is absent.

Global Vegetation: The overstory is codominated by variable mixtures of *Liriodendron tulipifera, Pinus strobus, Tsuga canadensis, Quercus rubra, Quercus velutina*, and *Quercus alba*. This forest generally has a moderate to strong evergreen component, but *Pinus strobus* varies from absent to widely scattered to codominant, and *Tsuga canadensis* has been greatly reduced in many areas by recent outbreaks of the hemlock woolly adelgid and may be restricted to the understory. Less frequent overstory associates include *Acer rubrum, Betula lenta, Carya alba, Carya glabra, Fagus grandifolia, Fraxinus americana, Nyssa sylvatica*, and *Quercus prinus*. The subcanopy is of variable cover and may include *Acer pensylvanicum, Acer rubrum, Amelanchier arborea, Cercis canadensis, Cornus florida, Ostrya virginiana, Oxydendrum arboreum, Nyssa sylvatica, Pinus strobus*, and *Tsuga canadensis*. The shrub layer is typically patchy or open and characterized by *Viburnum acerifolium, Rubus* spp., *Corylus americana, Hamamelis virginiana, Hydrangea arborescens, Ilex opaca*, and *Lindera benzoin*. The herb layer is usually patchy to moderately dense. Frequent patch-dominants include *Amphicarpaea bracteata, Dennstaedtia punctilobula, Eurybia divaricata*, and *Polystichum acrostichoides*. Other constant but low-cover herbs include *Botrychium virginianum, Desmodium nudiflorum, Dioscorea quaternata, Galium triflorum, Maianthemum racemosum ssp. racemosum, Medeola virginiana, Mitchella repens, Stellaria pubera, Viola hastata*, and *Dryopteris intermedia*. Many additional herbs occur at low constancy. Species richness of 34 Virginia and West Virginia plot samples ranges from 21 to 98 taxa per 400 square meters (mean = 57), with the WV plots decidedly less species-rich (WV mean=28.5 spp.; VA mean = 64 spp.).

Global Dynamics: Compositional variation in Central Appalachian mesic cove forests is strongly correlated with variation in soil chemistry, particularly calcium, magnesium, and total base saturation levels. Analyses of extensive regional plot data indicate that this community type occupies an intermediate position on the soil fertility gradient, on sites with acidic, moderately infertile to moderately fertile substrates.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Amphicarpaea bracteata*, *Liriodendron tulipifera*, *Maianthemum racemosum*, *Mitchella repens*, *Pinus strobus*, *Polystichum acrostichoides*, *Quercus alba*, *Quercus prinus*, *Tsuga canadensis*
Global: *Pinus strobus*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Rubus phoenicolasius* (Medium)
Global: Vulnerable Plants: *Panax quinquefolius* (G3G4, under collection pressure)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (25-Jan-2008). This community appears to be widely but locally distributed over a large part of the Central Appalachians in Virginia, West Virginia, and Maryland. The type frequently forms large patches in suitable mesic habitats, but mature, high-quality stands are uncommon due to extensive past logging and more recent biotic disturbances (e.g., hemlock woolly adelgid).

RELATED CONCEPTS

Global Similar Types:

- *Liriodendron tulipifera - Pinus strobus - (Tsuga canadensis) / Carpinus caroliniana / Amphicarpaea bracteata* Forest (CEGL008405) very similar but currently defined as a montane alluvial forest of small-stream floodplains.
- *Pinus strobus - Quercus alba - Quercus prinus / Vaccinium stamineum* Forest (CEGL008539) occurs on drier sites, primarily in the central Appalachian Ridge and Valley province and the Piedmont.
- *Pinus strobus - Tsuga canadensis / Acer pensylvanicum / Polystichum acrostichoides* Forest (CEGL006019) evergreen forest restricted to the northern part of the Central Appalachians.
- *Tsuga canadensis - Quercus prinus - Liriodendron tulipifera / Kalmia latifolia - (Rhododendron catawbiense)* Forest (CEGL008512) occurs in the same region but occupies extremely infertile coves, mostly on acidic granite, sandstone, and quartzite.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: *Rhododendron maximum* is absent from this community. This type has a strong *Pinus strobus* component and significantly higher herb richness due to its association with subacidic soils. High canopy compositional variation may occur due to dramatic changes currently happening in this community as a result of hemlock losses. For example, *Pinus strobus* is now the sole evergreen codominant or dominant in many stands. Even in stands unaffected by adelgid, the proportions of hemlock and white pine are highly variable.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: This association is represented by 35 Virginia plots, all of which have been analyzed in a statewide classification (>1300 plots) of montane upland forests and woodlands (Fleming and Patterson 2009b). Ten plots from the southern part of the Central Appalachians were classified as this association in the Appalachian Trail classification project (Fleming and Patterson 2009a).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is distributed in the southern part of the Central Appalachians from near Roanoke, Virginia, north to Maryland. It was sampled at Middle Creek, in Botetourt County, Virginia.
Global Range: This community occurs in the southern portion of the Central Appalachians of Maryland, West Virginia, and Virginia, extending to the adjacent Cumberland Plateau in West Virginia. It is rare in the western Piedmont foothills of Virginia, adjacent to the Blue Ridge.
Nations: US
States/Provinces: MD, OH, VA:S4, WV
TNC Ecoregions: 49:C, 50:C, 52:C, 59:C
USFS Ecoregions (1994/95): 231Ak:CCC, M221Aa:CCC, M221Ab:CCC, M221Bd:CCC, M221Be:CCC, M221Ca:CCC, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Cuyahoga Valley, Shenandoah); USFS (George Washington, Jefferson, Monongahela, Wayne)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCWH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 7 accuracy assessment points): APPA.0345, APPA_AA_0116, APPA_AA_0134, APPA_AA_0402, APPA_AA_0411, APPA_AA_0442, APPA_AA_0835, APPA_AA_0940.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and S.C. Gawler
References: CAP pers. comm. 1998, Eastern Ecology Working Group n.d.*, Fleming 2002b, Fleming and Coulling 2001, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Harrison 2004, Harrison 2011, Vanderhorst et al. 2010, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL007102] *Pinus strobus - Tsuga canadensis / Rhododendron maximum - (Leucothoe fontanesiana)* Forest

Translated Name: **Eastern White Pine - Eastern Hemlock / Great Laurel - (Highland Doghobble) Forest**
Common Name: **Southern Appalachian Eastern Hemlock Forest (White Pine Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Tsuga canadensis - Liriodendron tulipifera* Forest Alliance (A3304)

ELEMENT CONCEPT

Global Summary: This community occurs on creek and river margins and on lower or protected slopes. This association occurs in the Southern Blue Ridge and extends into adjacent ecoregions, such as the Cumberlands of Kentucky and Tennessee. This forest vegetation has a canopy dominated by *Pinus strobus*, sometimes codominating with *Tsuga canadensis*, occurring over a shrub stratum dominated by *Rhododendron maximum*. This is an evergreen forest, but deciduous trees may form a minor part of the canopy. Other minor canopy species may include *Liriodendron tulipifera, Betula lenta, Magnolia fraseri* (within its range), *Acer rubrum*, and *Tilia americana var. heterophylla*. Other shrub species may include *Kalmia latifolia, Leucothoe fontanesiana, Lindera benzoin*, and *Ilex opaca var. opaca*. Herbaceous cover is typically sparse. The Kentucky examples lack *Leucothoe fontanesiana* and have *Magnolia macrophylla* rather than *Magnolia fraseri*. Large stems of *Smilax rotundifolia* may be present in stands of this vegetation.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This acidic white pine - hemlock forest is largely restricted to lower slopes, coves, gorges, and stream and river margins below 915 m (3,000 feet). It was sampled at four locations in the park on sites that range from flat to gently sloping coves and lower slopes with mesic, moderately well- to well-drained clay loam, loam, sandy loam, and silt loam soils. Leaf litter with

some downed wood and occasional small rocks and bare soil cover the ground surface where vegetation is absent. Evidence of disturbance includes past logging, pine bark beetle damage, and wind/ice damage.
Global Environment: This community occurs on creek and river margins and on lower or protected slopes, at elevations below 915 m (3000 feet) in the southern Appalachian Mountains, including the Cumberland Mountains of Kentucky and Tennessee.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The moderately dense (60-70% cover) canopy and subcanopy are dominated almost exclusively by evergreen conifers *Pinus strobus* and *Tsuga canadensis*. Additional tree species may include *Acer rubrum, Halesia tetraptera var. monticola, Ilex opaca, Liriodendron tulipifera, Quercus alba*, and *Quercus prinus*. The shrub layers are dominated by *Rhododendron maximum*. Other common shrubs can include *Gaylussacia ursina, Halesia tetraptera var. monticola*, and *Kalmia latifolia*. *Tsuga canadensis* is also common in the shrub layer. Herbs are generally sparse to absent but when present include *Dennstaedtia punctilobula, Medeola virginiana, Thelypteris noveboracensis*, and *Viola* spp.
Global Vegetation: This forest vegetation has a canopy dominated by *Pinus strobus*, sometimes codominating with *Tsuga canadensis*, occurring over a shrub stratum dominated by *Rhododendron maximum*. This is an evergreen forest, with evergreen species dominating in all strata, but deciduous trees may form a minor part of the canopy. Other minor canopy or subcanopy species may include *Liriodendron tulipifera, Betula lenta, Magnolia fraseri* (within its range), *Acer rubrum, Quercus alba, Oxydendrum arboreum*, and *Tilia americana var. heterophylla*. Other shrub species may include *Kalmia latifolia, Leucothoe fontanesiana, Lindera benzoin, Hamamelis virginiana*, and *Ilex opaca var. opaca*. Herbaceous cover is typically sparse. Typical herbs include *Thelypteris noveboracensis, Chimaphila maculata, Mitchella repens, Polystichum acrostichoides, Medeola virginiana, Galax urceolata*, and *Tiarella cordifolia*. Kentucky Cumberland examples lack *Leucothoe fontanesiana* and have *Magnolia macrophylla* rather than *Magnolia fraseri*. Large stems of *Smilax rotundifolia* may be present in stands of this vegetation.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron maximum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Leucothoe fontanesiana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Dennstaedtia punctilobula*, *Gaylussacia ursina*, *Halesia tetraptera* var. *monticola*, *Kalmia latifolia*, *Liriodendron tulipifera*, *Pinus strobus*, *Rhododendron maximum*, *Tsuga canadensis*
Global: *Leucothoe fontanesiana*, *Pinus strobus*, *Rhododendron maximum*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Gaylussacia brachycera* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543) is a mixed to deciduous acidic cove forest of the Southern Appalachians.
- *Pinus strobus - Tsuga canadensis / Acer pensylvanicum / Polystichum acrostichoides* Forest (CEGL006019)
- *Tsuga canadensis - (Fagus grandifolia, Tilia americana var. heterophylla) / Magnolia tripetala* Forest (CEGL008407) is an evergreen to mixed acidic cove forest of the Cumberland Mountains, Cumberland Plateau, and Southern Ridge and Valley.
- *Tsuga canadensis - Liriodendron tulipifera - Platanus occidentalis / Rhododendron maximum - Xanthorhiza simplicissima* Wet Forest (CEGL007143) occurs on broad, regularly inundated floodplains.

- *Tsuga canadensis / Rhododendron maximum - (Clethra acuminata, Leucothoe fontanesiana)* Forest (CEGL007136) is dominated by *Tsuga canadensis*.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: The most constant species (≥64%) in 11 plots classified as this association in the Appalachian Trail analysis (Fleming and Patterson 2009a), in order of descending constancy, are *Tsuga canadensis, Pinus strobus, Rhododendron maximum, Acer rubrum, Oxydendrum arboreum, Quercus alba, Liriodendron tulipifera, Ilex opaca var. opaca, Kalmia latifolia*, and *Gaylussacia ursina*. Species richness ranges from 18 to 29 species in 1000-m2 plots. All plots are from the Great Smoky Mountains or Chattahoochee National Forest.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: Characterized by strong evergreen dominance in all layers. Environmental differences with Southern Appalachian Acidic Cove Forest (Typic Type) (CEGL007543) are obscure.
Global Classification Comments: This association is distinguished by a strong evergreen dominance in all strata and the importance of *Pinus strobus* in the canopy. Forests (included here) in the Cumberlands of Kentucky lack *Leucothoe fontanesiana* and have *Magnolia macrophylla* rather than *Magnolia fraseri*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Very local in southernmost part of the Southern Appalachians; it rarely intersects the AT corridor. All plots are from Chattahoochee National Forest in Georgia.
Global Range: This community occurs in the Southern Blue Ridge, but extends into adjacent Cumberland Plateau or Ridge and Valley.
Nations: US
States/Provinces: GA, KY, NC, SC, TN, VA?
TNC Ecoregions: 50:C, 51:C
USFS Ecoregions (1994/95): 221Hc:CCC, 221He:CCC, 222Eo:CCC, M221Be:CPP, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Great Smoky Mountains, Obed River); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FHWO
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: One plot occurs in an old-growth hemlock stand (possibly virgin) with *Tsuga canadensis* trees having dbh >1 m and trees over 30 m tall. In general many *Pinus strobus* are succumbing to old age and possible pine beetle damage.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (3 plots; 1 observation point; 13 accuracy assessment points): APPA.0533, APPA.0534, APPA.0535, APPA.0552, APPA_AA_0215, APPA_AA_0385, APPA_AA_0664, APPA_AA_0891, APPA_AA_0896, APPA_AA_0939, APPA_AA_1174, APPA_AA_1178, APPA_AA_1198, APPA_AA_1380, APPA_AA_1420, APPA_AA_1464, APPA_AA_1490.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson, C.W. Nordman
References: Allard 1990, CAP pers. comm. 1998, Eyre 1980, Fleming and Patterson 2009a, Patterson 1994, Peet et al. unpubl. data, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

[CEGL003819] *Rhododendron maximum* Upland Scrub

Translated Name: **Great Laurel Upland Scrub**
Common Name: **Montane Rhododendron Thicket**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Tsuga canadensis - Liriodendron tulipifera* Forest Alliance (A3304)

ELEMENT CONCEPT

Global Summary: This community occurs along streams and on protected slopes in the mountains of North Carolina, Tennessee, South Carolina, Georgia, West Virginia, and Kentucky. It can also occur on xeric ridges and sideslopes, or sites which have been subjected to extreme crown fires or other catastrophic disturbance that has removed the canopy. It is a broad-leaved, evergreen shrubland, dominated by *Rhododendron maximum* which forms a continuous, dense shrub canopy up to 5 m tall. *Kalmia latifolia, Rhododendron minus*, and *Rhododendron catawbiense* may also occur as components of the shrub stratum. Shrub vegetation beneath the upper shrub canopy may be open to dense depending on the stand's age and topographic setting. The ground layer is dominated by leaf litter or bare soil, although scattered herbs and woody seedlings do occur. Seedlings and saplings of *Rhododendron maximum, Acer rubrum, Betula lenta, Betula alleghaniensis*, and *Tsuga canadensis* are common and typical herbs include *Dryopteris intermedia, Heuchera villosa, Viola* spp., *Thelypteris noveboracensis, Listera smallii*, and *Galax urceolata*. This shrubland is typical along streams and on mesic, unexposed, often north-facing slopes at elevations of approximately 300-1100 m (1000-3000 feet), but can also occur on steep slopes and ridges where natural disturbances have removed the canopy. Soils supporting this community are typically acidic. Occurrences at edges of streams may flood during rainy seasons. This community can occur as the result of disturbance and will succeed to forest with an ericaceous understory without some form of disturbance. This community may have scattered woody species that are greater than 5 m tall but with generally less than 10% total cover.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: These montane shrublands are generally found in areas where tree canopy has died out or been blown down. The single sampled stand is located on a very steep, northwest-facing summit with well-drained peat soil. The unvegetated surface is made up almost entirely of leaf litter with some wood. Evidence of disturbance includes wind/ice damage.
Global Environment: This community occurs along streams and on mesic, unexposed, often north-facing slopes at elevations of approximately 300-1100 m (1000-3000 feet). Soils supporting this community are typically acidic. Occurrences at edges of streams may flood during rainy seasons. It can occur at higher elevations on steep slopes and ridges where extreme crown fires or other catastrophic disturbance have removed the canopy.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The continuous cover (100%) of tall shrubs is dominated almost exclusively by *Rhododendron maximum*. Additional shrubs do include *Kalmia latifolia, Vaccinium simulatum*, and the short shrub *Gaylussacia ursina*. In addition, there may be scattered emergent (5-10 m) trees of *Acer rubrum, Quercus coccinea, Quercus prinus*, and *Quercus rubra*. No herbs are present under the dense canopy.
Global Vegetation: This evergreen, sclerophyllous shrubland is dominated by *Rhododendron maximum* which forms a continuous, dense shrub canopy up to 5 m tall. *Kalmia latifolia, Rhododendron minus*, and *Rhododendron catawbiense* may also occur as components of the shrub stratum. Shrub vegetation beneath the upper shrub canopy may be open to dense depending on the stand's age and topographic setting. Species such as *Tsuga canadensis, Pinus strobus, Acer rubrum, Betula lenta*, and *Liriodendron tulipifera* in the tree canopy stratum make up less than 10% cover. The ground layer is dominated by leaf litter or bare soil although scattered herbs and woody seedlings do occur. Seedlings and saplings of *Rhododendron maximum, Acer rubrum, Betula lenta, Betula alleghaniensis*, and *Tsuga canadensis* are common, and typical herbs include *Dryopteris intermedia, Heuchera villosa, Viola* spp., *Thelypteris noveboracensis, Listera smallii*, and *Galax urceolata*.
Global Dynamics: *Rhododendron maximum* sprouts vigorously after disturbance, and this community often results from logging, fire, chestnut blight, or cessation of grazing. Stems greater than 4 cm in diameter survive hot fires, and fire generally stimulates basal sprouting, although intense annual fires may suppress reestablishment (Core 1966). Drastic overstory removal, heavy shading, and disease have been found to decrease the density of or kill *Rhododendron* (Hodgdon and Pike 1961).

This shrubland will become established by invading disturbed or cleared lands if there is adequate moisture and lack of direct sunlight. This community can also result from secondary succession when a forest's canopy is removed (by logging, disease, etc.) and the *Rhododendron* understory closes, forming a dense shrubland. The

reestablishment of woody competitors is inhibited by the shade of the dense shrub canopy as well as by phytotoxins in the litter and soil (Gant 1978). *Rhododendron maximum* Shrubland may persist for over 60 years on a site (Plocher and Carvell 1987) but will succeed to a forested community as trees that become established in thicket openings mature.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron maximum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Rhododendron maximum*
Global: *Rhododendron maximum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3?Q (14-Dec-1998). This association is of uncertain validity and, even if valid, is of uncertain circumscription.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This community was sampled in Nantahala Gorge at The Jump Up (Nantahala National Forest) in North Carolina.
Global Classification Comments: This *Rhododendron maximum* shrubland frequently occurs adjacent to wet herbaceous cliff vegetation, riparian shrublands, or within forests dominated by *Tsuga canadensis, Quercus rubra, Liriodendron tulipifera, Pinus strobus, Quercus prinus, Picea rubens*, or *Abies fraseri*. Similar ericaceous shrublands occur at higher elevations, over 1100 meters (3500 feet), in the southern Appalachian Mountains. These high-elevation "heath balds" are distinguished from *Rhododendron maximum* Upland Shrubland by the dominance of *Rhododendron catawbiense* or by the occurrence of ericaceous shrubs typical of high-elevation environments such as *Leiophyllum buxifolium, Menziesia pilosa*, and *Photinia melanocarpa (= Aronia melanocarpa)*. Disjunct populations of *Rhododendron maximum* are found in Maine and New Hampshire, but these populations may represent a different community (Hodgdon and Pike 1961). Similar vegetation has been observed at 1400 m (4600 feet) elevation on Beartown Mountain (Tazewell County, Virginia), where historical logging and subsequent fires burned *Picea / Rhododendron* forests, consuming the organic soil and exposing bare rock. Today this site has large areas of dense *Rhododendron maximum* on ridgecrests and upper slopes, with an occasional spruce tree growing above the shrubs and some shrub-sized spruce regeneration intermixed. These areas are currently treated as a disturbance stage of *Picea rubens - (Betula alleghaniensis, Aesculus flava) / Rhododendron (maximum, catawbiense)* Forest (CEGL004983).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled in Nantahala Gorge at The Jump Up (Nantahala National Forest) in North Carolina.
Global Range: This community occurs in the Southern Blue Ridge, but may be possible throughout the range of *Rhododendron maximum*.
Nations: US
States/Provinces: GA, NC, SC, TN, VA?
TNC Ecoregions: 49:P, 51:C
USFS Ecoregions (1994/95): 221E:PP, M221A:CC, M221B:CC, M221C:CC, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SMBT
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 6 accuracy assessment points): APPA.0619, APPA_AA_0232, APPA_AA_0814, APPA_AA_0868, APPA_AA_0941, APPA_AA_1185, APPA_AA_1329.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo
Global Description Author(s): K.D. Patterson
References: Allard 1990, Core 1966, Fleming and Patterson 2009a, Gant 1978, Hodgdon and Pike 1961, McGee and Smith 1967, Monk et al. 1985, Nelson 1986, Phillips and Murdy 1985, Plocher and Carvell 1987, Rawinski 1992, Schafale 1998b, Schafale 2012, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

[CEGL007693] *Tsuga canadensis - Halesia tetraptera - Magnolia fraseri / Rhododendron maximum / Dryopteris intermedia* Forest

Translated Name: **Eastern Hemlock - Mountain Silverbell - Mountain Magnolia / Great Laurel / Intermediate Woodfern Forest**
Common Name: **Southern Appalachian Acidic Cove Forest (Silverbell Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Tsuga canadensis - Liriodendron tulipifera* Forest Alliance (A3304)

ELEMENT CONCEPT

Global Summary: This association includes forests dominated by *Tsuga canadensis* and *Halesia tetraptera var. monticola*, occurring in restricted montane areas of western North Carolina and eastern Tennessee. This forest is found on protected, lower slopes and coves at elevations of 854 to 1403 m (2800-4600 feet). The most important canopy trees are *Tsuga canadensis* and *Halesia tetraptera var. monticola*, although *Magnolia fraseri* or *Fagus grandifolia* can have high canopy coverage in some examples. Some occurrences have dense, tall-shrub strata dominated by *Rhododendron maximum*, while other occurrences have a more open shrub stratum with greater herbaceous cover, often dominated by *Dryopteris intermedia*. Other subcanopy/shrub species may include *Acer pensylvanicum, Acer saccharum, Acer rubrum, Amelanchier laevis, Betula alleghaniensis, Betula lenta*, and *Prunus pensylvanica*. Other common herbaceous species include *Mitchella repens, Medeola virginiana, Polystichum acrostichoides, Solidago curtisii (= Solidago caesia var. curtisii), Viola blanda*, and *Viola hastata*. *Rubus canadensis* is also common. This community is distinguished from *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543) by not having *Liriodendron tulipifera* as an important component and by generally occurring at higher elevations (over 915 m [3000 feet]). This community is distinguished from *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861) by occurring on more protected sites and having more diverse tree and herb strata.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This acidic cove forest is found at higher elevations (850-1,400 m [2,800-4,600 feet]). Sites are somewhat steep to steep mid and upper slopes with mesic, well-drained sandy loam and silt loam soils. The unvegetated surface is dominated by leaf litter with some downed wood. Evidence of disturbance includes hemlock death due to hemlock woolly adelgid.
Global Environment: This association includes forests dominated by *Tsuga canadensis* and *Halesia tetraptera var. monticola*, occurring in restricted montane areas of western North Carolina and eastern Tennessee. This forest is found on protected, lower slopes and coves at elevations of 854 to 1403 m (2800-4600 feet).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The most important canopy trees are *Tsuga canadensis* and *Halesia tetraptera var. monticola*, although *Magnolia fraseri* or *Fagus grandifolia* can have high canopy coverage in some examples. *Acer saccharum, Acer rubrum, Liriodendron tulipifera, Tilia americana var. heterophylla*, and *Oxydendrum arboreum* may also be present. Some occurrences have the tall-shrub stratum dominated by *Rhododendron maximum*, while others are more open and often with understories dominated by *Dryopteris intermedia*. Common herbs include *Eurybia divaricata, Arisaema triphyllum, Athyrium filix-femina*

ssp. asplenioides, Dennstaedtia punctilobula, Laportea canadensis, Polygonatum biflorum, Polystichum acrostichoides, Solidago curtisii, Tiarella cordifolia, and *Viola rotundifolia*.
Global Vegetation: The most important canopy trees are *Tsuga canadensis* and *Halesia tetraptera var. monticola*, although *Magnolia fraseri* or *Fagus grandifolia* can have high canopy coverage in some examples. Some occurrences have dense, tall-shrub strata dominated by *Rhododendron maximum*, while other occurrences have a more open shrub stratum with greater herbaceous cover, often dominated by *Dryopteris intermedia*. Other subcanopy/shrub species may include *Acer pensylvanicum, Acer saccharum, Acer rubrum, Amelanchier laevis, Betula alleghaniensis, Betula lenta*, and *Prunus pensylvanica*. Other common herbaceous species include *Mitchella repens, Medeola virginiana, Polystichum acrostichoides, Solidago curtisii (= Solidago caesia var. curtisii), Viola blanda*, and *Viola hastata*. *Rubus canadensis* is also common.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Halesia tetraptera* var. *monticola*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Halesia tetraptera* var. *monticola*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer saccharum*, *Dennstaedtia punctilobula*, *Dryopteris intermedia*, *Halesia tetraptera* var. *monticola*, *Tsuga canadensis*
Global: *Acer saccharum*, *Dryopteris intermedia*, *Halesia tetraptera* var. *monticola*, *Mitchella repens*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Rugelia nudicaulis* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (29-Sep-2004). This community is uncommon and geographically restricted to the Great Smoky Mountains, Tennessee, and to Joyce Kilmer Wilderness in western North Carolina. Occurrences are subject to compositional modification by outbreaks of hemlock woolly adelgid (*Adelges tsugae*), an exotic insect pest that causes decline and eventual mortality of *Tsuga canadensis*.

RELATED CONCEPTS

Global Similar Types:
- *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861)
- *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: All occurrences along the AT are in the Great Smoky Mountains in North Carolina.
Global Classification Comments: In an analysis of more than 1100 Southern Appalachian plots for the Appalachian Trail vegetation mapping project, 14 plots from Great Smoky Mountains National Park classified as this type, forming a strong, compositionally cohesive group that was distinct from other cove forest types (Fleming and Patterson 2009a).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: All occurrences along the AT are in the Great Smoky Mountains in North Carolina.
Global Range: This association occurs in restricted montane areas of western North Carolina and eastern Tennessee.
Nations: US
States/Provinces: NC:S1, TN
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains); USFS (Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FSAH
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (3 observation points; 1 accuracy assessment point): APPA.1109, APPA.1110, APPA.1111, APPA_AA_0389.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson, G. Fleming and P. Coulling
References: Fleming and Patterson 2009a, Golden 1974, Newell et al. 1997, Peet et al. unpubl. data, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

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[CEGL006923] *Tsuga canadensis - Quercus prinus - Betula lenta* Forest

Translated Name: **Eastern Hemlock - Chestnut Oak - Sweet Birch Forest**
Common Name: **Central Appalachian Hemlock - Chestnut Oak Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Tsuga canadensis - Liriodendron tulipifera* Forest Alliance (A3304)

ELEMENT CONCEPT

Global Summary: This association is a hemlock - mixed oak forest which often occurs on steep northeastern to northwestern exposures. It ranges from the New Jersey Highlands south to the Blue Ridge, Ridge and Valley, Cumberlands, and Piedmont provinces of Maryland and West Virginia. Occurrences in West Virginia are known from the Bluestone River Gorge and are likely elsewhere. Stands occur at elevations from 150 m to about 750 m (500-2500 feet) on moderately to very steep, sheltered slopes. Northerly aspects and middle slope positions prevail among documented examples. Some sites are "boulderfields" with up to 60% cover by large rocks. Geologic substrate is variable. Soils are usually very stony to extremely stony sandy loams, consistently oligotrophic, with very low pH and base status. Stands of this association are typically floristically depauperate and generally dominated by variable combinations of *Quercus prinus* and *Tsuga canadensis*. *Betula lenta* and, less commonly, *Quercus velutina, Quercus coccinea*, and *Quercus rubra* are major overstory associates, each attaining codominance in a subset of stands. *Quercus alba, Acer rubrum, Liriodendron tulipifera, Pinus strobus, Sassafras albidum*, and *Fagus grandifolia* are minor overstory associates. Small trees and shrubs can be absent or sparse due to dense shading by hemlock, with *Hamamelis virginiana* most consistently providing moderate cover. Less frequently, *Kalmia latifolia, Rhododendron maximum*, and *Viburnum acerifolium* are shrub components. At some New Jersey sites, a single dense stratum or multiple open strata of ericaceous species can develop, including *Rhododendron maximum, Kalmia latifolia, Gaylussacia baccata*, and *Vaccinium pallidum*. The herb layer of this community is typically very sparse or absent; typical scattered species include *Maianthemum canadense, Dennstaedtia punctilobula, Chimaphila maculata, Deschampsia flexuosa, Carex swanii*, and *Aralia nudicaulis*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This hemlock - chestnut oak forest occurs on moderately steep sheltered slopes with northeastern to northwestern exposures at lower elevations from 150 m to about 750 m (500-2,500 feet). It was sampled once in the Central Appalachian project area

on a low flat with moderately well-drained sandy loam soil. The unvegetated surface is dominated by leaf litter with some downed wood. Evidence of disturbance includes heavy hemlock woolly adelgid damage resulting in canopy thinning.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This hemlock - mixed oak forest occurs on moderately steep sheltered slopes with northern exposures at lower elevations, globally ranging from 170-880 m (550-2,900 feet), from the New Jersey Highlands south to the Central Appalachians. Sites are dry gentle to steep mid and upper slopes, ridges and rock outcrops with mostly northern aspects. Soils are well-drained silt loam, loam and sandy loam. The unvegetated surface consists of leaf litter, with lesser amounts of exposed bedrock, large/small rocks, bare soil, and/or downed wood. Evidence of disturbance includes hemlock mortality and a minor presence of exotic plants.

Global Environment: Stands occur at elevations from 150 m to about 750 m (500-2500 feet) on moderately to very steep, sheltered slopes. Northern to northwestern aspects and middle slope positions prevail among documented examples. Some sites are "boulderfields" with up to 60% cover by large rocks; some appear above or below cliff bands. Geologic substrate is variable but includes shales and sandstone. Soils are usually very stony to extremely stony sandy loams, consistently oligotrophic, with very low pH and base status. Soils in eight West Virginia plots in the environs of Bluestone National Scenic River are described as dry to somewhat moist, well-drained, stone-free to very stony sandy loam, silt loam, sandy silt loam, and sandy clay loam; they tested extremely to medium acidic (mean pH = 4.4) with relatively high levels of organic matter, estimated N release, S, Al, B, and Fe and relatively low levels of Ca, Cu, K, Mg, Mn, P, and Zn compared to average values in the area.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus prinus, Quercus rubra*, and/or *Quercus alba* are codominant with *Tsuga canadensis* in the canopy. *Pinus strobus* and/or *Liriodendron tulipifera* may be common in some stands. *Betula lenta, Acer rubrum, Sassafras albidum*, and/or *Tsuga canadensis* are common in the subcanopy. *Hamamelis virginiana* is dominant in the shrub layer. *Rhododendron maximum, Kalmia latifolia*, and/or *Vaccinium pallidum* may be present. The herbaceous layer is sparse due to *Tsuga canadensis* cover and a thick hemlock needle layer.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Quercus prinus* is codominant with *Tsuga canadensis*, and *Quercus rubra* is an overstory associate. *Betula lenta, Acer rubrum*, and *Tsuga canadensis* are common in the subcanopy. *Rhododendron maximum* (rare in the north) and/or *Kalmia latifolia* are common tall shrubs; *Vaccinium pallidum* is a common short shrub. Herbs are sparse.

Global Vegetation: This association is a hemlock - mixed oak forest dominated by *Tsuga canadensis* in association with species of *Quercus* and other deciduous trees indicative of relatively dry, infertile soils. Stands are typically floristically depauperate and generally dominated by variable combinations of *Quercus prinus* and *Tsuga canadensis*. *Betula lenta* and, less commonly, *Quercus velutina, Quercus coccinea, Quercus alba*, and *Quercus rubra* are major overstory associates, each attaining codominance in a subset of stands. *Acer rubrum, Liriodendron tulipifera, Pinus strobus, Sassafras albidum*, and *Fagus grandifolia* are very minor overstory associates. *Oxydendrum arboreum* and *Acer saccharum*, along with overstory species, may be present in the subcanopy. Small trees and shrubs are often absent or sparse due to dense shading by hemlock, with *Hamamelis virginiana* most consistently providing moderate cover. Less frequently, *Kalmia latifolia, Rhododendron maximum, Vaccinium pallidum, Amelanchier arborea*, and *Viburnum acerifolium* are shrub components. At some New Jersey sites, a single dense stratum or multiple open strata of ericaceous species can develop, including *Rhododendron maximum, Kalmia latifolia, Gaylussacia baccata*, and *Vaccinium pallidum*. The herb layer of this community is typically very sparse or absent with scattered individuals of a few species; typical species vary somewhat with geography and include *Maianthemum canadense, Dennstaedtia punctilobula, Dioscorea quaternata, Chimaphila maculata, Deschampsia flexuosa, Dryopteris marginalis, Chimaphila maculata, Carex swanii, Eurybia divaricata, Goodyera pubescens, Gaultheria procumbens, Mitchella repens, Monotropa hypopithys, Monotropa uniflora, Parthenocissus quinquefolia*, and *Aralia nudicaulis*. In nine West Virginia plots, vascular plant richness ranged from 16 to 43 (mean = 26.5) species per 400-square-meter plot.

Global Dynamics: Extensive hemlock mortality caused by hemlock woolly adelgid (*Adelges tsugae*) is changing the composition of many of these forests. Most Maryland stands are now in a degraded condition, and some have suffered virtually complete hemlock mortality. In Bluestone National Scenic River (WV), many hemlocks appear stressed, but large scale mortality was not observed during the 2003-2006 vegetation surveys.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Quercus prinus*
Tree subcanopy	Broad-leaved deciduous tree	*Betula lenta*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula lenta*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Quercus prinus*
Tree subcanopy	Broad-leaved deciduous tree	*Betula lenta*, *Quercus* spp.
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium pallidum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Quercus prinus*, *Tsuga canadensis*
Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Betula lenta*, *Quercus prinus*, *Quercus rubra*, *Tsuga canadensis*
Global: *Chimaphila maculata*, *Quercus prinus*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Rhamnus cathartica* (High/Medium)
Global: Other Plants: *Kalmia latifolia* (G5), *Maianthemum canadense* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (4-Oct-2006). While this association does not appear to be intrinsically rare, it occurs in small patches in very specific habitats, and its viability is critically threatened by the spread of hemlock woolly adelgid.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community has *Quercus* spp. codominant in the canopy with *Tsuga canadensis* and no *Betula alleghaniensis*. In contrast, Hemlock - Northern Hardwood Forest (CEGL006109) is a hemlock - northern hardwoods community where *Quercus* spp. and *Pinus strobus* are minor to absent. *Liriodendron tulipifera* can occur in both communities, but tends to be more abundant in southern examples of CEGL006109 and is minor in this type (CEGL006923).
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: *Tsuga canadensis* is declining in this community. Hemlock snags and coarse woody debris are common in these stands.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Because of devastation by hemlock woolly adelgid, understory hemlock is often all that's left in this community in Virginia. The original description was based on A. Windisch's (1993) Picatinny Arsenal Hemlock-Mixed Oak-(Heath) Cool Sub-Mesic forest description (TcQf). An expanded circumscription is based on analysis of data from 20 Maryland and Virginia plots, data from Delaware Water Gap, and 9 West Virginia

plots. Analysis of more than 1300 montane Virginia plots indicated that the two Virginia plots originally assigned to this type in the National Capital Region analysis are cove plots that are better classified as *Tsuga canadensis - Quercus prinus - Liriodendron tulipifera / Kalmia latifolia - (Rhododendron catawbiense)* Forest (CEGL008512) (Fleming and Patterson 2009b).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from the New Jersey Highlands south to the Blue Ridge, Ridge and Valley, and Piedmont provinces of Pennsylvania and Maryland, and the Cumberlands in West Virginia. It was sampled in Cumberland County, Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in New Jersey and New York at Nuclear Lake, Canada Hill/Curry Pond, Canopus Lake South and Sunken Mine Road North in Fahnestock State Park.
Global Range: This association ranges from the New Jersey Highlands south to the Blue Ridge, Ridge and Valley, and Piedmont provinces of Pennsylvania and Maryland, and the Cumberlands in West Virginia.
Nations: US
States/Provinces: MD, NJ, NY, PA, WV
TNC Ecoregions: 52:C, 59:C, 60:P, 61:C
USFS Ecoregions (1994/95): 212Fc:PPP, 221Ae:CCC, 221Bd:CCC, M221Ac:CCC, M221Be:CCC
Federal Lands: NPS (Allegheny Portage Railroad, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Bluestone, C&O Canal, Catoctin Mountain, Delaware Water Gap, Monocacy)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHO
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 9 accuracy assessment points): APPA.0509, APPA_AA_0238, APPA_AA_0351, APPA_AA_0375, APPA_AA_0565, APPA_AA_0736, APPA_AA_1173, APPA_AA_1224, APPA_AA_1259, APPA_AA_1546.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 plots; 4 observation points; 17 accuracy assessment points): APPA.0060, APPA.0063, APPA.0681, APPA.1398, APPA.1402, APPA.1415, APPA.1539, APPA_AA_2060, APPA_AA_2104, APPA_AA_2246, APPA_AA_2260, APPA_AA_2296, APPA_AA_2353, APPA_AA_2517, APPA_AA_2555, APPA_AA_2577, APPA_AA_2695, APPA_AA_2777, APPA_AA_2789, APPA_AA_2809, APPA_AA_2819, APPA_AA_2981, APPA_AA_3235, APPA_AA_3268.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A. Windisch, S.C. Gawler and G.P. Fleming
References: Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Harrison 2004, Perez pers. comm., Perles et al. 2006d, Perles et al. 2007, Vanderhorst et al. 2008, WVNHP unpubl. data b, Windisch 1993, Windisch 1993*

[CEGL008512] *Tsuga canadensis - Quercus prinus - Liriodendron tulipifera / Kalmia latifolia - (Rhododendron catawbiense)* Forest

Translated Name: **Eastern Hemlock - Chestnut Oak - Tuliptree / Mountain Laurel - (Catawba Rosebay) Forest**
Common Name: **Central Appalachian Acidic Cove Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	*Tsuga canadensis - Liriodendron tulipifera* Forest Alliance (A3304)

ELEMENT CONCEPT

Global Summary: This community type occurs somewhat locally throughout the Northern Blue Ridge and Ridge and Valley regions of west-central and northwestern Virginia and may extend into West Virginia. Sites are located between 275 and 760 m (900-2500 feet) elevation. Stands often occupy elongated, linear patches in mesic ravines with incising first-, second-, and third-order streams. Underlying bedrock includes several sandstone and shale formations, as well as igneous and metamorphic formations of the Blue Ridge. Vegetation is a hemlock-hardwood

or mixed hardwood forest that usually, but not always, has a dense evergreen shrub layer. *Tsuga canadensis, Quercus prinus, Liriodendron tulipifera, Acer rubrum, Betula lenta, Quercus rubra*, and *Nyssa sylvatica* are the most characteristic and abundant trees. *Fagus grandifolia, Magnolia acuminata, Pinus strobus*, and *Quercus alba* are minor and localized overstory associates. Understory tree layers are mostly composed of younger trees of the canopy species. *Kalmia latifolia, Hamamelis virginiana*, and *Acer pensylvanicum* are the most constant and abundant species of the shrub layer; less frequently *Menziesia pilosa, Rhododendron catawbiense*, and rarely *Rhododendron maximum* may form large colonies. The herb layer is typically sparse, but some stands have substantial cover by the clonal ferns *Dennstaedtia punctilobula* and/or *Thelypteris noveboracensis*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This mixed hemlock-hardwood acidic cove forest is found along the AT only at Shenandoah National Park. Sites are located between 275 and 760 m (900-2,500 feet) elevation. Stands often occupy elongated, linear patches in mesic ravines with incising first-, second-, and third-order streams.

Global Environment: Sites are located between 275 and 760 m (900-2500 feet) elevation. Stands often occupy elongated, linear patches in mesic ravines with incising first-, second-, and third-order streams. Underlying bedrock includes several sandstone and shale formations, as well as igneous and metamorphic formations of the Blue Ridge. Microtopography of habitats is diverse and includes both stream bottoms and adjacent lower to middle slopes, usually with northerly aspects. Mean slope at plot-sampling sites is 22°, and average surface cover of boulders and stones is 14%. Occasional, brief flooding may occur along the larger streams in this unit. Mapped soils are mostly very stony, sometimes sandy colluvial loams. Along streams, substrates often consist of bouldery and rocky terraces with interstitial colluvial / alluvial soils. Soils collected from plots are very strongly to extremely acidic (mean pH = 4.0) and infertile, with high iron and aluminum levels and very low total base saturation.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Tsuga canadensis, Quercus prinus, Liriodendron tulipifera, Acer rubrum, Betula lenta, Quercus rubra*, and *Nyssa sylvatica* are the most characteristic and abundant trees. *Fagus grandifolia, Magnolia acuminata, Pinus strobus*, and *Quercus alba* are minor and localized overstory associates. Understory tree layers are mostly composed of younger trees of the canopy species. *Kalmia latifolia, Hamamelis virginiana*, and *Acer pensylvanicum* are abundant shrubs. Less frequently *Menziesia pilosa, Rhododendron catawbiense*, and rarely *Rhododendron maximum* may form large colonies. There is typically a sparse herb layer, but some stands have substantial cover by the clonal ferns *Dennstaedtia punctilobula* and/or *Thelypteris noveboracensis*.

Global Vegetation: Vegetation is a hemlock-hardwood or mixed hardwood forest that usually, but not always, has a dense evergreen shrub layer. *Tsuga canadensis, Quercus prinus, Liriodendron tulipifera, Acer rubrum, Betula lenta, Quercus rubra*, and *Nyssa sylvatica* are the most characteristic and abundant trees. *Fagus grandifolia, Magnolia acuminata, Pinus strobus*, and *Quercus alba* are minor and localized overstory associates. Understory tree layers are mostly composed of younger trees of the canopy species. In the southern part of the range, *Oxydendrum arboreum* is a common understory tree. Evergreen shrubs are variably important in this type. *Kalmia latifolia* is a constant species but dominates only in a subset of stands. The evergreen rhododendrons *Rhododendron catawbiense* and/or *Rhododendron maximum* occur in 40% of plot samples but never co-occur, and one or the other species is abundant in only 15% of the plots; *Rhododendron catawbiense* is the more frequent species, occurring in about a third of the plots. *Hamamelis virginiana* and *Acer pensylvanicum* are the only other constant shrubs; *Menziesia pilosa* is inconstant but occasionally abundant. The herb layer is typically sparse, with few if any species attaining as much as 1% cover in a 400-square-meter plot, although some stands may have substantial cover by the clonal ferns *Dennstaedtia punctilobula* and/or *Thelypteris noveboracensis*. The most frequent herbs are *Eurybia divaricata, Mitchella repens, Dioscorea quaternata, Goodyera pubescens, Medeola virginiana, Aralia nudicaulis*, and *Gaultheria procumbens*. Significant bryophyte cover is often present on moist rock surfaces and rotting wood. Species richness of 22 plot-sampled stands ranges from 21 to 58 taxa per 400 square meters (mean = 36).

Global Dynamics: In many occurrences of this community type in western Virginia, the *Tsuga canadensis* component has been reduced by heavy timbering or mortality from the introduced insect pest, hemlock woolly adelgid (*Adelges tsugae*).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera*, *Quercus prinus*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron catawbiense*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera*, *Quercus prinus*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia latifolia*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Kalmia latifolia*, *Liriodendron tulipifera*, *Quercus prinus*, *Tsuga canadensis*
Global: *Galax urceolata*, *Goodyera pubescens*, *Hexastylis virginica*, *Magnolia acuminata*, *Oxydendrum arboreum*, *Rhododendron catawbiense*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Global: Other Plants: *Thelypteris noveboracensis* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (25-Jun-2001). This vegetation type is locally distributed but fairly common in west-central and northwestern Virginia, sometimes covering large areas.

RELATED CONCEPTS

Global Similar Types:

- *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543) is a very similar type with a geographic distribution in the Southern Appalachians; the ranges of this and CEGL008512 meet, and compositional boundaries become ambiguous, in west-central and southwestern Virginia.
- *Liriodendron tulipifera - Pinus strobus - Tsuga canadensis - Quercus rubra / Polystichum acrostichoides* Forest (CEGL006304) occurs in the same region but occupies coves with somewhat higher soil fertility and has higher overall species richness.
- *Tsuga canadensis - Fagus grandifolia - Acer saccharum / (Hamamelis virginiana, Kalmia latifolia)* Forest (CEGL005043) is centered on the Western Allegheny Plateau, beyond ranges of *Rhododendron catawbiense, Galax urceolata, Oxydendrum arboreum*.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: Hemlock has been almost entirely extirpated from the canopy of this type in Virginia by hemlock woolly adelgid, although significant hemlock cover remains in the understory of many stands.
Global Classification Comments: The distribution of this unit generally corresponds to a geographic area in which *Rhododendron maximum* is spotty to absent, or both *Rhododendron maximum* and *Rhododendron catawbiense* are absent. Throughout much of southwestern and west-central Virginia, as well as in the Southern Appalachians of North Carolina and Tennessee, habitats favorable for the development of acidic cove forests generally support extensive populations of *Rhododendron maximum*. Over most of this region, *Rhododendron catawbiense* is restricted to more xeric and/or exposed sites, and does not appear to be competitive with *Rhododendron maximum* in mesic habitats (A.S. Weakley pers. comm. 2001). On the Northern Blue Ridge and certain sites of the Ridge and Valley, where *Rhododendron maximum* is inexplicably rare, it is possible that the absence of *Rhododendron maximum* enables *Rhododendron catawbiense* to occupy more mesic cove sites. *Rhododendron catawbiense* reaches its northern limits in Highland and Rockingham counties; north of these counties, many acidic coves lack both of the evergreen rhododendrons.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: Observed by the UMESC mapping team in Shenandoah National Park.
Global Range: This community occurs somewhat locally throughout the Northern Blue Ridge and Ridge and Valley regions of west-central and northwestern Virginia. It is rare in ravines of western Piedmont, metasedimentary foothills. There is good potential for occurrences in adjacent states, particularly West Virginia.
Nations: US
States/Provinces: VA:S3
TNC Ecoregions: 51:C, 52:C, 59:C
USFS Ecoregions (1994/95): 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Shenandoah); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: Observed by the UMESC mapping team in Shenandoah National Park and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 accuracy assessment point): APPA_AA_0118.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): E. Largay
Global Description Author(s): G.P. Fleming
References: Eyre 1980, Fleming 2002a, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 1998, Fleming and Moorhead 2000, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Fleming et al. 2007b, Rawinski et al. 1996, Southeastern Ecology Working Group n.d., Young et al. 2009

M502. Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland

G015. APPALACHIAN OAK / CHESTNUT FOREST

Group Summary Description: This dry acidic Appalachian oak forest group includes mostly closed-canopy deciduous (oak) forests and mixed (oak-pine) forests with a variable mixture of dry-site oak and pine species. It is characterized by the occurrence of *Quercus prinus* and/or other oaks, typically *Quercus alba, Quercus coccinea*, or *Quercus velutina*,, often with sprouts of *Castanea dentata*. *Pinus strobus* or *Pinus virginiana* may be an important associate in some areas. Widespread hardwood associates include *Quercus rubra, Betula lenta, Carya glabra, Nyssa sylvatica*, and *Sassafras albidum*. Additional associated trees in parts of the group's range include *Halesia tetraptera var. monticola, Liriodendron tulipifera, Magnolia acuminata*, and *Oxydendrum arboreum*. Subcanopy, shrub, and herb layers vary, but in many cases a moderately well- to well-developed heath layer is present. Ericaceous shrubs are often common and include *Kalmia latifolia, Gaylussacia baccata, Gaylussacia frondosa, Gaylussacia ursina, Vaccinium pallidum, Vaccinium angustifolium, Vaccinium stamineum, Vaccinium arboreum, Vaccinium simulatum, Menziesia pilosa, Rhododendron calendulaceum*, and *Rhododendron prinophyllum*. This group is centered on the ranges of *Castanea dentata* and *Quercus prinus*, ranging from central New England south through the Central Appalachian and Western Allegheny regions to the Cumberland Plateau and Southern Appalachians. The substrate is typically dry, acidic, and infertile. Elevation ranges from sea level (in the northern part of the range) to about 1500 m (in the Southern Appalachians).

A4128 *Pinus strobus - Quercus alba* Allegheny Forest & Woodland Alliance

Alliance Summary Description: This alliance contains pine-dominated and mixed pine-oak forests and woodlands found in the Allegheny Plateau, Lake Ontario plain and lower New England of the United States. Stands typically occur on mostly dry-mesic sites within glaciated and unglaciated landscapes and are dominated by *Pinus strobus*, often mixed with hardwood species such as *Quercus alba, Quercus rubra, Quercus velutina*, and *Acer rubrum*. Rarely, *Pinus resinosa* or *Pinus rigida* may co-occur.

[CEGL006293] *Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest

Translated Name: **Eastern White Pine - (Northern Red Oak, Black Oak) - American Beech Forest**
Common Name: **Northeastern White Pine - Oak Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Pinus strobus - Quercus alba* Allegheny Forest & Woodland Alliance (A4128)

ELEMENT CONCEPT

Global Summary: This mixed white pine - oak forest of the northeastern U.S. occurs on dry-mesic to mesic, acidic, nutrient-poor, sandy loam to sandy soils. In the northern glaciated portion of the range, the forest occurs on outwash plains or moraines, as well as along mid and lower slopes and within protected ravines, and on protected ridges or upper slopes of shale, sandstone or other sedimentary rock, occasionally underlain by metamorphic or igneous rock. Along the unglaciated plateau, this community occurs on rolling topography underlain by sandstone. It occurs at elevations below 915 m (3000 feet) throughout the range. The tree canopy is dominated by a mixture of *Pinus strobus* and oaks, including *Quercus velutina, Quercus rubra, Quercus alba, Quercus prinus* (usually in minor amounts), and *Quercus coccinea,* primarily only in the southern portions of the range. Oak species drop out at the northern extreme of the type's range, leaving only *Quercus rubra*. *Fagus grandifolia* is characteristic over much of the range of this type but is absent in some areas. Other less frequent canopy associates may include *Acer rubrum, Betula lenta, Carya alba, Pinus rigida, Populus tremuloides, Fraxinus americana, Ulmus americana, Tsuga canadensis*, and at the northern range limit may include *Betula papyrifera* and *Populus grandidentata*. The variable subcanopy may include *Hamamelis virginiana* or *Prunus serotina*; other species such as *Carpinus caroliniana, Cornus florida*, and *Nyssa sylvatica* may be present in the central and southern portions of the range. It has a sparse to well-developed, generally ericaceous shrub layer. The herb layer ranges from sparse to moderately dense cover. In disturbed settings, *Rhamnus cathartica* may be an abundant shrub. The bryophyte layer is not well-documented. This association is differentiated from mixed oak-pine forests to the south by *Fagus grandifolia* and the absence of southern-ranging species *Liriodendron tulipifera, Galax urceolata, Trillium catesbaei, Halesia tetraptera*, and

others. The absence of *Ilex glabra* and the unimportance of *Quercus alba* differentiate this type from a closely related association of northeastern coastal areas, *Pinus strobus - Quercus alba / Ilex glabra* Forest (CEGL006382). Earlier successional versions in New England have less dominance by *Pinus* spp. (usually) and more by *Betula* spp. and *Acer rubrum*; these are separated as *Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest (CEGL006506).

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This wide-ranging pine-oak forest occurs on a variety of slopes, exposures, and settings. It was sampled once in the Central Appalachian project area on a west-facing lower slope of a ravine with well-drained sandy loam soil. The unvegetated surface is dominated by leaf litter with some downed wood. Evidence of disturbance includes trails, wind/ice damage, standing dead trees (creating canopy gaps), and nearby campsite clearings.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: This white pine - oak forest ranges throughout the Northeast from West Virginia north to Maine at elevations below 915 m (3,000 feet). Sites range from gentle to very steep mid and upper slopes and ridges with mostly western and southern aspects. Soils are typically dry to dry-mesic, rapidly to well-drained sandy loam. The unvegetated surface consists of leaf litter, with lesser amounts of exposed bedrock, large/small rocks, and/or downed wood. Evidence of disturbance includes the presence of exotic plants.
Global Environment: This mixed white pine - oak forest occurs on dry-mesic to mesic, acidic, nutrient-poor, sandy loam to sandy soils along mid and lower slopes, and along the unglaciated plateau on rolling topography underlain by sandstone. In the northern glaciated portion of the range, the forest occurs on outwash plains or moraines, as well as along mid and lower slopes and within protected ravines, and on protected ridges of shale, sandstone, or other sedimentary rock, occasionally underlain by metamorphic or igneous rock. Along the unglaciated plateau, this community occurs on rolling topography underlain by sandstone. It occurs at elevations below 915 m (3000 feet) throughout the range.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus velutina, Quercus rubra, Quercus alba*, and *Quercus prinus* share the canopy with *Pinus strobus*. *Acer rubrum, Tsuga canadensis, Sassafras albidum, Nyssa sylvatica, Pinus rigida*, and *Betula lenta* are common in the canopy and subcanopy. *Fagus grandifolia* is characteristic but not always present. Heaths are the dominant shrubs and include *Kalmia latifolia, Vaccinium pallidum*, and *Gaultheria procumbens*. *Hamamelis virginiana* is another important shrub. Herbs are very sparse, but *Gaultheria procumbens* may be common.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Quercus rubra, Quercus prinus, Quercus alba, Quercus velutina*, and/or *Quercus coccinea* share canopy dominance with *Pinus strobus* (sometimes emergent); *Fagus grandifolia* and *Tsuga canadensis* can be common and abundant. *Betula lenta* and *Acer rubrum* are characteristic subcanopy species. *Kalmia latifolia* is a common tall shrub, and a dwarf-shrub heath layer that can be extensive includes *Vaccinium angustifolium* and *Gaylussacia baccata*. Common herbs include *Aralia nudicaulis, Pteridium aquilinum*, and *Gaultheria procumbens*. In addition, this community supports MA state-imperiled *Pinus resinosa*.
Global Vegetation: The tree canopy is dominated by a mixture of *Pinus strobus* and oaks, including *Quercus velutina, Quercus rubra, Quercus alba, Quercus prinus* (usually in minor amounts), and *Quercus coccinea*, primarily only in the southern portions of the range. Oak species drop out at the northern extreme of the type's range, leaving only *Quercus rubra*. *Fagus grandifolia* is characteristic but not always present. Other less frequent canopy associates may include *Acer rubrum, Betula lenta, Carya alba, Populus tremuloides, Fraxinus americana, Ulmus americana, Tsuga canadensis*, and at the northern range limit may include *Betula papyrifera* and *Populus grandidentata*. The variable subcanopy may include *Hamamelis virginiana* or *Prunus serotina*; other species such as *Carpinus caroliniana, Cornus florida*, and *Nyssa sylvatica* may be present in the central and southern portions of the range. The sparse to well-developed, generally ericaceous shrub layer includes *Gaylussacia* spp. (usually *Gaylussacia baccata*), *Kalmia latifolia, Vaccinium* spp. (typically *Vaccinium pallidum* and/or *Vaccinium angustifolium*), and sometimes *Kalmia angustifolia*, as well as *Rubus* spp., *Corylus americana, Rhododendron periclymenoides, Gaultheria procumbens, Sassafras albidum*, and *Viburnum prunifolium*. The herb layer ranges from sparse to moderately dense cover, with species including *Aralia nudicaulis, Ageratina altissima, Amphicarpaea bracteata, Brachyelytrum erectum, Carex communis, Carex woodii, Carex pensylvanica, Carex lucorum, Carex debilis, Chimaphila maculata, Desmodium nudiflorum, Galium latifolium, Gaultheria procumbens, Goodyera pubescens, Hieracium venosum, Houstonia purpurea, Maianthemum racemosum, Maianthemum canadense, Medeola virginiana, Melampyrum lineare, Mitchella repens, Monotropa uniflora, Poa cuspidata,*

Polygonatum biflorum, Polystichum acrostichoides, Pteridium aquilinum, Trientalis borealis, and/or *Viola hastata*. In disturbed settings, the exotic *Rhamnus cathartica* may be an abundant shrub. The bryophyte layer is not well-documented but supports *Leucobryum glaucum* and *Polytrichum commune* in occurrences in the northern portion of the range (Acadia National Park).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus prinus*, *Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula lenta*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Dwarf-shrub	*Gaylussacia baccata*, *Vaccinium angustifolium*
Herb (field)	Flowering forb	*Gaultheria procumbens*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus prinus*, *Quercus rubra*, *Quercus velutina*
Tree subcanopy	Broad-leaved deciduous tree	*Prunus serotina*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia* spp., *Vaccinium* spp.
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Herb (field)	Flowering forb	*Aralia nudicaulis*, *Maianthemum canadense*, *Trientalis borealis*
Herb (field)	Graminoid	*Carex pensylvanica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Pinus strobus*, *Quercus rubra*, *Quercus velutina*

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Betula lenta*, *Gaultheria procumbens*, *Gaylussacia baccata*, *Kalmia latifolia*, *Pinus strobus*, *Quercus rubra*, *Trientalis borealis*, *Vaccinium angustifolium*

Global: *Fagus grandifolia*, *Pinus strobus*, *Quercus rubra*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Pinus resinosa* (G5, MA state-imperiled); **Invasive/Exotic Plants**: *Berberis thunbergii* (High/Medium), *Larix decidua*

Global: Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium), *Larix decidua*

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (31-Jan-2007). This vegetation occurs as large patches of the matrix forest type and ranges across most northeastern states. Pristine or old-growth examples are few, but in general this forest type has recovered to mid- to late-successional stages following large-scale clearing by European settlers.

RELATED CONCEPTS

Global Similar Types:

- *Pinus strobus - (Pinus resinosa) - Quercus rubra* Forest (CEGL002480)
- *Pinus strobus - Quercus alba - Quercus prinus / Vaccinium stamineum* Forest (CEGL008539)
- *Pinus strobus - Quercus alba / Ilex glabra* Forest (CEGL006382)
- *Quercus (alba, rubra, velutina) - Carya* spp. / *Viburnum acerifolium* Forest (CEGL006336) has less pine, more hickory, and little or no beech, but can intergrade to this type.

- *Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest (CEGL006506)
- *Quercus rubra - Acer saccharum - Fagus grandifolia / Viburnum acerifolium* Forest (CEGL006633)
- *Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest (CEGL006635)
- *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: In the Massachusetts, Connecticut and New Jersey examples, the well-developed heath shrub layer is diagnostic of this community. *Acer saccharum* and occasional *Tsuga canadensis* may be more common in the understory in later-successional examples of this community in the northern part of the range. In New York, this community looks similar to Lower New England High Slope Chestnut Oak Forest (CEGL006282) but the presence of *Pinus strobus* makes it Northeastern White Pine - Oak Forest (CEGL006293).
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: Shallow, acidic soils are a driving force in these forests.
Global Classification Comments: In the northern part of this type's range, it can be similar to *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088), which is distinguished by having *Tsuga canadensis* as the principal canopy conifer. However, examples of both types may have *Pinus strobus* and *Tsuga canadensis* present. In the southern part of this type's range, drier expressions overlap conceptually with *Pinus strobus - Quercus alba - Quercus prinus / Vaccinium stamineum* Forest (CEGL008539) to the south, and the overlap between those two needs clarification.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs from New England south and west to Pennsylvania and West Virginia. In the Central Appalachian project area, it was sampled in Adams County in southern Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut (Sharon Mountain, Silver Hill in Sharon), Massachusetts (Beartown State Forest, Mt. Bushnell), New Jersey (Culvers Gap North, Culvers Gap South, north of Sunrise Mountain), and New York (West Mountain - Bear Mountain State Park).
Global Range: This community occurs in New England south and west to New Jersey and West Virginia. Total acreage for all subsections is approximately 230,000 square km.
Nations: US
States/Provinces: CT, MA, ME, NH:S3S4, NJ, NY, PA, RI, VT:S3
TNC Ecoregions: 48:C, 49:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212G:CC, 221Aa:CCC, 221Ac:CCC, 221Ae:CCC, 221Af:CCP, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Ba:CCC, 221Bb:CCP, 221Bc:CCC, 221Bd:CCC, 221Ea:CCC, 221Fa:CCC, 222Id:CCP, M212Ad:CCC, M212Ae:CCP, M212Ag:CCC, M212Ba:CCP, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Db:CCP, M212Dc:CCC, M212De:CCC, M212Ea:CCC, M212Eb:CCC, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bf:CCC, M221Da:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Delaware Water Gap, Minute Man, Saratoga, Upper Delaware); USFS (Finger Lakes); USFWS (Assabet River, Great Meadows, Oxbow, Rachel Carson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHP
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 observation point; 3 accuracy assessment points): APPA.1191, APPA_AA_0309, APPA_AA_0529, APPA_AA_1217.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 13 observation points; 27 accuracy assessment points): APPA.0046, APPA.0907, APPA.1343, APPA.1346, APPA.1392, APPA.1429, APPA.1434, APPA.1435, APPA.1436, APPA.1438, APPA.1460, APPA.1461, APPA.1462, APPA.1463, APPA.1466, APPA_AA_1660, APPA_AA_1762, APPA_AA_1767, APPA_AA_1857, APPA_AA_1865,

APPA_AA_1872, APPA_AA_2053, APPA_AA_2143, APPA_AA_2144, APPA_AA_2170, APPA_AA_2234, APPA_AA_2410, APPA_AA_2532, APPA_AA_2624, APPA_AA_2643, APPA_AA_2674, APPA_AA_2679, APPA_AA_2728, APPA_AA_2764, APPA_AA_2779, APPA_AA_2968, APPA_AA_2970, APPA_AA_2971, APPA_AA_3101, APPA_AA_3204, APPA_AA_3257, APPA_AA_3270.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay

Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay

Global Description Author(s): L.A. Sneddon, E. Largay and S.C. Gawler

References: Breden et al. 2001, CAP pers. comm. 1998, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Enser 1993, Enser 1999, Eyre 1980, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Gawler et al. 2005, Küchler 1956, Lubinski et al. 2003, Lundgren 2001, Moore and Taylor 1927, NRCS 2004a, Perles et al. 2007, Perles et al. 2008, Rawinski 1984a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Jenkins 1992, Thompson and Sorenson 2000

A2080 *Pinus strobus - Quercus prinus* Appalachian Forest Alliance

Alliance Summary Description: This alliance includes dry pine-oak forests dominated by *Pinus strobus* occurring either with *Quercus coccinea* and/or *Quercus prinus* in drier associations, or with *Quercus alba, Quercus rubra*, and/or *Quercus velutina* in dry-mesic to mesic ones. Typical species in the subcanopy of the drier associations include *Acer rubrum var. rubrum, Cornus florida, Nyssa sylvatica*, and *Oxydendrum arboreum*. *Pinus strobus* is a consistent constituent of the canopy and usually occurs as supercanopy trees, as well. In these more mesic associations, *Quercus alba, Quercus rubra*, and *Quercus velutina* are also important canopy trees along with minor amounts of *Acer rubrum, Carya alba, Liriodendron tulipifera, Quercus prinus*, and *Tsuga canadensis*. These forests often have dense ericaceous shrub strata with species such as *Gaylussacia* spp., Kalmia latifolia, Rhododendron maximum, and *Vaccinium* spp. Herbaceous strata have low species richness and are composed of species typical of dry montane forests, such as *Chamaelirium luteum, Chimaphila maculata, Epigaea repens, Galax urceolata, Goodyera pubescens, Smilax glauca, Smilax rotundifolia*, and *Viola hastata*. These forests occur on dry to upper slopes and ridgetops, as well as dry-mesic to mesic midslopes at low elevations (below 915 m [3000 feet]) in the Blue Ridge escarpment region. In the Ridge and Valley of Virginia, these forests are known from north-facing slopes over shale substrates and on lower to middle-elevation knobs and side ridges.

[CEGL007519] *Pinus strobus - Quercus (coccinea, prinus) / (Gaylussacia ursina, Vaccinium stamineum)* Forest

Translated Name: **Eastern White Pine - (Scarlet Oak, Chestnut Oak) / (Bear Huckleberry, Deerberry) Forest**
Common Name: **Appalachian White Pine - Subxeric Oak Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Pinus strobus - Quercus prinus* Appalachian Forest Alliance (A2080)

ELEMENT CONCEPT

Global Summary: This community occurs on exposed upper slopes and ridgetops at elevations below 915 m (3000 feet) in the southern Appalachian Mountains. This association represents mixed forests with *Pinus strobus, Quercus prinus*, and *Quercus coccinea*, occurring singly or in combination, each contributing 25-75% of the total canopy coverage. Open subcanopies are composed of *Oxydendrum arboreum, Acer rubrum var. rubrum, Nyssa sylvatica*, and *Cornus florida*. The shrub stratum is dominated by deciduous heath species, typically *Gaylussacia ursina* or *Vaccinium stamineum*. Other species in the shrub/sapling stratum may include *Vaccinium pallidum, Leucothoe recurva, Kalmia latifolia, Castanea dentata*, or *Acer rubrum var. rubrum*. On rocky sites, *Deschampsia flexuosa* may be common.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This white pine - oak forest was sampled at five locations in the Southern Blue Ridge project area. Sites range from moderate to steep, lower to upper slopes and ridgetops on any aspect. Elevations range from 670 to 1,050 m. Soil moisture is variable, ranging from xeric to dry-mesic, rapidly drained to moderately well-drained. Soil textures include loam, sandy loam, clay loam and clay. The unvegetated surface is dominated by leaf litter with some downed wood and occasional exposed bedrock and large/small rocks. Evidence of disturbance includes fire (as recently as 2008), hemlock/fir adelgid damage, and pine bark beetle damage.
Global Environment: This community occurs on exposed upper slopes and ridgetops at elevations below 915 m (3000 feet) in the southern Appalachian Mountains. The presence of *Pinus strobus* in these forests may be a product of disturbance and subsequent fire suppression. It may have increased its abundance since about 1900.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This natural mixed-age forest has a canopy that is a mixture of *Pinus strobus* (cover may be as little as 25%), *Quercus alba, Quercus coccinea, Quercus prinus, Quercus rubra*, and *Quercus velutina*. Other common tree species include *Acer rubrum, Quercus prinus, Nyssa sylvatica*, and *Oxydendrum arboreum*. The dominant shrubs include *Gaylussacia ursina, Kalmia latifolia, Vaccinium pallidum*, and *Rhododendron maximum*. Herbs are very sparse to absent.
Global Vegetation: Stands of this forest association typically contain *Pinus strobus* (contributing 25-75% of the canopy coverage) and *Quercus prinus* and/or *Quercus coccinea* (occurring singly or in combination) as 25-75% of the canopy coverage. Open subcanopies are composed of *Oxydendrum arboreum, Acer rubrum var. rubrum, Nyssa sylvatica*, and *Cornus florida*. The shrub stratum is dominated by deciduous heath species, typically *Gaylussacia ursina* or *Vaccinium stamineum*. Other species in the shrub/sapling stratum may include *Vaccinium pallidum, Leucothoe recurva, Kalmia latifolia, Castanea dentata*, or *Acer rubrum var. rubrum*. On rocky sites, *Deschampsia flexuosa* may be common.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Quercus coccinea*, *Quercus prinus*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Oxydendrum arboreum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia ursina*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Quercus coccinea*, *Quercus prinus*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum* var. *rubrum*, *Oxydendrum arboreum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia ursina*, *Vaccinium stamineum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Kalmia latifolia*, *Pinus strobus*, *Quercus coccinea*, *Quercus prinus*, *Rhododendron maximum*
Global: *Gaylussacia ursina*, *Kalmia latifolia*, *Pinus strobus*, *Quercus coccinea*, *Quercus prinus*, *Vaccinium stamineum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Castanea dentata* (G4, TN state-imperiled)
Global: Vulnerable Plants: *Monotropsis odorata* (G3), *Thermopsis fraxinifolia* (G3?), *Thermopsis mollis* (G3G4), *Vaccinium hirsutum* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (23-Oct-2003). This community has a restricted range and is uncommon. It is not threatened or particularly vulnerable. Grank changed to G4 on the recommendation of Gary Kauffman, USDA Forest Service.

RELATED CONCEPTS

Global Similar Types:
- *Pinus strobus - Quercus alba - Quercus prinus / Vaccinium stamineum* Forest (CEGL008539)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Dry white pine - oak / heath vegetation with abundant *Gaylussacia ursina*. The principal oak associates are *Quercus coccinea* and *Quercus prinus*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: AT corridor plots are from Unicoi County, Tennessee, and Graham County, North Carolina.
Global Range: This community is known from the escarpment region of the Southern Blue Ridge.
Nations: US
States/Provinces: GA, NC, SC, TN
TNC Ecoregions: 50:C, 51:C, 52:C
USFS Ecoregions (1994/95): 221Hc:CCC, 221He:CCC, 222Eo:CCC, M221Cd:CPP, M221Db:CCP, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Great Smoky Mountains, Obed River); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FHWO
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (3 plots; 2 observation points; 22 accuracy assessment points): APPA.0623, APPA.0624, APPA.0649, APPA.1094, APPA.1136, APPA_AA_0007, APPA_AA_0063, APPA_AA_0184, APPA_AA_0193, APPA_AA_0243, APPA_AA_0380, APPA_AA_0419, APPA_AA_0501, APPA_AA_0511, APPA_AA_0526, APPA_AA_0593, APPA_AA_0651, APPA_AA_0668, APPA_AA_1114, APPA_AA_1154, APPA_AA_1232, APPA_AA_1319, APPA_AA_1394, APPA_AA_1521, APPA_AA_1524, APPA_AA_1556, APPA_AA_1574.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson and S. Simon
References: Allard 1990, Ambrose 1990a, Fleming and Patterson 2009a, Patterson 1994, Peet et al. unpubl. data, Pyne 1994, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, White 2003

[CEGL007517] *Pinus strobus - Quercus alba - (Carya alba) / Gaylussacia ursina* Forest

Translated Name: **Eastern White Pine - White Oak - (Mockernut Hickory) / Bear Huckleberry Forest**
Common Name: **Appalachian White Pine - Mesic Oak Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Pinus strobus - Quercus prinus* Appalachian Forest Alliance (A2080)

ELEMENT CONCEPT

Global Summary: This association covers mesic pine-oak-hickory in the Cumberlands and Southern Ridge and Valley, Southern Blue Ridge Escarpment and in the Piedmont transition, found below 885 m (2900 feet) elevation, on protected ridges, mid- to upper slopes, and in disturbed bottoms. Canopies are dominated by variable mixtures of *Pinus strobus, Quercus alba, Quercus velutina, Carya alba*, and *Acer rubrum*. Other canopy species may include *Liriodendron tulipifera, Tsuga canadensis, Quercus rubra, Quercus falcata, Quercus prinus*, and *Magnolia fraseri*. Subcanopy and saplings include canopy species and *Cornus florida, Halesia tetraptera, Oxydendrum arboreum*, and *Nyssa sylvatica*. Shrub layers are moderate to dense, with *Gaylussacia ursina* and *Kalmia latifolia* most commonly dominating. Other shrubs include *Rhododendron minus, Rhododendron maximum, Symplocos tinctoria, Arundinaria*

gigantea, Castanea dentata, Sassafras albidum, Amelanchier arborea, Pyrularia pubera, and *Hydrangea radiata*. The herb stratum is sparse, although ferns (*Thelypteris noveboracensis, Dennstaedtia punctilobula* and *Polystichum acrostichoides*) may occasionally dominate. Common herbs include *Chimaphila maculata, Viola hastata, Goodyera pubescens, Maianthemum racemosum, Polygonatum biflorum, Monotropa uniflora, Trillium catesbaei, Desmodium nudiflorum, Eupatorium purpureum, Galium circaezans, Galium latifolium, Galax urceolata, Hexastylis shuttleworthii, Medeola virginiana, Mitchella repens*, and *Houstonia purpurea*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This white pine - oak forest is found below 1,220 m (4,000 feet) elevation and occurs on moderate to steep, mid to lower slopes, sometimes occurring on lower, broad ridgetops (occasionally reaching 1,370 m [4,500 feet]). Soils may be moderately well-drained clay loam. One sampled stand was probably logged in the 1940-50s.
Global Environment: Stands of this association are found below 885 m (2900 feet) elevation, on protected ridges, mid- to upper slopes, and in disturbed bottoms in the Cumberlands and Southern Ridge and Valley, Southern Blue Ridge Escarpment and in the Piedmont transition region. The presence of *Pinus strobus* in these forests may be a product of disturbance and subsequent fire suppression. It may have increased its abundance since about 1900.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This natural uneven-aged mixed forest typically has from 25-50% *Pinus strobus*; it can also include any or all of the following: *Carya alba, Carya glabra, Liriodendron tulipifera, Quercus alba, Quercus prinus*, and *Quercus velutina*. Common shrubs include *Amelanchier laevis, Castanea dentata, Gaylussacia ursina*, and *Kalmia latifolia*. Herbs are sparse but may include *Galax urceolata, Goodyera pubescens*, and *Lysimachia quadrifolia*.
Global Vegetation: Canopies are dominated by variable mixtures of *Pinus strobus, Quercus alba, Carya alba*, and *Acer rubrum*. Other canopy species may include *Liriodendron tulipifera, Tsuga canadensis, Quercus rubra, Quercus prinus*, and *Magnolia fraseri*. Subcanopy and saplings include canopy species and *Cornus florida, Halesia tetraptera, Oxydendrum arboreum*, and *Nyssa sylvatica*. Shrub layers are moderate to dense, with *Gaylussacia ursina* and *Kalmia latifolia* most commonly dominating. Other shrubs include *Rhododendron minus, Rhododendron maximum, Symplocos tinctoria, Arundinaria gigantea, Castanea dentata, Sassafras albidum, Amelanchier arborea, Pyrularia pubera*, and *Hydrangea radiata*. The herb stratum is sparse, although ferns (*Thelypteris noveboracensis, Dennstaedtia punctilobula*, and *Polystichum acrostichoides*) may occasionally dominate. Common herbs include *Chimaphila maculata, Viola hastata, Goodyera pubescens, Maianthemum racemosum, Polygonatum biflorum, Monotropa uniflora, Trillium catesbaei, Desmodium nudiflorum, Eupatorium purpureum, Galium circaezans, Galium latifolium, Galax urceolata, Hexastylis shuttleworthii, Medeola virginiana, Mitchella repens*, and *Houstonia purpurea*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Carya alba*, *Carya glabra*, *Quercus alba*, *Quercus coccinea*, *Quercus prinus*
Tree subcanopy	Broad-leaved deciduous tree	*Oxydendrum arboreum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia ursina*
Herb (field)	Flowering forb	*Goodyera pubescens*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Carya alba*, *Quercus alba*
Tree subcanopy	Broad-leaved deciduous tree	*Cornus florida*, *Halesia tetraptera*, *Nyssa sylvatica*, *Oxydendrum arboreum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia ursina*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Carya alba*, *Carya glabra*, *Galax urceolata*, *Gaylussacia ursina*, *Goodyera pubescens*, *Pinus strobus*, *Quercus alba*, *Quercus coccinea*, *Quercus prinus*
Global: *Carya alba*, *Goodyera pubescens*, *Liriodendron tulipifera*, *Magnolia fraseri*, *Medeola virginiana*, *Mitchella repens*, *Pinus strobus*, *Polystichum acrostichoides*, *Quercus alba*, *Thelypteris noveboracensis*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Gaylussacia brachycera* (G3), *Hexastylis contracta* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (23-Oct-2003). This community is geographically restricted and uncommon within its range. Grank changed to G3G4 from G2G3 on the recommendation of Gary Kauffman, USDA Forest Service.

RELATED CONCEPTS

Global Similar Types:
- *Pinus strobus - Quercus alba - Quercus prinus / Vaccinium stamineum* Forest (CEGL008539)
- *Quercus alba - Quercus falcata / Vaccinium (arboreum, hirsutum, pallidum)* Forest (CEGL008567)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Small group of white pine - oak forests with much higher species richness than Appalachian White Pine - Subxeric Oak Forest (CEGL007519). Compared to CEGL007519, average topographic position among this group is lower and mean aspect is northwest (versus southwest), suggesting at least somewhat more mesic site conditions. *Quercus alba* is the principal oak associate.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: Two of the plots were pre-classified (by others) as *Pinus strobus / Kalmia latifolia - (Vaccinium stamineum, Gaylussacia ursina)* Forest (CEGL007100), a "pure" *Pinus strobus* type known from the escarpment region of the Southern Blue Ridge.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is widely scattered near the AT in Georgia, North Carolina, and Tennessee. It rarely intersects the trail corridor. It was sampled at Nantahala Gorge in Nantahala National Forest, North Carolina, and in Chattahoochee National Forest, Georgia.
Global Range: This community is known from the Cumberlands and Southern Ridge and Valley, Southern Blue Ridge Escarpment and in the Piedmont transition region.
Nations: US
States/Provinces: GA, KY?, NC, SC, TN
TNC Ecoregions: 50:C, 51:C
USFS Ecoregions (1994/95): 221Hc:CCC, 221He:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Big South Fork, Great Smoky Mountains, Obed River); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FHWO
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 1 accuracy assessment point): APPA.0155, APPA.0544, APPA_AA_0430.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S. Simon and K.D. Patterson
References: Allard 1990, Ambrose 1990a, Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

[CEGL008539] *Pinus strobus - Quercus alba - Quercus prinus / Vaccinium stamineum* Forest

Translated Name: **Eastern White Pine - White Oak - Chestnut Oak / Deerberry Forest**
Common Name: **Central Appalachian-Piedmont White Pine - Subxeric Oak Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Pinus strobus* - *Quercus prinus* Appalachian Forest Alliance (A2080)

Element Concept

Global Summary: The known range of this community includes the Central Appalachian region of Virginia, Maryland, and West Virginia, and the northern and central Piedmont of Virginia. The type is particularly abundant and widespread on low shale mountains and hills in west-central Virginia and adjacent West Virginia. Sites are underlain primarily by shale and similar sedimentary rocks (siltstone, metasiltstone, phyllite) or, less commonly, sandstone in the mountains and by a variety of acidic metamorphic and igneous rocks in the Piedmont. Stands occupy middle and upper slopes, ridge crests, dry ravines, and bluffs, mostly below 760 m (2500 feet) elevation in the mountains and above 75 m (240 feet) in the Piedmont. Aspect is variable, and site moisture is typically assessed as subxeric or submesic. Vegetation is a mixed forest, with canopies varying from closed to somewhat open, codominated by *Pinus strobus* (25-75% canopy cover) and various oaks, particularly *Quercus alba, Quercus coccinea, Quercus velutina, Quercus rubra*, and *Quercus prinus*. Minor canopy associates include *Acer rubrum, Carya alba, Carya glabra, Fagus grandifolia* (mostly Piedmont), *Liriodendron tulipifera, Nyssa sylvatica, Pinus virginiana, Quercus falcata* (mostly Piedmont), *Quercus velutina*, and *Tsuga canadensis*. Understory trees include *Acer rubrum, Oxydendrum arboreum*, and *Nyssa sylvatica*, which may be abundant, along with *Cornus florida*. The shrub layer is predominantly ericaceous and varies from sparse and patchy to occasionally dense, with *Vaccinium stamineum, Vaccinium pallidum, Gaylussacia baccata*, and *Kalmia latifolia* being characteristic. Other frequent but lower-cover shrub-layer species include *Amelanchier arborea, Viburnum acerifolium, Smilax rotundifolia, Smilax glauca, Sassafras albidum*, and *Diospyros virginiana*. The herb layer is characterized by species tolerant of dry, acidic soils; it is usually sparse but occasionally contains dense graminoid patches of *Danthonia spicata, Deschampsia flexuosa*, or *Carex pensylvanica*.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This white pine - subxeric oak / heath forest is found on sites that are underlain primarily by shale and similar sedimentary rocks (siltstone) mostly below 760 m (2,500 feet) elevation. It occurs on mid and upper slopes, ridge crests, dry ravines, and bluffs. This community was sampled at four locations in the Central Appalachian project area. The sites are somewhat steep mid and upper northeast- and west-facing slopes and ridges with dry, well-drained silt loam soil. The unvegetated surface is dominated by leaf litter with some downed wood. Coppicing of oaks is common and indicative of past logging in some stands.

Global Environment: Sites are underlain primarily by shale and similar sedimentary rocks (siltstone, metasiltstone, phyllite) or, less commonly, sandstone in the mountains and by a variety of acidic metamorphic and igneous rocks in the Piedmont. Stands occupy middle and upper slopes, ridge crests, dry ravines, and bluffs, mostly below 760 m (2500 feet) elevation in the mountains and above 75 m (240 feet) in the Piedmont. At least in West Virginia, it occurs in large patches in all slope positions on southwesterly aspects and becomes restricted to smaller patches on ridge spurs and convex upper slopes on cooler aspects. Aspect is variable, and site moisture is typically assessed as subxeric or submesic. Soils are extremely acidic (mean pH = 4.2) with very low base cation levels. Chemical analysis of soils from 16 sites near the Bluestone River in West Virginia showed soils with relatively high levels of organic matter, estimated N release, S, Al, and Fe, and relatively low levels of B, Ca, Cu, K, Mg, Mn, Na, P, and Zn compared to average values in the area.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus prinus, Quercus alba, Quercus rubra*, and/or *Quercus coccinea* are codominant with *Pinus strobus* in the canopy. *Acer rubrum, Amelanchier arborea, Cornus florida, Kalmia latifolia*, and *Viburnum acerifolium* are common in the tall-shrub layer as are oaks from the canopy. *Vaccinium pallidum* and *Vaccinium stamineum* are characteristic short shrubs. Scattered herbs include *Chimaphila maculata, Galax urceolata*, and *Polygonatum biflorum*. This community also supports VA-state critically imperiled and regional endemic *Heuchera caroliniana*.

Global Vegetation: Vegetation is a mixed forest, with canopies varying from closed to somewhat open, codominated by *Pinus strobus* (25-75% canopy cover) and various oaks, particularly *Quercus alba, Quercus coccinea, Quercus velutina, Quercus rubra*, and *Quercus prinus*. Minor canopy associates include *Acer rubrum, Carya alba, Carya glabra, Fagus grandifolia* (mostly Piedmont), *Liriodendron tulipifera, Nyssa sylvatica, Pinus virginiana, Quercus falcata* (mostly Piedmont), *Quercus velutina*, and *Tsuga canadensis*. In addition, *Acer rubrum, Oxydendrum arboreum*, and *Nyssa sylvatica* are abundant understory trees, along with *Cornus florida*. The shrub layer is predominantly ericaceous and varies from sparse and patchy to occasionally dense. *Vaccinium stamineum, Vaccinium pallidum, Gaylussacia baccata*, and *Kalmia latifolia* are characteristic ericads. Other frequent but lower-cover shrub-layer species include *Amelanchier arborea, Viburnum acerifolium, Smilax rotundifolia, Smilax glauca, Sassafras albidum*, and *Diospyros virginiana*. The herb layer is typically sparse and characterized by species tolerant of dry, acidic soils. It consists mostly of woody seedlings and scattered individuals of *Chimaphila maculata, Polygonatum biflorum, Mitchella repens, Cypripedium acaule, Dioscorea quaternata, Conopholis americana, Houstonia longifolia, Antennaria plantaginifolia, Zizia trifoliata, Gaultheria procumbens, Cunila origanoides, Potentilla simplex*, and *Viola x palmata*. Occasional stands, especially on shale substrates, contain dense graminoid patches of *Danthonia spicata, Deschampsia flexuosa*, or *Carex pensylvanica*. Species richness of plot-sampled stands ranged from 16 to 65 taxa per 400 square meters (mean = 36) in the VA and MD plots and from 20 to 53 (mean = 33.5) species per 200 square meters in the WV plots.

Global Dynamics: The successional status of this community is somewhat unclear. At some sites, it appears that *Pinus strobus* has increased greatly following logging disturbances or fire exclusion, and that the white pine-hardwood forest is characteristic of secondary succession in disturbed oak forests. However, Rhoades (1995) describes a mature mixed oak forest (primarily *Quercus prinus* and *Quercus coccinea*) that underwent rapid change toward an oak-maple-white pine composition over a 20-year period. In 1971, *Pinus strobus* was present only as small seedlings, but by 1994 it had assumed dominance of the sapling class. This suggests that in some situations, particularly in the absence of fire, this forest may be a late-successional or climax community type. In a study along the Bluestone River in West Virginia, some stands of this association have some shade-tolerant, mesophytic trees such as *Acer saccharum var. saccharum, Tsuga canadensis*, and *Fagus grandifolia* in the understory, which may indicate successional trends; in other stands, however, there is evidence of abundant oak regeneration.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus coccinea*, *Quercus prinus*
Tall shrub/sapling	Broad-leaved deciduous tree	*Amelanchier arborea*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Viburnum acerifolium*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Herb (field)	Flowering forb	*Galax urceolata*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus coccinea*, *Quercus prinus*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Amelanchier arborea*, *Viburnum acerifolium*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Herb (field)	Flowering forb	*Galax urceolata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Pinus strobus*, *Vaccinium stamineum*
Global: *Carya alba*, *Chimaphila maculata*, *Diospyros virginiana*, *Pinus strobus*, *Pinus virginiana*, *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Quercus stellata*, *Vaccinium stamineum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Heuchera caroliniana* (G3, globally vulnerable & VA state-critically imperiled)
Global: Vulnerable Plants: *Heuchera caroliniana* (G3), *Monarda fistulosa* ssp. *brevis* (G5T1T2), *Tsuga caroliniana* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (21-Sep-2001). Although currently known from a relatively small geographic range, this community type locally covers extensive areas in the Ridge and Valley portion of the Central Appalachians.

RELATED CONCEPTS

Global Similar Types:

- *Liriodendron tulipifera - Pinus strobus - Tsuga canadensis - Quercus rubra / Polystichum acrostichoides* Forest (CEGL006304) of more mesic habitats (e.g., acidic coves) in Maryland, Virginia, and West Virginia.
- *Pinus strobus - Quercus (coccinea, prinus) / (Gaylussacia ursina, Vaccinium stamineum)* Forest (CEGL007519) of the Southern Appalachians.
- *Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest (CEGL006293)
- *Pinus strobus - Quercus alba - (Carya alba) / Gaylussacia ursina* Forest (CEGL007517) of the Southern Appalachians.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Although it occupies a variety of substrates, it is most abundant north of the AT study area on Devonian and Silurian shales of the Ridge and Valley region in west-central Virginia and east-central West Virginia (Fleming and Patterson 2009a).
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: In Virginia, many stands of oak/heath are succeeding to *Pinus strobus - Quercus alba - Quercus prinus / Vaccinium stamineum* Forest (CEGL008539) because of fire exclusion. The circumscription of this type is based on analysis of 16 plot samples from the Virginia Piedmont and Blue Ridge, and Maryland Ridge and Valley, with an additional 16 plots from the environs of the Bluestone River, West Virginia. Additional data, particularly from Central Appalachian regions where white pine is prevalent, would assist in making the classification more robust and identifying potential regional patterns of variation. Central Appalachian white pine - hardwood forests are distinguished from similar vegetation of the Southern Appalachians, e.g., *Pinus strobus - Quercus alba - (Carya alba) / Gaylussacia ursina* Forest (CEGL007517) and *Pinus strobus - Quercus (coccinea, prinus) / (Gaylussacia ursina, Vaccinium stamineum)* Forest (CEGL007519) by the absence of Southern Appalachian species such as *Gaylussacia ursina, Leucothoe recurva, Rhododendron minus, Arundinaria gigantea*, and *Hydrangea radiata*. Six plots from the southern part of the Central Appalachians were classified as this association in the Appalachian Trail classification project (Fleming and Patterson 2009a).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is scattered along and near the AT in the Ridge and Valley section of Virginia from near Roanoke to Bland County. It was sampled at Craig Creek, Dragons Tooth, Lickskillet Hollow, and Peters Mountain in Virginia.
Global Range: The known range of this community includes the Central Appalachian region of Virginia, Maryland, and West Virginia, and the northern and central Piedmont of Virginia. The type is particularly abundant and widespread on low shale mountains and hills in the west-central Virginia (Alleghany, Bath, and Craig counties) and adjacent West Virginia (Pendleton and Pocahontas counties).
Nations: US
States/Provinces: MD, VA:S4, WV
TNC Ecoregions: 50:C, 51:?, 52:C, 58:C, 59:C
USFS Ecoregions (1994/95): 231Aa:CC?, 231Ae:CCC, 231Ak:CCC, 231Al:CC?, 231An:CCC, 231Ap:CCC, 232Br:CCC, M221Aa:CCC, M221Ab:CCC, M221Bc:CCC, M221Bd:CCC, M221Be:CCC, M221Da:CCC, M221Db:CC?, M221Dc:CC?
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Bluestone, C&O Canal, Fredericksburg-Spotsylvania, Manassas, New River Gorge); USFS (George Washington, Jefferson, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHP
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 plots; 1 observation point; 8 accuracy assessment points): APPA.0404, APPA.0410, APPA.1018, APPA.1153, APPA_AA_0025, APPA_AA_0082, APPA_AA_0223, APPA_AA_0416, APPA_AA_0483, APPA_AA_0586, APPA_AA_0731, APPA_AA_1014.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming, P.P. Coulling, S.C. Gawler
References: Abrams et al. 1995, Brooks 1910, Eyre 1980, Fleming 1999, Fleming 2002b, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 2000, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming and Weber 2003, Fleming et al. 2001, Fleming et al. 2006, Harrison 2004, Patterson 2008e, Perles pers. comm., Rentch et al. 2005, Rhoades 1995, Taverna and Patterson 2008, VDNH 2003, Vanderhorst et al. 2007, Vanderhorst et al. 2008, WVNHP unpubl. data b

[CEGL006454] *Quercus (rubra, velutina, alba) - Betula lenta - (Pinus strobus)* Forest

Translated Name: **(Northern Red Oak, Black Oak, White Oak) - Sweet Birch - (Eastern White Pine) Forest**
Common Name: **Mid-Atlantic Mid-Successional Oak - Pine Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Pinus strobus* - *Quercus prinus* Appalachian Forest Alliance (A2080)

ELEMENT CONCEPT

Global Summary: This association covers mid-successional forests developing after heavy cutting or other disturbance in the mid-Atlantic states, where dry-mesic oak species and earlier successional trees predominate, typically with a supercanopy of *Pinus strobus*. It is usually found on dry-mesic sites that are flat to gently rolling. Characteristic structure is large *Pinus strobus* over a layer of young, small-diameter hardwoods, such as *Acer rubrum, Betula lenta*, and mesic oaks, including *Quercus rubra* and *Quercus palustris*. *Juniperus virginiana* and *Tsuga canadensis* may be common in the canopy or subcanopy. Other common associates include *Prunus serotina, Fagus grandifolia, Fraxinus americana, Populus grandidentata, Acer saccharum, Carya cordiformis, Betula alleghaniensis*, and occasional dry oak species such as *Quercus alba* or *Quercus velutina*. The subcanopy may contain *Carpinus caroliniana* and/or *Ostrya virginiana*. The tall-shrub layer is sparse to moderately dense, consisting of *Lindera benzoin, Ilex verticillata, Viburnum prunifolium, Viburnum recognitum*, and saplings of canopy tree species. Common short shrubs are *Berberis thunbergii, Viburnum acerifolium, Rubus occidentalis, Rubus flagellaris*, and *Rubus allegheniensis*. Ericaceous shrubs may be scattered in this type, however, they generally do not cover greater than 25% of the forest floor. The herbaceous layer is sparse to moderately dense; characteristic herbs include *Maianthemum canadense, Dennstaedtia punctilobula, Lycopodium digitatum, Chimaphila maculata, Galium circaezans, Galium mollugo, Mitchella repens, Polystichum acrostichoides, Dryopteris intermedia, Ageratina altissima var. altissima, Podophyllum peltatum*, and *Oxalis stricta*. *Alliaria petiolata* is a common invasive plant in these forests. Vines are usually sparse, with *Parthenocissus quinquefolia* and *Toxicodendron radicans* typically present at low cover.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This mid-successional forest develops after heavy cutting or other disturbance in southern New England and New York south through Delaware Water Gap. It was not observed, but is possible within the Lower New England project area.
Global Environment: This forest occurs on dry-mesic sites that are flat to gently rolling. It typically develops after heavy cutting or other disturbance in the mid-Atlantic states, where dry-mesic oak species and earlier successional trees predominate, typically with a supercanopy of *Pinus strobus*.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: No data available.
Global Vegetation: Characteristic structure is large *Pinus strobus* over a layer of young, small-diameter hardwoods, such as *Acer rubrum, Betula lenta*, and mesic oaks, including *Quercus rubra* and *Quercus palustris*. *Juniperus virginiana* and *Tsuga canadensis* may be common in the canopy or subcanopy. Other common associates include *Prunus serotina, Fagus grandifolia, Fraxinus americana, Populus grandidentata, Acer saccharum, Carya cordiformis, Betula alleghaniensis*, and occasional dry oak species such as *Quercus alba* or *Quercus velutina*. The canopy is typically 20 to 30 m in height with canopy cover usually greater than 70%. The subcanopy usually contains similar species as the canopy, as well as *Carpinus caroliniana* and *Ostrya virginiana*. The tall-shrub layer is sparse to moderately dense, consisting of *Lindera benzoin, Ilex verticillata, Viburnum prunifolium, Viburnum recognitum*, and saplings of canopy tree species. Common short shrubs are *Berberis thunbergii, Viburnum acerifolium, Rubus occidentalis, Rubus flagellaris*, and *Rubus allegheniensis*. Ericaceous shrubs, such as *Kalmia latifolia, Gaylussacia baccata, Vaccinium angustifolium, Vaccinium pallidum*, and *Vaccinium stamineum*, may be scattered in this type, however, they generally do not cover greater than 25% of the forest floor. The herbaceous layer is usually sparse to moderately dense; characteristic herbs include *Maianthemum canadense, Dennstaedtia punctilobula, Lycopodium digitatum, Chimaphila maculata, Galium circaezans, Galium mollugo, Mitchella repens, Polystichum acrostichoides, Dryopteris intermedia, Ageratina altissima var. altissima, Podophyllum peltatum*, and *Oxalis stricta*. *Alliaria petiolata* is a common invasive plant in these forests, Vines are usually sparse, with *Parthenocissus quinquefolia* and *Toxicodendron radicans* typically present at low cover.
Global Dynamics: Varying land-use histories are likely responsible for the species composition and structure of these stands. These are mid-successional forests developing after heavy cutting or other disturbances.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula lenta*
Tree subcanopy	Broad-leaved deciduous tree	*Fagus grandifolia*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Ilex verticillata*, *Lindera benzoin*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus occidentalis*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area):
Global: *Acer rubrum*, *Betula lenta*, *Dennstaedtia punctilobula*, *Fagus grandifolia*, *Lindera benzoin*, *Pinus strobus*

OTHER NOTEWORTHY SPECIES

Global: Other Plants: *Polystichum acrostichoides* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (23-Jun-2006).

RELATED CONCEPTS

Global Similar Types:
- *Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest (CEGL006506) is somewhat more northern, with *Betula papyrifera* more typical than *Betula lenta, Quercus rubra* as the only oak species, and *Picea rubens* an occasional minor associate.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was not observed, but is possible within AT Lower New England project area in the vicinity of Delaware Water Gap and is in a map class with Northeastern White Pine - Oak Forest (CEGL006293).
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Mid-successional forests like this are variable and have not been thoroughly sampled and analyzed.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community is possible within the Lower New England project area in the vicinity of Delaware Water Gap.
Global Range: This association occurs in southern New England south to Pennsylvania and possibly further west and south.
Nations: US
States/Provinces: CT?, MA, NJ, NY?, PA
TNC Ecoregions: 59:P, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Bd:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHP
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was not observed, but is possible within the Lower New England project area in the vicinity of Delaware Water Gap.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: None.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Perles et al. 2007, Swain and Kearsley 2001

A0248 *Quercus prinus - Quercus coccinea* Forest Alliance

Alliance Summary Description: This alliance includes dry oak forests strongly dominated by *Quercus prinus* or *Quercus prinus* with admixtures of *Quercus coccinea, Quercus velutina*, or, to the north, *Quercus rubra*. Other canopy/subcanopy associates include *Acer rubrum, Amelanchier arborea, Carya pallida, Magnolia fraseri, Nyssa sylvatica, Oxydendrum arboreum, Pinus rigida, Pinus strobus, Quercus alba, Quercus rubra, Sassafras albidum*, and *Vaccinium arboreum*. An ericaceous shrub layer is variable in cover, with species such as *Gaylussacia baccata, Gaylussacia ursina, Kalmia latifolia, Leucothoe recurva, Rhododendron maximum, Vaccinium angustifolium, Vaccinium pallidum*, and *Vaccinium stamineum*. In the upper Piedmont, *Kalmia latifolia, Vaccinium arboreum*, and *Vaccinium pallidum* are common. In the montane distribution of this alliance, forests of this alliance have replaced forests formerly dominated or codominated by *Castanea dentata*, and chestnut sprouts are common in the understory. Other shrub species found in forests of this alliance include *Diospyros virginiana, Sassafras albidum*, and *Styrax grandifolius*. Herbaceous cover is typically sparse in these dry, rocky forests, and species vary with geographic location. Common species may include *Chimaphila umbellata, Danthonia spicata, Epigaea repens, Galax urceolata, Gaultheria procumbens*, and *Solidago odora*, and others. The alliance is broad-ranging, from the Southern and Central Appalachians, Ridge and Valley, Cumberland Plateau, Piedmont, Interior Low Plateau, north into the Western Allegheny Plateau, Southern New England / Northern Piedmont, to the Chaplain / St. Lawrence valleys and scattered locations of the Northern Appalachians. These forests occur on convex upper slopes, ridgetops, and south-facing slopes, over thin, rocky, infertile soils in the Appalachians, typically below 1066 m (3500 feet) elevation where windthrow and ice damage are common natural disturbances. In the Piedmont, these forests occur on low mountains and hills, on rocky, well-drained, acidic soils, sometimes associated with outcrops of quartzite or other resistant rock.

[CEGL006271] *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest

Translated Name: **(Chestnut Oak, Scarlet Oak) / Mountain Laurel / (Beetleweed, Eastern Teaberry) Forest**
Common Name: **Chestnut Oak Forest (Subxeric Ridge Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus prinus* - *Quercus coccinea* Forest Alliance (A0248)

ELEMENT CONCEPT

Global Summary: This community includes subxeric ridgetop and exposed slope forests in the Southern Appalachians, ranging south and east into the upper Piedmont, north into the Central Appalachians, and north and west into the Ridge and Valley. This community occurs over shallow soils, primarily on south- to west-facing slopes and ridgetops where solar exposure is high. Soils are rocky, infertile, dry, acidic sandy loams typically derived from sandstone. The community includes forests with canopies strongly dominated by *Quercus prinus* and/or *Quercus coccinea*, with lesser amounts of *Quercus velutina, Quercus rubra, Quercus falcata, Oxydendrum arboreum, Nyssa sylvatica, Pinus virginiana*, and *Acer rubrum*, occurring over a typically dense shrub stratum dominated by ericaceous species. The shrub layer may vary between evergreen and deciduous dominance. Typical shrub species include *Kalmia latifolia, Rhododendron maximum, Vaccinium stamineum, Vaccinium pallidum, Gaylussacia ursina, Gaylussacia baccata*, and (in the more southern portions of the range) *Leucothoe recurva*. In addition, *Castanea dentata* may occur abundantly as root sprouts. The herb layer is typically sparse and includes subshrubs such as *Epigaea repens* and *Gaultheria procumbens*. Other common species include *Chamaelirium luteum, Chimaphila maculata, Galax urceolata, Magnolia fraseri, Sassafras albidum, Symplocos tinctoria, Smilax rotundifolia*, and *Smilax glauca*. This community is distinguished by its overall floristic composition, with a high abundance of acid-loving ericaceous species, which are indicative of this community's extremely infertile, acidic soils.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This dry, acidic chestnut oak / heath forest occurs on upper convex slopes and dry ridges with rocky, infertile, dry, acidic sandy loam soil. It was sampled at 14 locations within the AT corridor in the southern part of the Central Appalachians. Sites range from gentle to somewhat steep low to upper slopes and ridges with mostly northern or southern aspects. Soils are xeric to dry-mesic well-drained loam, sandy loam, clay loam, and silt loam. The unvegetated surface is dominated by leaf litter with some downed wood and occasional large and/or small rocks. Evidence of disturbance includes past fire, past logging, trails, and wind/ice damage.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This acidic chestnut oak forest is found below 1,220 m (4,000 feet) elevation and occurs on upper slopes and exposed ridgetops and sometimes on lower, broad ridgetops (occasionally reaching 1,370 m [4,500 feet]) with a range of aspects. Soils range from xeric to dry-mesic and from rapidly drained to moderately well-drained. Soil textures include clay loam, loam, sandy loam, and silt loam. The unvegetated surface is dominated by leaf litter with some downed wood and occasional large/small rocks and bare soil. Evidence of disturbance includes past logging, trails, pine bark beetle damage, and hemlock/fir adelgid damage.

Global Environment: This community occurs on upper slopes, ridges and spurs, usually convex, primarily on south- to west-facing slopes and ridgetops where solar exposure is high. This community includes subxeric ridgetop forests in the Southern Blue Ridge, ranging south and east into the upper Piedmont and north into the Central Appalachians, and west into the Ridge and Valley. Soils are rocky, infertile, dry to very dry, acidic sandy loams to clay loams often derived from sandstone. These forests occur on moderate to very steep slopes or on flat to gently sloping interfluves. Sites supporting this association are typically below 1067 m elevation (3500 feet), but range up to 1280 m (4200 feet). The average elevation of 55 plots classified as this association in the Appalachian Trail project (Fleming and Patterson 2009a) is 845 m (2771 feet), ranging from 262 m (860 feet) to 1305 m (4281 feet).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus prinus* dominates the canopy. *Quercus coccinea, Acer rubrum*, and *Nyssa sylvatica* are common associates. *Kalmia latifolia* dominates the shrub layer. Other common shrubs include *Castanea dentata* and *Vaccinium pallidum*. This community includes Southern Appalachian species such as *Galax urceolata, Oxydendrum arboreum*, and *Leucothoe recurva*. Additional species common in the herb layer include *Gaultheria procumbens, Epigaea repens*, and *Uvularia puberula*.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The forest canopy is dominated largely by dry to subxeric oak species, primarily *Quercus prinus* or *Quercus coccinea* (sometimes *Quercus alba*) usually but not always occurring over a nearly completely closed shrub layer of *Kalmia latifolia*. Additional common tree species include *Acer rubrum, Nyssa sylvatica, Oxydendrum arboreum, Quercus rubra*, and *Quercus velutina*. Common shrubs in addition to *Kalmia latifolia* are *Castanea dentata, Leucothoe recurva, Rhododendron calendulaceum, Rhododendron maximum, Sassafras albidum, Vaccinium pallidum*, and *Vaccinium stamineum*. Herbs are sparse but diverse; common taxa include *Epigaea repens, Galax urceolata, Gaultheria procumbens*, and *Uvularia puberula*. This community also supports TN-state imperiled *Stachys clingmanii* (also considered globally imperiled) and *Buckleya distichophylla*. In a southern variant of this association restricted to the Great Smoky Mountains and Nantahala Mountains, *Gaylussacia ursina* (strongly dominant), *Quercus rubra,*

Pyrularia pubera, Tsuga canadensis, and *Magnolia fraseri* are much more important in a southern variant of this association restricted to the Great Smoky Mountains and Nantahala Mountains.

Global Vegetation: Stands of this association are forests with canopies strongly dominated by *Quercus prinus* and *Quercus coccinea* alone or in mixture. *Quercus velutina* is an important associate in some stands. Other trees, usually in lesser amounts, include *Quercus rubra, Quercus alba, Quercus falcata, Oxydendrum arboreum, Nyssa sylvatica, Pinus virginiana, Pinus rigida, Betula lenta*, and *Acer rubrum*. In addition, *Carya alba, Carya glabra, Magnolia acuminata*, and *Magnolia fraseri* are present in some areas. The canopy trees grow over a typically dense shrub stratum dominated by ericaceous species, which may display either evergreen or deciduous dominance. Typical shrub species include *Kalmia latifolia, Vaccinium stamineum, Vaccinium pallidum, Gaylussacia ursina*, and *Gaylussacia baccata*. Some areas may feature *Rhododendron maximum, Rhododendron calendulaceum, Rhododendron catawbiense*, and *Leucothoe recurva*. In addition, *Castanea dentata* may occur abundantly as root sprouts. The herb layer is typically sparse and includes subshrubs such as *Epigaea repens* and *Gaultheria procumbens*. Other common species include *Carex digitalis var. digitalis, Chamaelirium luteum, Chimaphila maculata, Coreopsis major, Galax urceolata, Danthonia spicata, Dichanthelium dichotomum var. dichotomum, Dioscorea quaternata, Hieracium venosum, Houstonia longifolia, Lysimachia quadrifolia, Solidago caesia, Symplocos tinctoria*, and *Potentilla simplex*. Mosses include *Dicranum fulvum, Dicranum scoparium, Thuidium delicatulum*, and *Leucobryum glaucum*. Macrolichens include *Flavoparmelia baltimorensis, Cladonia furcata, Lasallia papulosa*, and *Umbilicaria mammulata*. This community is distinguished by its overall floristic composition, with a high abundance of acid-loving ericaceous species, which are indicative of this community's extremely infertile, acid soils. In the Great Smoky Mountains *Acer rubrum* is often dominant or codominant in these forests, presumably on former American chestnut (*Castanea dentata*) sites. In the Blue Ridge-Piedmont transition, below 853 m (2800 feet) elevation, where this community is often associated with *Pinus rigida* forests and woodlands, *Quercus falcata* may be a component of the canopy, and the shrub stratum is strongly dominated by *Vaccinium pallidum*.

Global Dynamics: There is abundant evidence of past fires in this community, and the vegetation may be fire-adapted, although information on natural fire regimes is lacking. Most sites have a history of logging.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus coccinea*, *Quercus prinus*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Nyssa sylvatica*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Herb (field)	Dwarf-shrub	*Epigaea repens*, *Galax urceolata*, *Gaultheria procumbens*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus coccinea*, *Quercus prinus*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Dwarf-shrub	*Epigaea repens*, *Gaultheria procumbens*
Herb (field)	Flowering forb	*Galax urceolata*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus coccinea*, *Quercus prinus*, *Quercus velutina*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium stamineum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Dwarf-shrub	*Epigaea repens*, *Gaultheria procumbens*
Herb (field)	Flowering forb	*Galax urceolata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Castanea dentata*, *Galax urceolata*, *Kalmia latifolia*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Quercus coccinea*, *Quercus prinus*, *Vaccinium pallidum*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer rubrum*, *Castanea dentata*, *Galax urceolata*, *Kalmia latifolia*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Quercus alba*, *Quercus coccinea*, *Quercus prinus*, *Uvularia puberula*, *Vaccinium pallidum*
Global: *Acer rubrum*, *Carex digitalis* var. *digitalis*, *Castanea dentata*, *Chimaphila maculata*, *Coreopsis major*, *Danthonia spicata*, *Dichanthelium dichotomum* var. *dichotomum*, *Galax urceolata*, *Gaylussacia baccata*, *Hieracium venosum*, *Kalmia latifolia*, *Lysimachia quadrifolia*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Quercus alba*, *Quercus coccinea*, *Quercus prinus*, *Quercus velutina*, *Rhododendron periclymenoides*, *Sassafras albidum*, *Solidago caesia*, *Vaccinium pallidum*, *Vaccinium stamineum*

Other Noteworthy Species

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Buckleya distichophylla* (G3, globally imperiled), *Castanea dentata* (G4, TN state-imperiled), *Stachys clingmanii* (G2, globally imperiled & TN-state critically imperiled)
Global: Vulnerable Plants: *Buckleya distichophylla* (G3), *Canoparmelia amabilis* (G1), *Hexastylis contracta* (G3), *Monotropsis odorata* (G3), *Robinia hispida* var. *rosea* (G4T3?), *Stachys clingmanii* (G2), *Thermopsis fraxinifolia* (G3?), *Thermopsis mollis* (G3G4), *Tsuga caroliniana* (G3), *Vaccinium hirsutum* (G3); **Other Plants**: *Smilax biltmoreana* (G4)

Conservation Status Rank

Global Rank & Reasons: G5 (31-Dec-1997).

Related Concepts

Global Similar Types:
- *Acer rubrum var. rubrum - Betula lenta - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Ruderal Forest (CEGL008558) is an acidic mixed hardwood forest of the Southern Blue Ridge, resulting after severe fire, logging, or loss of chestnut; a modified type originally defined from the Great Smoky Mountains.
- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119)
- *Quercus alba - Quercus (coccinea, velutina, prinus) / Gaylussacia baccata* Forest (CEGL008521)
- *Quercus prinus - (Quercus coccinea) / Carya pallida / Vaccinium arboreum - Vaccinium pallidum* Forest (CEGL008431) defined for the southern Cumberland Plateau and western fringe of the Southern Blue Ridge, with more diverse shrubs.
- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299) is the Central Appalachian analogue of CEGL006271; compositionally similar but generally lacking Southern Appalachian species such as *Galax, Oxydendrum*, and *Leucothoe recurva*.
- *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267)
- *Quercus prinus - Carya* spp. - *Quercus velutina / Vaccinium arboreum / Iris verna var. smalliana* Forest (CEGL007261) is defined for the lower Piedmont of Alabama and has Coastal Plain affinities.
- *Quercus prinus - Quercus (alba, coccinea) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023) is a broadly defined type for the Appalachian Plateau and Interior Low Plateau.
- *Quercus prinus - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum*) Forest (CEGL006282) is defined for the Northern Piedmont, Central Appalachians; occurs on granite monadnocks.
- *Quercus prinus - Quercus alba / Oxydendrum arboreum / Vitis rotundifolia* Forest (CEGL006281)
- *Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest (CEGL006286) is more mesic and has a higher component of *Rhododendron maximum* and relatively little *Kalmia latifolia*.

Classification

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: The most constant species, in order of descending constancy are *Acer rubrum, Kalmia latifolia, Quercus prinus, Quercus coccinea, Nyssa sylvatica, Vaccinium pallidum, Oxydendrum arboreum, Galax urceolata, Smilax rotundifolia, Castanea dentata, Sassafras albidum*, and *Smilax glauca*.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: For the purpose of mapping this association, the northern limit was set in Roanoke, Virginia, extending south into the Southern Blue Ridge. Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299) was mapped from north of Roanoke through to Cumberland County, Pennsylvania. Unambiguous Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271) is confined to south of the New River. Unambiguous CEGL006299 occurs from Roanoke north.

Between the New River and Roanoke is a transition zone in which many stands could be assigned equally well to either type.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: A southern variant is restricted to Great Smoky Mountains and Nantahala Mountains. Many of the common species in the typic CEGL006271, such as *Quercus coccinea, Nyssa, Vaccinium pallidum, Gaylussacia baccata*, and *Leucothoe recurva*, are absent or inconstant. Additionally, a suite of other species, including *Gaylussacia ursina* (strongly dominant), *Quercus rubra, Pyrularia pubera, Tsuga canadensis*, and *Magnolia fraseri*, are much more important.

Global Classification Comments: Like the other matrix oak/heath forests in Virginia, this type can occur on a wide variety of topographic positions, as long as soil conditions are favorable. A similar association defined for the southern Cumberland Plateau, *Quercus prinus - (Quercus coccinea) / Carya pallida / Vaccinium arboreum - Vaccinium pallidum* Forest (CEGL008431), occurs over sandstone or other geologies not as acidic as the Blue Ridge type and lacks species indicative of the Blue Ridge association, such as *Kalmia latifolia, Gaylussacia ursina, Gaylussacia baccata*, and *Gaultheria procumbens*.

In the Great Smoky Mountains, *Acer rubrum* is often dominant or codominant in these forests, presumably on former American chestnut (*Castanea dentata*) sites. In the Blue Ridge-Piedmont transition, below 853 m (2800 feet) elevation, where this community is often associated with *Pinus rigida* forests and woodlands, *Quercus falcata* may be a component of the canopy, and the shrub stratum is strongly dominated by *Vaccinium pallidum*. A similar association defined for the southern Cumberland Plateau, *Quercus prinus - (Quercus coccinea) / Carya pallida / Vaccinium arboreum - Vaccinium pallidum* Forest (CEGL008431), occurs over sandstone or other geologies not as acid as the Blue Ridge type and lacks species indicative of the Blue Ridge association, such as *Kalmia latifolia, Gaylussacia ursina, Gaylussacia baccata*, and *Gaultheria procumbens*.

In 55 plots classified as this association (homoteneity = 0.60) in the Appalachian Trail analysis (Fleming and Patterson 2009a), the most constant species, in order of descending constancy are *Acer rubrum, Kalmia latifolia, Quercus prinus, Quercus coccinea, Nyssa sylvatica, Vaccinium pallidum, Oxydendrum arboreum, Galax urceolata, Smilax rotundifolia, Castanea dentata, Sassafras albidum*, and *Smilax glauca*. Species richness ranges from 13-52 species and averages 30 species per 400-m2 plot sample. In this same analysis, a group of 11 plots from the Great Smoky and Nantahala mountains segregated as a distinct group in cluster analysis. While the composition of this group fits within the broad concept of this association (CEGL006271), this "southern variant" is distinguished by the dominance of *Gaylussacia ursina* and the greater importance of *Quercus rubra, Pyrularia pubera, Tsuga canadensis*, and *Magnolia fraseri* than in the "typic" expression of CEGL006271. Further, species that are common in the "typic" expression of CEGL006271, *Quercus coccinea, Nyssa sylvatica, Vaccinium pallidum, Gaylussacia baccata*, and *Leucothoe recurva*, are absent or inconstant in the "southern variant." Based on available plot data, environmental and geographic distinctions could not be made between the two groups, but further study may be warranted.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This forest of the Southern Appalachians ranges north to the New River in Virginia. It was sampled in the southern Central Appalachians of Virginia at Brushy Mountain, Garden Mountain, Glade Mountain, Kelly Knob, Lick Creek, Pearis Mountain West, Peters Mountain, Pine Swamp Branch, and Vaught Branch.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is common in and near the AT corridor at low to middle elevations throughout the Southern Blue Ridge. It was sampled in Chattahoochee National Forest and elsewhere in Georgia, in North Carolina and Tennessee (including Mt. Buckley), and in Virginia at Bobby's Ridge, Feathercamp Ridge, Holston Mountain, Hurricane Mountain, and Straight Mountain.

Global Range: The center of distribution for this community is the Southern Blue Ridge of southwestern Virginia, western North Carolina, eastern Tennessee, northeastern Georgia, and northwestern South Carolina. It ranges south and east into the upper Piedmont and north into the Central Appalachians. This type is common in the Southern Ridge and Valley and Cumberland Mountains of southwestern Virginia and presumably Kentucky.

Nations: US

States/Provinces: GA, KY, NC, SC, TN, VA:S4S5, WV

TNC Ecoregions: 50:C, 51:C, 52:P, 59:C

USFS Ecoregions (1994/95): 221Ja:CCC, 231Ag:CCC, M221Aa:CCC, M221Ab:CCC, M221Bd:CCC, M221Be:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCP, M221Ce:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Gauley River, Great Smoky Mountains, New River Gorge); USFS (Chattahoochee, Chattahoochee (Piedmont)?, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCOM
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (9 plots; 4 observation points; 19 accuracy assessment points): APPA.0058, APPA.0099, APPA.0101, APPA.0492, APPA.0992, APPA.0995, APPA.1022, APPA.1024, APPA.1025, APPA.1152, APPA.1173, APPA.1179, APPA.1181, APPA_AA_0099, APPA_AA_0296, APPA_AA_0405, APPA_AA_0408, APPA_AA_0415, APPA_AA_0444, APPA_AA_0580, APPA_AA_0610, APPA_AA_0697, APPA_AA_0804, APPA_AA_0902, APPA_AA_0915, APPA_AA_1012, APPA_AA_1244, APPA_AA_1374, APPA_AA_1418, APPA_AA_1439, APPA_AA_1484, APPA_AA_1533.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (14 plots; 12 observation points; 37 accuracy assessment points): APPA.0133, APPA.0167, APPA.0253, APPA.0259, APPA.0263, APPA.0264, APPA.0543, APPA.0548, APPA.0577, APPA.0599, APPA.0603, APPA.0611, APPA.0648, APPA.1012, APPA.1044, APPA.1044B, APPA.1049, APPA.1062, APPA.1062B, APPA.1064, APPA.1064B, APPA.1087, APPA.1091, APPA.1100, APPA.1101, APPA.1169, APPA_AA_0030, APPA_AA_0102, APPA_AA_0110, APPA_AA_0144, APPA_AA_0147, APPA_AA_0222, APPA_AA_0308, APPA_AA_0340, APPA_AA_0365, APPA_AA_0446, APPA_AA_0525, APPA_AA_0536, APPA_AA_0558, APPA_AA_0629, APPA_AA_0637, APPA_AA_0650, APPA_AA_0738, APPA_AA_0772, APPA_AA_0802, APPA_AA_0808, APPA_AA_0847, APPA_AA_1021, APPA_AA_1049, APPA_AA_1063, APPA_AA_1066, APPA_AA_1073, APPA_AA_1098, APPA_AA_1107, APPA_AA_1180, APPA_AA_1279, APPA_AA_1281, APPA_AA_1305, APPA_AA_1354, APPA_AA_1385, APPA_AA_1505, APPA_AA_1538, APPA_AA_1582.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson, R. White and S.C. Gawler
References: Allard 1990, CAP pers. comm. 1998, Evans 1991, Evans et al. 2009, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Golden 1974, Major et al. 1999, McLeod 1988, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Patterson 1994, Peet et al. unpubl. data, Pyne 1994, Rawinski et al. 1996, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, VDNH 2003, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2010, White 2003, White 2006, Whittaker 1956

[CEGL006299] *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest

Translated Name: **Chestnut Oak - (Scarlet Oak, Northern Red Oak) / Mountain Laurel / Blue Ridge Blueberry Forest**
Common Name: **Central Appalachian-Northern Piedmont Chestnut Oak Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus prinus - Quercus coccinea* Forest Alliance (A0248)

ELEMENT CONCEPT

Global Summary: This chestnut oak forest occurs at relatively low elevations (mostly <900 m) in the Central Appalachians and adjacent areas (e.g., northern Piedmont), in association with dry, acidic, infertile soils on middle and upper slopes. The canopy, which may be rather short, is strongly dominated by *Quercus prinus*. The most characteristic canopy associates are *Quercus coccinea*, which varies from sparse to codominant, and *Quercus rubra*. Minor associates frequently include *Quercus velutina, Quercus alba, Nyssa sylvatica, Sassafras albidum*, and/or *Robinia pseudoacacia*. Root sprouts of *Castanea dentata* are present in some areas. *Acer rubrum* and *Nyssa sylvatica* are often abundant in the understory tree layers. Tall shrubs include *Kalmia latifolia* (usually dominant),

Viburnum acerifolium, and *Rhododendron periclymenoides*. The short-shrub layer is well-developed and includes *Vaccinium pallidum, Vaccinium stamineum*, and *Gaylussacia baccata*, any one of which can exhibit patch-dominance. The herb layer generally has sparse cover but sometimes includes scattered individuals of *Aureolaria laevigata, Chimaphila maculata, Comandra umbellata, Cypripedium acaule, Danthonia spicata, Epigaea repens, Gaultheria procumbens, Hieracium venosum, Lysimachia quadrifolia, Medeola virginiana, Monotropa uniflora, Pteridium aquilinum*, and/or *Uvularia puberula*. Strong dominance of *Quercus prinus* in the canopy, strong dominance of *Kalmia latifolia* in the tall-shrub layer, and *Vaccinium pallidum* present and often abundant as a short shrub are diagnostics for this type.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This dry chestnut oak forest occurs on acidic, infertile soils at low elevations (mostly <900 m [2,950 feet]), on mid and upper dry, rocky slopes and crests. This community was sampled throughout the Central Appalachians. Sites range from gentle to steep mid and upper slopes and summits with mostly westerly aspects. Soils are very dry, rapidly to moderately well-drained sandy loam, loam, and silt loam. The unvegetated surface is dominated by leaf litter with some downed wood and may include significant amounts of exposed bedrock and large/small rocks. Bryophytes and lichens are often present. Evidence of disturbance includes past logging, trails, grazing/browsing, gypsy moth infestation, and the minor presence of exotic plant species. Two variants of this community were sampled. One variant is found on warmer, more open and exposed sites, especially those with a more discernable history of heavy cutting and fire within the last 100 years. A second variant occurs on sheltered slopes, often with northerly aspects.
Global Environment: This association is found on acidic, infertile soils on low-elevation (mostly <900 m), middle and upper slopes (occasionally on lower slopes). Sites are often exposed, or at least on convex slopes, and moisture potential is typically subxeric to xeric. Sandy loam soils, often stony, are typical. Some exposed bedrock is often present. Many sites have a history of occasional or frequent fires.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus prinus* dominates the canopy with *Kalmia latifolia* dominant in the tall-shrub layer. *Acer rubrum, Nyssa sylvatica*, and *Sassafras albidum* are common in the subcanopy. A well-developed ericaceous short-shrub layer is characteristic which includes *Vaccinium pallidum, Vaccinium stamineum*, and *Gaylussacia baccata*, any one of which can exhibit patch-dominance. *Dennstaedtia punctilobula, Gaultheria procumbens*, and *Epigaea repens* are common in the herb layer. There are two variants of this community found in the park. *Quercus prinus* is dominant in the canopy in both. In one variant, *Quercus coccinea* is the principal associate in the canopy, with *Betula lenta* and *Hamamelis virginiana* important in the subcanopy and shrub layers. *Quercus rubra* is the primary associate in the other variant with *Gaylussacia baccata* and *Rhododendron periclymenoides* occurring in the shrub layer. This community also supports regionally rare and VA-state critically imperiled *Heuchera caroliniana*.
Global Vegetation: The canopy is strongly dominated by *Quercus prinus* or, less frequently, by combinations of *Quercus prinus* and other oaks. The most frequent canopy associates are *Quercus coccinea*, which varies from sparse to codominant, and *Quercus rubra*. Minor associates frequently include *Quercus velutina, Quercus alba, Nyssa sylvatica, Betula lenta*, and *Sassafras albidum*. *Acer rubrum* and *Nyssa sylvatica* are usually abundant in the understory tree layers. Tall shrubs *Kalmia latifolia* (usually dominant), *Viburnum acerifolium*, and *Rhododendron periclymenoides* are often associated, sometimes at low cover. The short-shrub layer is well-developed and includes *Vaccinium pallidum, Vaccinium stamineum*, and *Gaylussacia baccata*, any one of which can exhibit patch-dominance. Occasional stands lack *Kalmia latifolia* and have an entirely deciduous, ericaceous shrub layer. The herb layer generally has sparse cover but sometimes includes *Aureolaria laevigata, Chimaphila maculata, Comandra umbellata, Cypripedium acaule, Danthonia spicata, Epigaea repens, Gaultheria procumbens, Hieracium venosum, Lysimachia quadrifolia, Medeola virginiana, Monotropa uniflora, Pteridium aquilinum*, and *Uvularia puberula*. Strong dominance of *Quercus prinus* in the canopy, strong dominance of *Kalmia latifolia* in the tall-shrub layer, and *Vaccinium pallidum* present and often abundant as a short shrub are diagnostics for this type.
Global Dynamics: Windthrow, fire, and ice storms are common natural disturbances in these habitats. Evidence of past fires is present at many sites, and periodic fire appears to be an important ecological factor in oak regeneration. Development of *Acer rubrum*-dominated understories in these forests is widely considered to be the result of drastic reductions of fire frequencies or exclusion of fire altogether. *Castanea dentata* was formerly an important canopy species in these forests prior to chestnut blight.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus coccinea*, *Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Nyssa sylvatica*, *Sassafras albidum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium pallidum*, *Vaccinium stamineum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus coccinea*, *Quercus prinus*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Nyssa sylvatica*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*, *Vaccinium stamineum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Epigaea repens*, *Gaultheria procumbens*, *Gaylussacia baccata*, *Kalmia latifolia*, *Nyssa sylvatica*, *Quercus prinus*, *Sassafras albidum*, *Vaccinium pallidum*
Global: *Kalmia latifolia*, *Quercus prinus*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Castanea dentata* (G4, MD state-vulnerable), *Heuchera caroliniana* (G3, globally vulnerable & VA state-critically imperiled);
Invasive/Exotic Plants: *Calystegia sepium*, *Microstegium vimineum* (High/Medium)
Global: Vulnerable Plants: *Carex polymorpha* (G3), *Heuchera caroliniana* (G3), *Monotropsis odorata* (G3), *Tsuga caroliniana* (G3); **Other Plants**: *Gaylussacia baccata* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (29-Jan-2004). Extensive examples occur in Virginia, Maryland, and West Virginia.

RELATED CONCEPTS

Global Similar Types:

- *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271) of the Southern Appalachians.
- *Quercus alba - Quercus (coccinea, velutina, prinus) / Gaylussacia baccata* Forest (CEGL008521) primarily of the Piedmont.
- *Quercus prinus - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum*) Forest (CEGL006282) northern; at high elevations at the southern edge of its range.
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057) occurs on submesic sites.
- *Quercus prinus - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest (CEGL008523) occurs on subxeric sites.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This association is the Central Appalachian analogue of Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271). It is compositionally similar but generally lacks Southern Appalachian species such as *Galax urceolata, Oxydendrum arboreum*, and *Leucothoe recurva*. At the southern end of its range, there is a transition zone, and many stands could be assigned equally well to either type. It can be distinguished from Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057) by its dense ericaceous short-shrub layer and canopy dominated just by *Quercus prinus*. The canopy in CEGL006057 is codominated by *Quercus prinus* and *Quercus rubra*.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: For the purpose of mapping this association and to distinguish it from other similar chestnut oak associations to the south, i.e., Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271) and to the north, i.e., Lower New England High Slope Chestnut Oak Forest (CEGL006282), the southern limit for mapping was set just north of Roanoke, Virginia, and extending

north through the Central Appalachians to Cumberland, County, Pennsylvania. Unambiguous Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271) is confined to south of the New River. Unambiguous Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299) occurs from Roanoke north. Between the New River and Roanoke is a transition zone in which many stands could be assigned equally well to either type. Lower New England High Slope Chestnut Oak Forest (CEGL006282) is mapped from north of Cumberland, County, Pennsylvania, into Lower New England.

Global Classification Comments: This community can be readily identified by its dry, infertile sites and quite species-poor vegetation overwhelmingly dominated by *Quercus prinus* and *Kalmia latifolia* (each averaging 25 to 50% cover in more than 80 Virginia and Maryland plot samples), with *Acer rubrum* and *Nyssa sylvatica* abundant in the subcanopy. Two variants of the type have been detected in quantitative analyses: (1) a variant with *Quercus rubra* as the principal associate of *Quercus prinus*, with *Betula lenta* and *Hamamelis virginiana* often important in the subcanopy and shrub layers, typically occurring on sheltered slopes, often with northerly aspects; and (2) a variant with *Quercus coccinea* as the principal associate of *Quercus prinus*, occurring with *Gaylussacia baccata* and *Rhododendron periclymenoides*, typically on warmer, more open and exposed sites, especially those with a more discernible history of heavy cutting and fire within the last 100 years. However, these variants and their habitats are fully intergradational and have few other floristic attributes that could be considered reliably "diagnostic." This association is the Central Appalachian analogue of *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271). It is compositionally similar but generally lacks Southern Appalachian species such as *Galax urceolata, Oxydendrum arboreum*, and *Leucothoe recurva*. At the southern end of its range, there is a transition zone and many stands could be assigned equally well to either type.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges throughout the Central Appalachians, from north Roanoke, Virginia, to Cumberland County, Pennsylvania. It was sampled in Maryland, Pennsylvania (including Lehigh Furnace Gap) and Virginia (including Brushy Mountain/Dismal Creek, Catawba Mountain, James River Face Wilderness, Loft Mountain, McAfee Knob, and Sawmill Run Overlook in Shenandoah National Park).
Global Range: This association is currently described from the Central Appalachians and northern part of the Piedmont in Pennsylvania, Virginia, Maryland, and West Virginia. In northern Virginia, the District of Columbia, and Maryland, it occasionally occurs at the extreme western edge of the Coastal Plain on steep ravine slopes of the fall zone. It also occurs at the northern periphery of the Southern Blue Ridge near Roanoke, Virginia.
Nations: US
States/Provinces: DC, DE:S2, MD:S5, PA, VA:S5, WV
TNC Ecoregions: 51:C, 52:C, 58:C, 59:C, 61:C
USFS Ecoregions (1994/95): 221Db:CCC, 231Aa:CCC, 231Ad:CCC, 231Af:CCC, 231Ak:CCC, 231Al:CCC, 232Ad:CCC, M221Aa:CCC, M221Ab:CCC, M221Ba:CCC, M221Bb:CCC, M221Bd:CCP, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, C&O Canal, Catoctin Mountain, George Washington Parkway, Harpers Ferry, National Capital-East, Rock Creek, Shenandoah, Wolf Trap); USFS (George Washington, Jefferson, Monongahela); USFWS (Patuxent)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCOH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (9 plots; 13 observation points; 26 accuracy assessment points): APPA.0227, APPA.0233, APPA.0355, APPA.0477, APPA.0501, APPA.0504, APPA.0516, APPA.0519, APPA.0521, APPA.0529, APPA.1001, APPA.1186, APPA.1245, APPA.1253, APPA.1255, APPA.1260, APPA.1261, APPA.1267, APPA.1268, APPA.1269, APPA.1270, APPA.1272, APPA_AA_0002, APPA_AA_0010, APPA_AA_0107, APPA_AA_0155, APPA_AA_0244, APPA_AA_0246, APPA_AA_0250, APPA_AA_0342, APPA_AA_0384, APPA_AA_0449, APPA_AA_0487, APPA_AA_0514, APPA_AA_0625, APPA_AA_0641, APPA_AA_0646, APPA_AA_0721, APPA_AA_0744, APPA_AA_0857, APPA_AA_0961, APPA_AA_0969, APPA_AA_1026, APPA_AA_1164, APPA_AA_1265, APPA_AA_1433, APPA_AA_1443, APPA_AA_1612.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S. Neid, G.P. Fleming, E. Largay and S.C. Gawler

References: Allard and Leonard 1943, Coxe 2009, Eastern Ecology Working Group n.d.*, Fike 1999, Fleming 2002a, Fleming 2002b, Fleming 2007, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Moorhead 2000, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2007b, Harrison 2004, Lea 2003, Lea 2004, Rawinski et al. 1994, Rawinski et al. 1996, Vanderhorst 2001a, Vanderhorst and Streets 2006, Young et al. 2006, Young et al. 2009

[CEGL006282] *Quercus prinus - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum)* Forest

Translated Name: **Chestnut Oak - (Northern Red Oak, Black Oak) / (Lowbush Blueberry, Blue Ridge Blueberry) Forest**

Common Name: **Lower New England High Slope Chestnut Oak Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus prinus* - *Quercus coccinea* Forest Alliance (A0248)

Element Concept

Global Summary: This dry to xeric oak-heath forest of central and southern New England ranges south to the northern Piedmont and central Appalachian Mountains. It occurs on upper slopes and ridgetops with thin, nutrient-poor, acidic soils. Windthrow, fire and ice damage are common natural disturbances. The canopy is closed to partially open and is dominated by *Quercus prinus*, which can be codominant with *Quercus rubra*. *Quercus alba, Quercus velutina*, and *Acer rubrum* are common associates, with other less frequent trees including *Betula lenta, Quercus coccinea, Amelanchier arborea, Pinus rigida*, and *Pinus strobus*. *Sassafras albidum, Cornus florida*, and *Nyssa sylvatica* can be minor associates at the southern and western portions of the range. The low-shrub layer is well-developed and comprised chiefly of ericaceous species, including *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium stamineum, Gaylussacia baccata*, or *Kalmia angustifolia*. A tall-shrub layer is often lacking but when present may include *Castanea dentata, Kalmia latifolia, Viburnum acerifolium, Hamamelis virginiana, Quercus ilicifolia*, and *Viburnum prunifolium*. *Ilex montana, Rhododendron prinophyllum*, and *Menziesia pilosa* are minor shrub associates at the southern end of the range. The herbaceous layer is of sparse to moderate cover, depending on shrub cover, and may include *Carex pensylvanica, Deschampsia flexuosa, Danthonia spicata, Ageratina altissima var. altissima, Antennaria plantaginifolia, Aralia nudicaulis, Aureolaria laevigata, Gaultheria procumbens, Chimaphila maculata, Carex rosea, Carex swanii, Carex pensylvanica, Corydalis sempervirens, Comandra umbellata, Cypripedium acaule, Dryopteris marginalis, Epigaea repens, Goodyera pubescens, Hieracium venosum, Lycopodium clavatum, Medeola virginiana, Melampyrum lineare, Monotropa uniflora, Potentilla canadensis, Pteridium aquilinum*, and *Uvularia sessilifolia*.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This oak / heath forest occurs on xeric upper slopes and ridgetops and steep sideslopes with shallow, acidic, rocky, infertile soils. It was sampled at 18 locations in the central and northern Pennsylvania in the Central Appalachian project area. Sites range from gentle to somewhat steep upper slopes and flat summits with mostly westerly aspects. Soils are dry to dry-mesic, rapidly to well-drained sandy loam and loam. The unvegetated surface consists of leaf litter with some downed wood and large rocks, often with some cover of bryophytes/lichens. No evidence of disturbance was reported.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This oak / heath forest occurs on xeric upper slopes and ridgetops and steep sideslopes with shallow, acidic, rocky, infertile soils. It is a widespread chestnut oak forest of Lower New England. The sites are variable ranging from gentle to steep mid and upper slopes and ridgetops. Soils are dry-mesic to dry to somewhat xeric and are typically well-drained or moderately well-drained sandy loam, silt loam and loam. The unvegetated surface consists of leaf litter, with lesser amounts of exposed bedrock, large/small rocks (sometimes significant amounts) and downed wood. Evidence of disturbance includes trails and trampling, deer browse, wind/ice damage, chestnut blight, and the minor presence of exotic plants.

Global Environment: This forest generally occurs on xeric upper slopes and ridgetops and steep sideslopes with shallow, acidic, rocky, infertile soils. Windthrow, fire, and ice storms are common natural disturbances in these habitats.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus prinus* is dominant with *Quercus rubra, Quercus velutina, Nyssa sylvatica, Acer rubrum*, and/or *Betula lenta* codominant in the canopy. *Pinus strobus* and/or *Pinus rigida* may be present (<10% cover). Subcanopy dominants include *Sassafras albidum* and *Cornus florida*. *Vaccinium pallidum, Vaccinium angustifolium, Gaylussacia baccata*, and *Kalmia angustifolia* are common short shrubs. *Kalmia latifolia* and/or *Hamamelis virginiana* may be present, but neither dominant, and are always mixed with other tall shrubs. The herbaceous layer is poorly developed and depauperate and typically includes *Gaultheria procumbens*.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Quercus prinus* typically dominates the canopy, but occasionally *Quercus rubra* or *Quercus velutina* can codominate. *Quercus velutina, Quercus alba*, and/or *Quercus coccinea* may also be common. Subcanopy dominants include *Acer rubrum, Sassafras albidum*, and *Betula lenta*. *Kalmia latifolia* and *Hamamelis virginiana* are common tall shrubs. *Vaccinium pallidum, Vaccinium angustifolium*, and/or *Gaylussacia baccata* form a dense understory. The herbaceous layer is poorly developed and depauperate but includes *Danthonia spicata, Carex pensylvanica*, and *Aralia nudicaulis*. In addition, this community supports NJ state-critically imperiled *Pinus resinosa* and state-imperiled *Sorbus americana* and *Symphyotrichum prenanthoides*.

Global Vegetation: The canopy is closed to partially open and dominated by *Quercus prinus*, which can be codominant with *Quercus rubra*. *Quercus alba, Quercus velutina*, and *Acer rubrum* are common associates, with other less frequent trees including *Betula lenta, Quercus coccinea, Amelanchier arborea, Pinus rigida*, and *Pinus strobus*. *Sassafras albidum, Cornus florida*, and *Nyssa sylvatica* can be minor associates at the southern and western portions of the range. The low-shrub layer is well-developed and comprised chiefly of ericaceous species, including *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium stamineum, Gaylussacia baccata*, or *Kalmia angustifolia*. A tall-shrub layer is often lacking but when present may include *Castanea dentata, Kalmia latifolia, Viburnum acerifolium, Hamamelis virginiana, Quercus ilicifolia*, and *Viburnum prunifolium*. *Ilex montana, Rhododendron prinophyllum*, and *Menziesia pilosa* are minor shrub associates at the southern end of the range. The herbaceous layer is of sparse to moderate cover, depending on shrub cover, and may include *Carex pensylvanica, Deschampsia flexuosa, Danthonia spicata, Ageratina altissima var. altissima, Antennaria plantaginifolia, Aralia nudicaulis, Aureolaria laevigata, Gaultheria procumbens, Chimaphila maculata, Carex rosea, Carex swanii, Carex pensylvanica, Corydalis sempervirens, Comandra umbellata, Cypripedium acaule, Dryopteris marginalis, Epigaea repens, Goodyera pubescens, Hieracium venosum, Lycopodium clavatum, Medeola virginiana, Melampyrum lineare, Monotropa uniflora, Potentilla canadensis, Pteridium aquilinum*, and *Uvularia sessilifolia*.

Global Dynamics: Periodic fire is likely an important ecological factor in oak regeneration.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Short shrub/sapling	Dwarf-shrub	*Vaccinium angustifolium*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*
Short shrub/sapling	Dwarf-shrub	*Vaccinium angustifolium*, *Vaccinium pallidum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Vaccinium angustifolium*, *Vaccinium pallidum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium stamineum*
Herb (field)	Flowering forb	*Aralia nudicaulis*
Herb (field)	Graminoid	*Carex pensylvanica*
Herb (field)	Fern (Spore-bearing forb)	*Pteridium aquilinum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Gaultheria procumbens*, *Kalmia latifolia*, *Nyssa sylvatica*, *Quercus prinus*, *Quercus rubra*, *Quercus velutina*, *Vaccinium angustifolium*, *Vaccinium pallidum*
Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Carex pensylvanica*, *Gaylussacia baccata*, *Kalmia latifolia*, *Quercus prinus*, *Quercus rubra*, *Quercus velutina*, *Vaccinium angustifolium*, *Vaccinium pallidum*
Global: *Acer rubrum*, *Amelanchier arborea*, *Aralia nudicaulis*, *Carex pensylvanica*, *Castanea dentata*, *Danthonia spicata*, *Deschampsia flexuosa*, *Gaultheria procumbens*, *Gaylussacia baccata*, *Kalmia latifolia*, *Nyssa sylvatica*, *Pteridium aquilinum*, *Quercus coccinea*, *Quercus prinus*, *Quercus rubra*, *Quercus velutina*, *Sassafras albidum*, *Vaccinium angustifolium*, *Vaccinium pallidum*, *Vaccinium stamineum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Calystegia sepium*, *Microstegium vimineum* (High/Medium)
Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Pinus resinosa* (G5, NJ state-critically imperiled), *Sorbus americana* (G5, NJ state-imperiled), *Symphyotrichum prenanthoides* (G4G5, NJ state-imperiled); **Invasive/Exotic Plants**: *Anthoxanthum odoratum*
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (31-Jan-2007). This is a very widely distributed oak / ericad forest that covers large areas.

RELATED CONCEPTS

Global Similar Types:
- *Quercus (alba, rubra, velutina) - Carya* spp. / *Viburnum acerifolium* Forest (CEGL006336) is similar to the more mesic end of the range of variation found in this type at Valley Forge National Historical Park.
- *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271) of Southern Appalachians.
- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299)
- *Quercus prinus - Quercus (alba, coccinea) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023) of Western Alleghenies, Interior Low Plateau, etc.
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057)
- *Quercus prinus - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest (CEGL008523)
- *Quercus prinus - Quercus* spp. / *Vaccinium arboreum - (Kalmia latifolia, Styrax grandifolius)* Forest (CEGL007700)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community is distinguished by the presence of northern species, such as *Pinus strobus* and *Vaccinium angustifolium*; its lack of Southern Appalachian species; and an abundant ericaceous shrub component.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: For the purpose of mapping this association and to distinguish it from other similar dry chestnut oak associations to the south (i.e., Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299) and Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271)), the southern limit for mapping in the Central Appalachians was set just north of

Cumberland County, Pennsylvania, to the northern limit at Delaware Water Gap in Pennsylvania. It extends north along the AT throughout the Lower New England project area.

Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community extends north along the AT through New Jersey, New York, Connecticut and Massachusetts in the Lower New England project area. In Connecticut, at Buck Hill in the Housatonic Valley, this community extends from 300 m up to the summit; Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest (CEGL006406) occurs in midslope positions and successional forests dominate the lower slopes. New York examples have a heath layer that ranges in cover from dense to sparse and dominated by *Vaccinium* spp., *Gaylussacia baccata*, or scattered *Kalmia latifolia*

Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

Global Classification Comments: This community type is closely related to other oak / heath. It is distinguished by the presence of northern species, such as *Pinus strobus* and *Vaccinium angustifolium*, and its general lack of southern Appalachian species, such as *Gaylussacia ursina, Leucothoe recurva*, and *Galax urceolata*. In comparison to *Quercus prinus - Quercus (alba, coccinea) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023), it lacks *Oxydendrum arboreum, Pinus echinata*, and *Pinus virginiana*. It occupies poorer sites and has a more abundant ericaceous shrub component than *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057). The Chestnut Oak / Low-Elevation Subtype of Virginia intergrades with the more southern *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271) throughout west-central Virginia. A well-developed Piedmont example of the Chestnut Oak / Low-Elevation Subtype is described by Allard and Leonard (1943). The Chestnut Oak - Northern Red Oak / High-Elevation Subtype of Virginia is similar to *Quercus prinus - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest (CEGL008523) of high-elevation granitic terrain on the northern Blue Ridge, but lacks *Quercus velutina, Rhododendron periclymenoides*, and the suite of low-cover herbaceous species characteristic of mineral soil microhabitats in that unit. The recognition of global subtypes equivalent to two distinct state community types is well supported by quantitative analysis of compositional and environmental data. Further study may support the elevation of these subtypes to full association-level status in the USNVC.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled in central and northern Pennsylvania and extends north along the AT through Delaware Water Gap and into Lower New England.

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut (Housatonic Valley - Buck Hill, Sharon Mountain), Massachusetts (Sage's Ravine Natural Heritage Site, Upper Sherman Brook Natural Heritage Site), New Jersey (Culvers Gap South, High Point 1, High Point South, Sunrise Mountain Northeast, Sunrise Mountain West), and New York (Harriman State Park, Bellvale Mountain North, Canada Hill/Curry Pond, Canopus Lake North/Fahnestock State Park, Depot Hill, Doodletown, Fort Defiance Hill).

Global Range: This community ranges from southern Maine through the Central Appalachians to higher elevations in Virginia and West Virginia, and north more locally in the Piedmont (an estimated 215,000 square km based on approximate acreage of subsections of occurrence).

Nations: US

States/Provinces: CT, DE:S2?, MA:S4, MD, ME, NH:S1S2, NJ:S3S4, NY, PA, RI, VA:S3, VT, WV?

TNC Ecoregions: 52:C, 59:C, 60:C, 61:C, 63:C, 64:C

USFS Ecoregions (1994/95): 212Ec:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCP, 221Dc:CCC, 231Ak:CCP, 231Al:CCC, M212De:CCC, M212Ea:CCC, M212Eb:CCP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCP, M221Bf:CCC, M221Da:CCC, M221Db:CCC

Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Delaware Water Gap, Upper Delaware, Valley Forge, Weir Farm); USFS (George Washington, Jefferson, Monongahela?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCNO, FSCO

Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 plots; 17 observation points; 36 accuracy assessment points): APPA.0663, APPA.0664, APPA.1244, APPA.1246, APPA.1247, APPA.1248, APPA.1251, APPA.1252, APPA.1256, APPA.1257, APPA.1259, APPA.1262, APPA.1263, APPA.1264,

APPA.1265, APPA.1266, APPA.1271, APPA.1300, APPA.1301, APPA_AA_0036, APPA_AA_0067, APPA_AA_0079, APPA_AA_0157, APPA_AA_0220, APPA_AA_0257, APPA_AA_0312, APPA_AA_0468, APPA_AA_0498, APPA_AA_0570, APPA_AA_0579, APPA_AA_0604, APPA_AA_0665, APPA_AA_0694, APPA_AA_0720, APPA_AA_0732, APPA_AA_0797, APPA_AA_0800, APPA_AA_0826, APPA_AA_0838, APPA_AA_0879, APPA_AA_0949, APPA_AA_1015, APPA_AA_1019, APPA_AA_1064, APPA_AA_1117, APPA_AA_1127, APPA_AA_1143, APPA_AA_1216, APPA_AA_1317, APPA_AA_1320, APPA_AA_1348, APPA_AA_1393, APPA_AA_1396, APPA_AA_1570, APPA_AA_1587.

Appalachian National Scenic Trail (Lower New England Project Area) Plots: (14 plots; 13 observation points; 42 accuracy assessment points): APPA.0002, APPA.0012, APPA.0018, APPA.0023, APPA.0035, APPA.0062, APPA.0064, APPA.0562, APPA.0563, APPA.0567, APPA.0674, APPA.0904, APPA.0906, APPA.0910, APPA.1337, APPA.1338, APPA.1339, APPA.1351, APPA.1400, APPA.1403, APPA.1404, APPA.1422, APPA.1427, APPA.1430, APPA.1432, APPA.1433, APPA.1536, APPA_AA_1659, APPA_AA_1662, APPA_AA_1727, APPA_AA_1766, APPA_AA_1837, APPA_AA_1878, APPA_AA_2061, APPA_AA_2238, APPA_AA_2270, APPA_AA_2293, APPA_AA_2294, APPA_AA_2315, APPA_AA_2339, APPA_AA_2445, APPA_AA_2475, APPA_AA_2635, APPA_AA_2660, APPA_AA_2677, APPA_AA_2680, APPA_AA_2682, APPA_AA_2691, APPA_AA_2722, APPA_AA_2726, APPA_AA_2727, APPA_AA_2848, APPA_AA_2857, APPA_AA_2861, APPA_AA_2883, APPA_AA_2898, APPA_AA_2920, APPA_AA_2936, APPA_AA_2937, APPA_AA_3040, APPA_AA_3045, APPA_AA_3125, APPA_AA_3134, APPA_AA_3167, APPA_AA_3241, APPA_AA_3281, APPA_AA_3309, APPA_AA_3330, APPA_AA_3339.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay

Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay

Global Description Author(s): G. Fleming, P. Coulling, S.L. Neid, L.A. Sneddon and S.C. Gawler

References: Allard and Leonard 1943, Breden 1989, Breden et al. 2001, Clancy 1996, Collins and Anderson 1994, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Enser 1999, Enser and Lundgren 2006, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2006, Fleming et al. 2007b, Gawler 2002, Gawler and Cutko 2010, Harrison 2004, Harrison 2011, Harshberger 1919, Hunt 1997a, Kasmer et al. 1984, Keever 1973, Metzler and Barrett 1996, Metzler and Barrett 2001, Metzler and Barrett 2006, Metzler et al. 2009, Nerurkar 1974, Overlease 1978, Overlease 1987, Pearson 1979, Perles et al. 2007, Perles et al. 2008, Podniesinski et al. 2005b, Rawinski 1984a, Rawinski et al. 1994, Rawinski et al. 1996, Russell and Schuyler 1988, Shreve et al. 1910, Sperduto 1997a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2000, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Vanderhorst 2000b, Walton et al. 1997

[CEGL008524] *Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest

Translated Name: **Chestnut Oak / Catawba Rosebay - Mountain Laurel Forest**

Common Name: **Central Appalachian Chestnut Oak / Catawba Rosebay Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus prinus* - *Quercus coccinea* Forest Alliance (A0248)

Element Concept

Global Summary: The documented range of this community is confined to the northern Virginia Blue Ridge, scattered locations in the Ridge and Valley province of west-central and southwestern Virginia, and in the gorges of the New and Gauley rivers of southern West Virginia. In addition, there are a few local outliers on sheltered, north-facing bluffs along the James River in the western Piedmont. In the main part of this association's range, stands are associated with strongly convex, upper slopes and spur crests at elevations from 325 m to over 975 m (1050-3200 feet). North or northwest aspects are common, but the type has been documented from other aspects as well, generally with high solar exposure. The vegetation is a species-poor, open to closed-canopy forest of stunted (often <20 m tall, sometimes <10 m tall), gnarled trees over a dense, evergreen tall-shrub layer. *Quercus prinus* is the usual canopy dominant, with occasional associates of *Betula lenta, Tsuga canadensis, Quercus velutina, Quercus*

coccinea, Quercus alba, Nyssa sylvatica, Acer rubrum, Pinus virginiana, and/or *Pinus strobus*. The shrub layer is dominated by *Rhododendron catawbiense, Kalmia latifolia*, and/or *Rhododendron maximum* (the latter primarily in West Virginia occurrences). Additional shrubs which are present at low cover include *Hamamelis virginiana, Ilex montana*, and *Amelanchier arborea*. Deciduous ericads such as *Gaylussacia baccata* and *Vaccinium pallidum* may be present but rarely contribute more than 10% cover. Herbs and subshrubs are exceedingly sparse in the densely shaded, forest-floor environment; most likely to be encountered are the evergreen species *Gaultheria procumbens, Epigaea repens, Galax urceolata, Goodyera pubescens, Mitchella repens*, and *Chimaphila maculata*, sometimes present at low cover.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This chestnut oak / heath forest occurs on north- or northwest-facing convex, upper slopes, clifftops, and spur crests at elevations from 305 to 1,097 m (1,000-3,600 feet). It was sampled at five locations in the Central Appalachians and Cumberlands and Southern Ridge and Valley. Sites vary from gently sloping to steep north-facing slopes, ridges and saddles. Soils are well-drained and include silt loam and sandy loam. The unvegetated surface is dominated by leaf litter with some downed wood and large/small rocks. Disturbance includes *Cornus florida* damage from anthracnose and exposure to wind and storms.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This chestnut oak/heath forest occurs on north- or northwest-facing convex, upper slopes, cliff tops, and spur crests at elevations from 305 to over 975 m (1,000-3,200 feet) Sites may be gently sloping to somewhat steep. Soils range from somewhat poorly drained to well-drained and include silt loam and sandy loam. The unvegetated surface is dominated by leaf litter with some downed wood and large/small rocks. No evidence of disturbance was reported.

Global Environment: This type is generally associated with strongly convex, upper slopes, cliff tops, and spur crests at elevations from 325 m to over 975 m (1050-3200 feet). Plot-sampled stands have various aspects, with north or northwest aspects most common. Slopes are mostly steep, generally >20° but sometimes as low as 10°. Piedmont occurrences of this vegetation type differ somewhat from the main part of the range: they are confined to steep, sheltered bluffs subtending the James River at <200 m (650 feet) elevation. Site moisture potential appears to be in the subxeric to submesic range, with soils in plots described as well- to rapidly-drained, dry sandy loam and silty clay. Surface cover of rocks varies from low to high, and soils have thick, poorly decomposed duff layers. Soils are extremely acidic (mean pH = 4.1) and infertile, with low levels of most nutrients (Ca, Cu, K, Mg, Mn, P, Zn).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The often stunted canopy is dominated by *Quercus prinus* with occasional *Quercus rubra, Acer rubrum, Quercus coccinea, Tsuga canadensis*, and/or *Nyssa sylvatica*; scattered *Pinus pungens* are possible. *Rhododendron catawbiense* is the dominant shrub; *Kalmia latifolia, Hamamelis virginiana*, and *Amelanchier arborea* are mixed into the shrub layer. The short-shrub layer is dominated by *Vaccinium pallidum* and *Gaylussacia baccata*. Herbs are sparse but include *Galax urceolata*.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This is an exceptionally species-poor, open- to closed-canopy forest of often stunted (<10 m tall), gnarled trees over a dense, evergreen tall-shrub layer. The canopy is dominated by *Quercus prinus*. Additional tree species include *Acer rubrum* and other *Quercus* spp. The shrub layer can be dense or not and dominated by heaths *Gaylussacia baccata, Kalmia latifolia, Rhododendron catawbiense*, and *Vaccinium pallidum*. The herb layer is generally sparse; *Galax urceolata* is a common species.

Global Vegetation: The vegetation is an exceptionally species-poor, open to closed-canopy forest of somewhat stunted (<20 m tall) to very stunted (<10 m tall), gnarled deciduous or mixed evergreen-deciduous trees over a dense, evergreen tall-shrub layer. *Quercus prinus* is the canopy dominant, with occasional associates of *Tsuga canadensis, Betula lenta, Nyssa sylvatica, Acer rubrum, Quercus velutina, Quercus coccinea, Quercus alba, Quercus rubra, Betula alleghaniensis, Pinus virginiana*, and/or *Pinus strobus*. *Acer rubrum* and *Oxydendrum arboreum* may be abundant subcanopy trees. *Rhododendron catawbiense* and *Kalmia latifolia*, each with mean cover of 25-50% in plots, dominate the shrub layer; *Rhododendron maximum* may be locally important in West Virginia occurrences. Additional shrubs present at low cover include *Acer pensylvanicum, Gaylussacia baccata, Hamamelis virginiana, Ilex montana, Ilex opaca, Amelanchier arborea, Smilax rotundifolia, Vaccinium pallidum*, and *Viburnum acerifolium*. Although not documented in plots, *Pieris floribunda* is reported to be a characteristic shrub of this community in the Thunder Ridge - Apple Orchard Mountain area of Virginia's Bedford and Botetourt counties (Rawinski et al. 1996). Herbs and subshrubs are exceedingly sparse in the densely shaded forest floor environment, but the evergreen species *Gaultheria procumbens, Epigaea repens, Galax urceolata, Goodyera pubescens, Mitchella repens*, and *Chimaphila maculata* are sometimes present at low cover. Occasional herbs

include *Aralia nudicaulis, Conopholis americana, Cypripedium acaule, Dryopteris intermedia, Hexastylis virginica*, and *Polypodium virginianum*. The bryophyte layer may have significant cover by *Leucobryum glaucum*; other bryophytes identified in plots include *Hypnum imponens, Thuidium delicatulum, Dicranum scoparium, Bazzania trilobata*, and *Polytrichum juniperinum*. Lichens collected from this community include *Cladonia caroliniana, Cladonia uncialis, Flavoparmelia baltimorensis*, and *Umbilicaria mammulata*. Vascular plant species richness (per 400 square meters) of Virginia plot-sampled stands ranges from 9 to 16 taxa (mean = 12); in the nine WV sampled plots it ranges from 13 to 33 taxa (mean = 22.4).

Most Abundant Species

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Amelanchier arborea*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron catawbiense*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron catawbiense*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Shrub/sapling (tall & short)	Broad-leaved evergreen tree	*Rhododendron catawbiense*

Characteristic Species

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Amelanchier arborea*, *Kalmia latifolia*, *Quercus prinus*, *Rhododendron catawbiense*, *Vaccinium pallidum*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer rubrum*, *Galax urceolata*, *Gaylussacia baccata*, *Kalmia latifolia*, *Quercus prinus*, *Rhododendron catawbiense*, *Vaccinium pallidum*
Global: *Aralia nudicaulis*, *Cypripedium acaule*, *Gaultheria procumbens*, *Goodyera pubescens*, *Hamamelis virginiana*, *Kalmia latifolia*, *Quercus prinus*, *Rhododendron catawbiense*, *Tsuga canadensis*

Other Noteworthy Species

Global: Vulnerable Plants: *Tsuga caroliniana* (G3)

Conservation Status Rank

Global Rank & Reasons: G4 (20-May-2011). Although this is a somewhat geographically restricted, mostly small-patch vegetation type, many stands occur in public lands on generally inaccessible steep slopes, ridge, and spurs. Threats to this association are neither serious nor wide-ranging, and include occasional clearing for utility corridors with essentially slight impact. Hemlock woolly adelgid may impact some occurrences with high hemlock cover, but in general, this would not cause conversion to a different vegetation type. The dry, acidic soils of this vegetation provide some natural protection against invasive plant species.

Related Concepts

Global Similar Types:
- *Fagus grandifolia - Quercus alba / Kalmia latifolia - (Rhododendron catawbiense) / Galax urceolata* Forest (CEGL004539)
- *Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest (CEGL006286) is a more mesophytic forest of protected slopes, with substantial *Quercus rubra* and a *Rhododendron maximum* understory.
- *Tsuga caroliniana / Kalmia latifolia - Rhododendron catawbiense* Forest (CEGL007139)

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community is scattered in the southern Central Appalachians in Virginia and extends north through central Virginia to the northern range limit of *Rhododendron catawbiense*. The northernmost stands documented in Virginia are in

Augusta, Nelson, Amherst, and Rockbridge counties; the absolute northern limit of *Rhododendron catawbiense* is Albemarle and Rockingham counties.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Originally defined from the Northern Blue Ridge of Virginia, this type has recently been extended south to the Southern Blue Ridge and Ridge and Valley of southwestern Virginia. It occurs less than 1.5 km north of the North Carolina stateline on the Blue Ridge Parkway. The type is a localized *Quercus prinus*-dominated forest of dry, rocky, somewhat protected to exposed north- or west-facing upper slopes, ridge crests, and blufftops. The understory is characterized by a dense *Rhododendron catawbiense* shrub layer.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: Compared to Chestnut Oak Forest (Mesic Slope Heath Type) (CEGL006286), this type occupies distinctly drier, rockier sites; has a group of more xerophytic indicator species; and contains few Southern Appalachian endemics.
Global Classification Comments: The geographic distribution of this community and the extent to which it recurs throughout the Northern Blue Ridge and Ridge and Valley are somewhat uncertain and need further investigation. Although documented by plot data only on the Blue Ridge of Virginia and at New River Gorge and the Gauley River in West Virginia, similar vegetation is reported to be frequent on xeric, rocky upper slopes and summits throughout the west-central and southwestern Virginia Ridge and Valley region (T.F. Wieboldt pers. comm.). These putative Ridge and Valley occurrences sometimes contain mixtures of *Rhododendron catawbiense* and *Rhododendron maximum*, as do the Gauley River occurrences. For the most part, however, this community appears to reach optimal development in geographic areas (i.e., the Northern Blue Ridge) and drier habitats where *Rhododendron maximum* is spotty or absent. *Tsuga canadensis* is prominent in this association at New River Gorge and the Gauley River, another contrast to Virginia stands. This association (CEGL008524) is not likely to be found in the Southern Blue Ridge, where *Rhododendron catawbiense* is more restricted to high elevations and exposed habitats, above the elevational limits of *Quercus prinus* (Newell 1997, A.S. Weakley pers. comm.). Although stands of this type can be rather difficult to plot-sample, the collection of additional quantitative data from well-developed occurrences would be desirable. This community type is similar to and sometimes co-occurs with *Tsuga caroliniana / Kalmia latifolia - Rhododendron catawbiense* Forest (CEGL007139) on the Northern Blue Ridge. The degree to which periodic fires have influenced the structure and composition of this community type needs investigation.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: The community occurs from the northern part of the Southern Blue Ridge north into Nelson, Amherst, and Rockbridge counties in Virginia. It was sampled in Virginia at Angels Rest, Brushy Mountain, James River Face Wilderness, and Lick Creek.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is frequent in the Central Appalachians and peripheral in the northern Virginia Blue Ridge and scattered locations in the Ridge and Valley. It was sampled at Comers Creek in Smyth County in southwestern Virginia.
Global Range: The documented range of this community includes the southern part of the Central Appalachians and adjacent areas of the Southern Blue Ridge, Southern Ridge and Valley, and Cumberland Mountains in Virginia and West Virginia. In addition, there are a few local outliers on sheltered, north-facing bluffs along the James River in the western Virginia Piedmont.
Nations: US
States/Provinces: VA:S3, WV:S2
TNC Ecoregions: 50:C, 51:C, 52:C, 59:C
USFS Ecoregions (1994/95): 231Ak:CCC, M221Aa:CCC, M221Ab:CCC, M221Ca:CCC, M221Cb:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Gauley River, New River Gorge); USFS (Jefferson, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCOM
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (4 plots; 1 observation point; 3 accuracy assessment points): APPA.0096, APPA.0353, APPA.0358, APPA.0632, APPA.1157, APPA_AA_0212, APPA_AA_0647, APPA_AA_1013.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 observation point): APPA.1183.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming, P. Coulling, S.C. Gawler
References: Coulling and Rawinski 1999, Eyre 1980, Fleming 2002b, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Newell 1997, Rawinski et al. 1996, Vanderhorst et al. 2007, Vanderhorst et al. 2010, WVNHP unpubl. data b, Wieboldt pers. comm.

A0250 *Quercus prinus - Quercus rubra* Forest Alliance

Alliance Summary Description: This alliance includes dry-mesic oak forests codominated by *Quercus prinus* and *Quercus rubra* at moderate elevations in the Central and Southern Appalachians. Many forests in this alliance occur in areas previously dominated by *Castanea dentata*, and chestnut sprouts are common in the understory. The canopy of forests in this alliance tend to be dominated by *Quercus rubra* and/or *Quercus prinus*, although other mesic hardwood species can codominate or be present in the canopy and subcanopy. Typical tree associates include *Acer rubrum, Carya glabra, Carya ovalis, Carya ovata, Liriodendron tulipifera, Quercus coccinea, Quercus velutina*, and *Sassafras albidum*. Typical understory trees include *Acer pensylvanicum, Cornus florida*, or *Oxydendrum arboreum*. Shrub layers are often dense and dominated by ericaceous species, including *Gaylussacia* spp., *Kalmia latifolia, Rhododendron maximum* (especially on northerly aspects), *Rhododendron minus*, and *Vaccinium* spp. Other shrubs may include *Hamamelis virginiana*. Herbaceous coverage tends to be inversely proportional to the shrub coverage. Typical herbaceous species include *Chimaphila maculata, Galax urceolata, Gaultheria procumbens, Houstonia purpurea, Lysimachia quadrifolia, Maianthemum racemosum ssp. racemosum, Polystichum acrostichoides, Thelypteris noveboracensis*, and *Uvularia* spp.

[CEGL007267] *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest

Translated Name: **Chestnut Oak - (Northern Red Oak) - Hickory species / Sourwood - Flowering Dogwood Forest**
Common Name: **Appalachian Montane Oak - Hickory Forest (Chestnut Oak Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus prinus - Quercus rubra* Forest Alliance (A0250)

ELEMENT CONCEPT

Global Summary: This community is known from low to intermediate elevations of the Southern Blue Ridge escarpment, the Great Smoky Mountains, Piedmont transition areas, into the Southern Ridge and Valley, and in the Cumberlands in southern West Virginia. It occurs on relatively exposed landforms below 1000 m (3280 feet) elevation (220-1000 m [700-3280 feet]), on nearly level to steep, convex, middle to upper slopes, ridges, and plateaus, with mostly northwestern to southeastern aspects. These are forests characterized by canopies dominated by *Quercus* and *Carya* species that do not have a well-developed heath shrub layer. *Acer rubrum* and *Liriodendron tulipifera* may have significant coverage, apparently related to logging history. The predominant oaks and hickories in the canopy are *Quercus prinus, Carya glabra, Carya alba, Carya ovata, Quercus coccinea, Quercus velutina, Quercus alba*, and *Quercus rubra*. Additional canopy and subcanopy species can include *Nyssa sylvatica, Magnolia fraseri, Halesia tetraptera var. monticola, Fagus grandifolia, Ilex opaca*, and *Oxydendrum arboreum*. In addition, *Cornus florida* is characteristic and may be dominant in the subcanopy and tall-shrub layers; other tall-shrub species include *Magnolia fraseri, Hamamelis virginiana*, and *Sassafras albidum*. *Kalmia latifolia* or *Rhododendron maximum* may be present but only at very low cover. The short-shrub stratum is sparse (up to 20% cover), with no clear dominant. Some typical shrub species include *Vaccinium pallidum, Viburnum acerifolium*, and (in the central and southern portions of the type's range) *Gaylussacia ursina, Hydrangea arborescens*, and *Hydrangea radiata*. Common vines are *Smilax rotundifolia, Smilax glauca, Parthenocissus quinquefolia, Toxicodendron radicans, Vitis aestivalis, Vitis rotundifolia*, and *Vitis vulpina*. Herb cover is sparse to moderate; diversity and species composition vary among occurrences. Some of the more typical herb species include *Eurybia divaricata, Dioscorea quaternata,*

Maianthemum racemosum, Polystichum acrostichoides, Solidago caesia, Uvularia perfoliata, and *Uvularia puberula*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This montane oak-hickory forest was sampled on moderate to somewhat steep upper slopes and ridgetops on northern aspects at elevations from 762 to 1,029 m. Soils are moderately well- to well-drained loam, sandy loam and clay loam. The unvegetated surface is dominated by leaf litter with small amounts of rock and downed wood.

Global Environment: This community is known from plateaus, ridges, and gorge slopes at low to intermediate elevations, on relatively exposed landforms from 220 to 1000 m (700-3250 feet) elevation. Slopes are moderately steep to steep where it occurs on convex, middle to upper slopes, grading to gentle on ridges and plateaus; aspects are mostly northern to southwestern. Unvegetated ground cover is dominated by litter and rock. In Virginia, the type occurs on sites underlain by colluvial and alluvial fan material, sandstone, quartzite, and rocks of the Northern Blue Ridge granitic complex. Farther south, soils are weathered from sandstones and, less commonly, shales and are strongly acidic, relatively nutrient-poor and sandy to loamy in texture. Soils in West Virginia plots are well- to rapidly-drained, dry to somewhat moist sandy loam, sandy clay loam, sandy silt loam, silt loam, and clay loam, and test slightly to extremely acidic (mean pH = 4.59). Soil chemistry data from 25 plot samples from throughout the range indicate that mean conditions are extremely acidic, with low levels of calcium, magnesium, and total base saturation, along with moderately high iron and aluminum (Fleming and Patterson 2009a).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: *Quercus prinus* is typically dominant or occasionally codominant with *Quercus rubra*. Canopy associates include *Acer rubrum, Carya glabra, Carya ovalis, Quercus alba*, and *Quercus coccinea*. *Cornus florida* is common in the subcanopy. Shrubs may include *Acer rubrum, Hydrangea arborescens, Ilex montana, Pyrularia pubera, Rubus allegheniensis, Sassafras albidum, Symplocos tinctoria*, and *Vaccinium hirsutum* (regional endemic). Herbs are sparse.

Global Vegetation: These are forests dominated by species of *Quercus* and *Carya* and without a well-developed heath shrub layer. *Acer rubrum* and *Liriodendron tulipifera* may have significant coverage, apparently related to logging history. The predominant oaks and hickories in the canopy are *Quercus prinus, Carya glabra, Carya alba, Carya ovata, Quercus coccinea, Quercus velutina, Quercus alba*, and *Quercus rubra*. Additional canopy and subcanopy species can include *Nyssa sylvatica, Magnolia fraseri, Halesia tetraptera var. monticola, Fagus grandifolia, Ilex opaca*, and *Oxydendrum arboreum*. In addition, *Cornus florida* is characteristic and may be dominant in the subcanopy and tall-shrub layers; other tall-shrub species include *Magnolia fraseri, Hamamelis virginiana*, and *Sassafras albidum*. *Kalmia latifolia* or *Rhododendron maximum* may be present but only at very low cover. The short-shrub stratum is sparse (up to 20% cover), with no clear dominant. Some typical shrub species include *Vaccinium pallidum, Viburnum acerifolium*, and (in the central and southern portions of the type's range) *Gaylussacia ursina, Hydrangea arborescens*, and *Hydrangea radiata*. Common vines are *Smilax rotundifolia, Smilax glauca, Parthenocissus quinquefolia, Toxicodendron radicans, Vitis aestivalis, Vitis rotundifolia*, and *Vitis vulpina*. Herb cover is sparse to moderate; diversity and species composition vary among occurrences. Some of the more typical species include *Ageratina altissima, Eurybia divaricata (= Aster divaricatus), Carex communis var. communis, Carex digitalis var. digitalis, Chimaphila maculata, Desmodium nudiflorum, Dichanthelium* spp. (e.g., *Dichanthelium boscii, Dichanthelium commutatum, Dichanthelium dichotomum*), *Dioscorea quaternata, Galium circaezans, Galium latifolium, Goodyera pubescens, Maianthemum racemosum ssp. racemosum, Medeola virginiana, Houstonia purpurea, Lysimachia quadrifolia, Maianthemum racemosum ssp. racemosum, Polystichum acrostichoides, Prenanthes* spp., *Solidago caesia, Thalictrum thalictroides, Thelypteris noveboracensis, Uvularia perfoliata, Uvularia puberula, Uvularia sessilifolia*, and *Viola* spp. (e.g., *Viola blanda, Viola hastata, Viola x palmata, Viola tripartita*). Common mosses from West Virginia plots include *Thuidium delicatulum, Leucobryum glaucum, Hypnum imponens, Polytrichum ohioense, Leucobryum albidum*, and *Dicranum fulvum*.

Global Dynamics: Evidence of past fires is abundant in this type, but its natural fire regime is not known. Most stands have been logged, and in West Virginia, many areas likely formerly covered by this forest type have been strip-mined. Evidence of disturbance recorded in Virginia plots includes fire scars on older trees, charcoal in duff, much rotting *Castanea dentata* wood, damage to *Cornus florida* from dogwood anthracnose (*Discula destructiva*), and minor wind/ice damage to tree crowns. Large areas of this community type were impacted by logging and/or the loss of codominant *Castanea dentata*. Based on the abundance of *Castanea* wood debris and live sprouts, as well as the presence of numerous intact logs in older stands, *Castanea dentata* may have reached near optimal importance on sites of this community type prior to the arrival of the blight. At Peters Mountain in Allegheny County, Virginia, the current canopy dominants in these areas typically range from about 35-69 cm (14-27 inches) dbh, with

maximum ages of 90 to 140 years. Some patches of old-growth forest remain at Peters Mountain, especially on the steeper dip slopes and landslide benches (Fleming and Moorhead 2000).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Cornus florida*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*, *Carya alba*, *Carya glabra*, *Carya ovata*, *Liriodendron tulipifera*, *Quercus alba*, *Quercus velutina*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Cornus florida*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer pensylvanicum*, *Acer rubrum*, *Carya glabra*, *Carya ovalis*, *Ilex montana*, *Pyrularia pubera*, *Quercus alba*, *Quercus coccinea*, *Quercus prinus*, *Quercus rubra*, *Rubus allegheniensis*

Global: *Acer pensylvanicum*, *Acer rubrum*, *Ageratina altissima*, *Carya alba*, *Carya glabra*, *Carya ovata*, *Castanea dentata*, *Cornus florida*, *Dioscorea quaternata*, *Eurybia divaricata*, *Galium circaezans*, *Goodyera pubescens*, *Liriodendron tulipifera*, *Maianthemum racemosum*, *Medeola virginiana*, *Nyssa sylvatica*, *Parthenocissus quinquefolia*, *Polystichum acrostichoides*, *Quercus alba*, *Quercus prinus*, *Quercus rubra*, *Quercus velutina*, *Solidago caesia*, *Thelypteris noveboracensis*, *Toxicodendron radicans*, *Uvularia perfoliata*, *Uvularia puberula*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Vaccinium hirsutum* (G3, GA state-imperiled)

Global: Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Carex lucorum* var. *austrolucorum* (G5T3T4), *Isotria medeoloides* (G2?), *Monotropsis odorata* (G3), *Solidago glomerata* (G3), *Tsuga caroliniana* (G3), *Vaccinium hirsutum* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (15-Aug-1997).

RELATED CONCEPTS

Global Similar Types:

- *Acer rubrum var. rubrum - Betula lenta - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Ruderal Forest (CEGL008558)
- *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271) is similar but features a well-developed ericaceous shrub layer.
- *Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest (CEGL007230) occurs at higher elevations and has a stronger white oak component.
- *Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268) is similar but characterized by *Acer saccharum* as an important subcanopy (or canopy) tree.
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057)
- *Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest (CEGL006286)
- *Quercus rubra - Quercus prinus - Magnolia (acuminata, fraseri) / Acer pensylvanicum* Forest (CEGL004817)

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Global Classification Comments: This forest lacks the dense ericaceous shrub layer typical of other *Quercus prinus*-dominated forests in the Blue Ridge escarpment region and commonly has diverse herbaceous composition. It is distinguished from similar forests in the Ridge and Valley by lacking *Acer saccharum* and from Piedmont forests by the lack of *Quercus falcata* and *Quercus stellata*, and by the presence of species more typical of the Southern Appalachians (*Magnolia fraseri, Halesia tetraptera*, and *Castanea dentata*). This association was

originally defined from the Chattooga Basin Project (S. Simon pers. comm.) and later refined with information from the Great Smoky Mountains. The North Carolina Piedmont examples of this association are only montane transition areas, such as the Sauratown Mountains and Hanging Rock. In West Virginia, this association is floristically intermediate between *Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268) and the more xeric *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271), and some stands are difficult to distinguish. It lacks the abundance of *Acer saccharum* of the former and the abundance of ericaceous shrubs of the latter and has higher abundance of *Liriodendron tulipifera* than either.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled in Georgia and North Carolina.
Global Range: This community occurs in the Southern Blue Ridge, the Great Smoky Mountains, and Piedmont transition areas of western North Carolina, eastern Tennessee, northwestern South Carolina, and northeastern Georgia, extending north into the Cumberlands in southern West Virginia and the border area between Virginia, Kentucky, and Tennessee. It also extends north in the Virginia Ridge and Valley and Blue Ridge to Allegheny, Botetourt, and Bedford counties.
Nations: US
States/Provinces: GA, KY, NC, SC, TN, VA:S3S4, WV
TNC Ecoregions: 50:C, 51:C, 52:C, 59:C
USFS Ecoregions (1994/95): 231Aa:PPP, M221Aa:CCC, M221Ab:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCC, M221Ce:CCC, M221Da:CCC, M221Db:CCP, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Gauley River, Great Smoky Mountains, New River Gorge); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, George Washington, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCOM
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 2 observation points; 2 accuracy assessment points): APPA.0609, APPA.1028, APPA.1138, APPA_AA_0683, APPA_AA_1589.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo
Global Description Author(s): K.D. Patterson, T. Govus, R. White, S.C. Gawler, G.P. Fleming
References: Allard 1990, Ambrose 1990a, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Patterson 1994, Peet et al. unpubl. data, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Simon pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2010, White 2003, White 2006

[CEGL006057] *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest

Translated Name: **Chestnut Oak - Northern Red Oak / American Witch-hazel Forest**
Common Name: **Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus prinus* - *Quercus rubra* Forest Alliance (A0250)

ELEMENT CONCEPT

Global Summary: This closed-canopy, dry-mesic oak forest of the central Appalachian Mountains is a montane forest of somewhat protected rocky slopes. The canopy is codominated by *Quercus prinus* and *Quercus rubra*. Associated canopy species include *Liriodendron tulipifera, Acer rubrum, Carya glabra, Carya ovalis, Carya alba, Acer saccharum, Tilia americana, Fagus grandifolia*, and *Betula lenta*. The tall-shrub layer is most often characterized by *Hamamelis virginiana* and *Acer pensylvanicum*. The lower shrub layer is patchy and contains a mixture of scrambling vines, ericads, and non-ericaceous species. The herbaceous layer is usually sparse but may include *Dryopteris marginalis, Dioscorea quaternata, Eurybia divaricata (= Aster divaricatus), Ageratina*

altissima, Polygonatum biflorum, Solidago caesia, Festuca subverticillata, Thelypteris noveboracensis, Sanicula trifoliata, Prenanthes altissima, Polystichum acrostichoides, Desmodium nudiflorum, Galium latifolium, Houstonia purpurea, and *Maianthemum racemosum*. This association is more or less intermediate in site conditions and composition between oak / heath forests of exposed, xeric, infertile sites and richer cove or montane oak-hickory forests of sheltered, fertile sites.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This widespread mixed chestnut oak - red oak forest occupies sheltered rocky slopes, weathered boulderfields, and rocky ridges from <300 m to about 1,100 m (1,000-3,600 feet) elevation. It was sampled at 22 locations along the AT in the Central Appalachian project area. Sites range from moderate to steep slopes and summits. Soils are dry to dry-mesic, mostly well-drained sandy loam, loam, silt loam and clay loam. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks (often significant amounts) and occasional exposed bedrock and bare ground. Evidence of disturbance includes past logging, trails, tree gaps, gypsy moth damage, hemlock woolly adelgid, and the presence of exotic plant species.

Global Environment: Sites occupied by this dry-mesic oak forest are mostly protected rocky mountain slopes. In the Central Appalachians of Virginia, West Virginia, and Maryland, the type occurs at low and middle elevations, from <300 m (1000 feet) to about 1100 m (3600 feet), reaching optimal development at 610-915 m (2000-3000 feet). Habitats are underlain by a variety of bedrock types, including metabasalt (greenstone), pyroxene-rich granitic rocks, Antietam and Tuscarora quartzites, metasiltstone and phyllite, shale, and sedimentary material (interbedded sandstone, siltstone, and shale). Among plot-sampled Mid-Atlantic stands, lower to middle slope topographic positions predominate, along with steep (mean = 27°), usually concave slopes, and relatively high surface cover of outcrops, boulders, and stones. Slope aspect is variable, but the majority of aspects range from north to southeast. Soil samples collected from plots were strongly to very strongly acidic (mean pH = 4.8) but had moderately high levels of calcium (mean = 1019 ppm), reflecting the frequent occurrence of this community on moderately base-rich substrates.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus prinus* and *Quercus rubra* dominate the canopy along with up to 25% *Carya glabra, Carya ovalis*, and/or *Carya alba*. Other canopy and subcanopy associates include *Liriodendron tulipifera, Acer rubrum, Sassafras albidum*, and/or *Betula lenta*. *Cornus florida* is a common small tree. *Hamamelis virginiana* is characteristic in the shrub layer. *Toxicodendron radicans* and *Parthenocissus quinquefolia* are common vines. Short ericads are absent or sparse. Dry-mesophytic herbs include a diversity of *Carex* spp., *Asplenium platyneuron, Dioscorea quaternata, Dryopteris marginalis, Eurybia divaricata, Maianthemum racemosum ssp. racemosum*, and *Solidago caesia*. This community lacks Southern Appalachian species.

Global Vegetation: The vegetation is usually a closed-canopy forest codominated by *Quercus prinus* and *Quercus rubra* in variable proportions. Over the full geographic range, overstory associates are reported to include *Liriodendron tulipifera, Fraxinus americana, Tilia americana, Betula lenta, Acer rubrum, Magnolia acuminata, Nyssa sylvatica, Robinia pseudoacacia, Carya glabra, Carya ovalis*, and *Carya alba*. Less frequent, and more local, overstory and understory trees include *Acer saccharum, Amelanchier arborea, Asimina triloba, Fagus grandifolia, Ostrya virginiana*, and *Tsuga canadensis*. A tall-shrub layer is occasionally absent but usually characterized by *Hamamelis virginiana* and, less frequently, by *Cornus florida* and *Acer pensylvanicum*, the latter more common at higher elevations. The lower shrub layer contains scrambling or climbing vines of *Parthenocissus quinquefolia, Vitis aestivalis*, and *Toxicodendron radicans*, along with *Viburnum acerifolium, Hydrangea arborescens, Vaccinium pallidum*, and *Vaccinium stamineum*. In general, ericaceous species are patchy to sparse in this community. The herbaceous layer is usually sparse but may include *Dryopteris marginalis, Dioscorea quaternata, Eurybia divaricata (= Aster divaricatus), Ageratina altissima, Polygonatum biflorum, Solidago caesia, Festuca subverticillata, Thelypteris noveboracensis, Sanicula trifoliata, Prenanthes altissima, Polystichum acrostichoides, Desmodium nudiflorum, Galium latifolium, Houstonia purpurea*, and *Maianthemum racemosum*. Although not one of the more constant herbs, *Aralia nudicaulis* may occasionally dominate the herb layer of this community in large, clonal patches. This association is more-or-less intermediate in site conditions and composition between oak/heath forests of exposed, xeric, infertile sites and richer cove or montane oak-hickory forests of sheltered, fertile sites.

Global Dynamics: Wind and ice damage to tree crowns, damage to *Cornus florida* from dogwood anthracnose (*Discula destructiva*), and a few small fire scars were disturbances noted in plots. Although *Castanea dentata* logs and wood were not abundant in plots, frequent sprouts indicate that *Castanea dentata* was at least an associate tree in this type prior to the arrival of chestnut blight. The northwest slopes of Peters Mountain in Alleghany County,

Virginia, contains old-growth examples of the type with large, widely spaced canopy trees in the 43- to 72-cm (17-28 inches) dbh range. Representative old-age trees include a 59-cm (23 inches) dbh *Quercus prinus* >220 years old; a 63-cm (25 inches) dbh *Quercus prinus* about179 years old; a 67-cm (26 inches) dbh *Quercus prinus* 265 years old; and a 71-cm (28 inches) dbh *Quercus rubra* >247 years old (Fleming and Moorhead 2000).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Eurybia divaricata*, *Hamamelis virginiana*, *Liriodendron tulipifera*, *Parthenocissus quinquefolia*, *Quercus prinus*, *Quercus rubra*, *Toxicodendron radicans*
Global: *Acer pensylvanicum*, *Acer rubrum*, *Carya glabra*, *Cornus florida*, *Hamamelis virginiana*, *Parthenocissus quinquefolia*, *Quercus prinus*, *Quercus rubra*, *Sassafras albidum*, *Viburnum acerifolium*, *Vitis aestivalis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Castanea dentata* (G4, MD state-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Calystegia sepium*, *Hieracium caespitosum* (Medium/Insignificant), *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum caespitosum*, *Rosa multiflora* (Medium/Low)
Global: Vulnerable Plants: *Panax quinquefolius* (G3G4, under collection pressure), *Scutellaria saxatilis* (G3), *Tsuga caroliniana* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Oct-2001). This is a widespread oak forest of the central Appalachian Mountains found on intermediate rocky slopes. It is secure within its range.

RELATED CONCEPTS

Global Similar Types:
- *Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland (CEGL006565)
- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299)
- *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267)
- *Quercus prinus - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum*) Forest (CEGL006282)
- *Quercus prinus - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest (CEGL008523) occurs on more subxeric sites and has a more prominent ericaceous shrub layer.
- *Quercus rubra - Quercus prinus - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (CEGL008514)
- *Quercus rubra - Quercus prinus - Magnolia (acuminata, fraseri) / Acer pensylvanicum* Forest (CEGL004817)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: These are Central Appalachian *Quercus prinus - Quercus rubra* forests that occur on sheltered rocky slopes and weathered boulderfields. This type has been repeatedly circumscribed in regional analyses of Central Appalachian data (e.g., George Washington/Jefferson National Forests, Shenandoah National Park, National Capital Region parks) and is robust. This community lacks Southern Appalachian species. A distinctive feature of this community is the little to no cover of ericads.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: Wind and ice damage to tree crowns, damage to *Cornus florida* from dogwood anthracnose (*Discula destructiva*), and a few small fire scars were disturbances noted in plots. Although *Castanea dentata* logs and wood are not abundant in plots, frequent sprouts indicate that *Castanea dentata* was at least an associate tree in this type prior to the arrival of

chestnut blight. Geography drives the differences between Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057) and Southern Appalachian Montane Northern Red Oak - Chestnut Oak Forest (CEGL004817). Soils supporting CEGL006057 have significantly higher base status (particularly Ca, Mg) than those of CEGL004817, reflecting the location of many on base-rich granitic and metabasalt substrates. Along the AT, the area of overlap between these types is roughly in Giles County, Virginia. CEGL006057 lacks Southern Appalachian species, while one or both of the magnolias, *Magnolia acuminata* and *Magnolia fraseri* and *Rhododendron maximum* are present in CEGL004817.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs throughout the Central Appalachians (from I-77 in Virginia north to Lehigh County in Pennsylvania). It was sampled in Maryland (Weverton), Pennsylvania (northern and central, Peter's Mountain, Sherman Creek), and Virginia (Angels Rest, Brushy Mountain/Dismal Creek, Dragons Tooth, Front Royal, and James River Face Wilderness).
Global Range: This association occurs throughout the central Appalachian region of Virginia, West Virginia, Maryland, Pennsylvania, and possibly farther north. In Virginia, it is a large-patch community type in both the Northern Blue Ridge and Ridge and Valley provinces. Small-patch outliers of this type occur in rocky, sheltered ravines of the northern Virginia and Maryland Piedmont.
Nations: US
States/Provinces: DE:S3, MD:S4, NJ, PA, VA:S4, WV
TNC Ecoregions: 52:C, 59:C, 61:C
USFS Ecoregions (1994/95): 212G:P?, 221Am:CCP, 221Da:CCP, 221Db:CCC, 221E:C?, 221F:C?, 231A:??, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bf:CCC, M221C:C?, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, C&O Canal, Catoctin Mountain, George Washington Parkway, Harpers Ferry, Monocacy, Morristown, Shenandoah); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCAO
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (9 plots; 13 observation points; 49 accuracy assessment points): APPA.0211, APPA.0351, APPA.0354, APPA.0356, APPA.0357, APPA.0507, APPA.0525, APPA.0667, APPA.0671, APPA.1158, APPA.1177, APPA.1190, APPA.1202, APPA.1203, APPA.1204, APPA.1205, APPA.1206, APPA.1208, APPA.1210, APPA.1212, APPA.1327, APPA.1333, APPA_AA_0014, APPA_AA_0050, APPA_AA_0085, APPA_AA_0086, APPA_AA_0177, APPA_AA_0204, APPA_AA_0217, APPA_AA_0229, APPA_AA_0230, APPA_AA_0235, APPA_AA_0241, APPA_AA_0249, APPA_AA_0278, APPA_AA_0290, APPA_AA_0306, APPA_AA_0358, APPA_AA_0362, APPA_AA_0376, APPA_AA_0382, APPA_AA_0406, APPA_AA_0410, APPA_AA_0445, APPA_AA_0545, APPA_AA_0560, APPA_AA_0583, APPA_AA_0674, APPA_AA_0686, APPA_AA_0724, APPA_AA_0767, APPA_AA_0791, APPA_AA_0803, APPA_AA_0860, APPA_AA_0917, APPA_AA_0930, APPA_AA_1128, APPA_AA_1165, APPA_AA_1171, APPA_AA_1189, APPA_AA_1240, APPA_AA_1264, APPA_AA_1311, APPA_AA_1343, APPA_AA_1399, APPA_AA_1401, APPA_AA_1440, APPA_AA_1447, APPA_AA_1463, APPA_AA_1575, APPA_AA_1592.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming, P. Coulling, S.L. Neid and. G. Fleming
References: Breden et al. 2001, CAP pers. comm. 1998, Coxe 2009, Eastern Ecology Working Group n.d., Ehrenfeld 1977, Eyre 1980, Fike 1999, Fleming 2002a, Fleming 2002b, Fleming 2007, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 1996, Fleming and Moorhead 2000, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2006, Harrison 2004, Harrison 2011, Lea 2003, Lea 2004, Rawinski et al. 1994, Rawinski et al. 1996, Sneddon et al. 2008, Stephenson and Adams 1991, VDNH 2003, Vanderhorst 2000b, Windisch 1993, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL006286] *Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest

Translated Name: **Chestnut Oak - Northern Red Oak / Great Laurel / Beetleweed Forest**
Common Name: **Chestnut Oak Forest (Mesic Slope Heath Type)**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus prinus* - *Quercus rubra* Forest Alliance (A0250)

Element Concept

Global Summary: This forest is known from protected, usually steep slopes in the Southern Blue Ridge and ranges into adjacent areas of the upper Piedmont to the east and the Cumberlands and Southern Ridge and Valley to the west. In the southern portion of its range (Southern Blue Ridge), it usually occurs on north-facing slopes, while in the northern part of its range (the Cumberlands in West Virginia), most sites have southerly to westerly aspects. This is typically a midslope to lower slope type, but it can be found on upper slopes in a more sheltered position. This forest is found at elevations between 760 and 1220 m (2500-4000 feet) in the Southern Blue Ridge and at somewhat lower elevations (200-600 m) in the Cumberland Plateau. Canopies in these forests are dominated by *Quercus prinus*, usually with lesser amounts of *Quercus rubra* and/or *Acer rubrum*, and always occurring over a dense, very tall shrub stratum (2-6 m) of *Rhododendron maximum*. In some examples, this community may also be codominated or dominated by *Quercus velutina, Quercus alba*, or *Betula lenta*. Additional trees with lower constancy and cover in the canopy and subcanopy include *Tsuga canadensis, Oxydendrum arboreum, Fagus grandifolia*, and *Nyssa sylvatica*. On some sites, *Tsuga canadensis* may have dense understory regeneration. In some areas of the Southern Blue Ridge, *Rhododendron minus* may dominate the shrub layer. Other common shrubs can include *Gaylussacia ursina* (in the Southern Blue Ridge), *Kalmia latifolia, Smilax rotundifolia, Ilex opaca var. opaca*, and/or *Hamamelis virginiana*. Herbs are sparse. The ground cover is dominated by leaf litter, but *Galax urceolata* is found in most occurrences except at the northern limit of this type's range in West Virginia. Other herb species that can be typical include *Chimaphila maculata, Goodyera pubescens, Polystichum acrostichoides, Maianthemum racemosum, Solidago caesia, Mitchella repens, Eurybia divaricata, Dryopteris marginalis*, and *Dioscorea quaternata*. Some examples may have sparse (woodland-like) canopies and occur in association with rock outcroppings. Vascular plant species richness in seven 400-square-meter West Virginia plots ranges from 12 to 49 taxa (mean = 30.1).

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This mesic chestnut oak - northern red oak forest was sampled at two locations in the park; one in Giles County, Virginia, in the Central Appalachians and one in Smyth County, Virginia, in the Cumberlands and Southern Ridge and Valley. The sites are somewhat steep to steep upper slopes and ridges with north aspects at 1,000 m (3,280 feet) elevation. Soils are well-drained loam. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. No evidence of disturbance was reported.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This chestnut oak forest is found at elevations below 1,164 m on somewhat steep to steep mid and upper slopes with northern aspects. Soils are mesic, well-drained sandy loam and loam. The unvegetated surface is dominated by leaf litter with some downed wood. Evidence of disturbance includes wind/ice damage.

Global Environment: This forest is known from protected, usually steep slopes in the Southern Blue Ridge and ranges into adjacent areas of the upper Piedmont to the east and the Cumberlands and Southern Ridge and Valley to the west. In the southern portion of its range (Southern Blue Ridge), it usually occurs on north-facing slopes, while in the northern part of its range (the Cumberlands in WV), most sites have southerly to westerly aspects. This is typically a midslope to lower slope type, but it can be found on upper slopes in a more sheltered position. This forest is found at elevations between 760 and 1220 m (2500-4000 feet) in the Southern Blue Ridge and at somewhat lower elevations (200-600 m) in the Cumberland Plateau. Soils in WV plots are described as well- to rapidly-drained, dry to somewhat moist sandy loam and sandy clay loam that test very strongly to extremely acidic (mean pH = 4.20). Soils of some sites may be classified as folists, characterized by deep organic horizons (duff) over bouldery colluvium.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This forest is dominated by a mix of *Quercus prinus* and *Quercus rubra*; *Acer rubrum, Betula lenta, Magnolia fraseri*, and *Oxydendrum arboreum* occur in the subcanopy. There is very heavy cover (approaching 100% in most cases) of *Rhododendron maximum* in the shrub layer. Herbs are sparse due to the dense shrub layer.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is dominated by a mix of *Quercus prinus* and *Quercus rubra*; additional trees may include *Acer rubrum, Acer pensylvanicum, Betula lenta, Magnolia fraseri*, and *Oxydendrum arboreum*. The shrub layer has very thick cover (approaching 100% in most cases) of *Rhododendron maximum*. Herbs are sparse but may include *Clintonia umbellulata* and *Galax urceolata*.

Global Vegetation: Canopies in these forests are dominated by *Quercus prinus*, usually with lesser amounts of *Quercus rubra* and/or *Acer rubrum*, and always occurring over a dense, very tall shrub stratum (2-6 m) of *Rhododendron maximum*. In some examples, this community may also be codominated or dominated by *Quercus velutina, Quercus alba*, or *Betula lenta*. Additional trees with lower constancy and cover in the canopy and subcanopy include *Tsuga canadensis, Oxydendrum arboreum, Fagus grandifolia*, and *Nyssa sylvatica*. On some sites, *Tsuga canadensis* may have dense understory regeneration. In some areas of the Southern Blue Ridge, *Rhododendron minus* may dominate the shrub layer. Other common shrubs can include *Gaylussacia ursina* (in the Southern Blue Ridge), *Kalmia latifolia, Smilax rotundifolia, Ilex opaca var. opaca*, and/or *Hamamelis virginiana*. Herbs are sparse. The ground cover is dominated by leaf litter, but *Galax urceolata* is found in most occurrences except at the northern limit of this type's range in West Virginia. Other herb species that can be typical include *Chimaphila maculata, Goodyera pubescens, Polystichum acrostichoides, Maianthemum racemosum, Solidago caesia, Mitchella repens, Eurybia divaricata, Dryopteris marginalis*, and *Dioscorea quaternata*. Some examples may have sparse (woodland-like) canopies and occur in association with rock outcroppings. Vascular plant species richness in seven 400-square-meter WV plots ranges from 12 to 49 taxa (mean = 30.1).

In the Great Smoky Mountains, this community is found consistently as a transitional band of vegetation, downslope from drier *Quercus prinus* ridgetop forests, *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271), and grading into acidic cove forests, *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543), on the steep ravines below. At Cumberland Gap National Historical Park and the Gauley River National Recreation Area, it can grade into mixed mesophytic forests (CEGL005222) as well.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron maximum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Quercus prinus*, *Quercus rubra*, *Rhododendron maximum*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Galax urceolata*, *Quercus prinus*, *Quercus rubra*, *Rhododendron maximum*

Global: *Chimaphila maculata*, *Galax urceolata*, *Polystichum acrostichoides*, *Quercus prinus*, *Quercus rubra*, *Quercus velutina*, *Rhododendron maximum*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Trillium rugelii* (G3), *Tsuga caroliniana* (G3); **Other Plants**: *Quercus alba* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (22-Feb-2010). This community is uncommon, but not rare, throughout most of its range. As currently defined, it is a regional endemic, found only in the Southern Blue Ridge and adjacent regions of the upper Piedmont and Cumberlands and Southern Ridge and Valley. This community is often overlooked or not distinguished separately in inventories; thus, it is more common than the number of documented occurrences suggests.

RELATED CONCEPTS

Global Similar Types:

- *Acer rubrum var. rubrum - Betula lenta - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Ruderal Forest (CEGL008558)
- *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543)
- *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271)
- *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267)
- *Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest (CEGL008524) is mostly of the Central Appalachians and only peripherally in the northern portion of the Southern Blue Ridge; occupies drier sites and is characterized by a dense *Rhododendron catawbiense* shrub layer.
- *Quercus rubra / (Kalmia latifolia, Rhododendron catawbiense, Rhododendron maximum) / Galax urceolata* Forest (CEGL007299)

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This is a mesophytic oak / heath forest with substantial *Quercus rubra* and a *Rhododendron maximum* understory. At most of the Virginia sampling sites, this type appears to occupy a transitional zone between acidic cove forests, i.e., Southern Appalachian Acidic Cove Forest (Typic Type) (CEGL007543), and more xeric oak / heath forests, Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271). In comparison to Central Appalachian Chestnut Oak / Catawba Rosebay Forest (CEGL008524), Chestnut Oak Forest (Mesic Slope Heath Type) (CEGL006286) is associated with distinctly more mesophytic sites, has a strong group of differential indicator species, and contains many more Southern Appalachian endemics.

Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: This community is included in the Central Appalachian project area classification for the AT because of the mapping boundaries set for the project. It is more of a Southern Blue Ridge community. It is a rather rare type in Virginia and all occurrences are south of the New River.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: A mesophytic oak/heath forest with substantial *Quercus rubra* and a *Rhododendron maximum* understory. At most of the Virginia sampling sites, this type appears to occupy a transitional zone between acidic cove forests, Southern Appalachian Acidic Cove Forest (Typic Type) (CEGL007543), below and more xeric oak/heath forests, Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271), above.

Global Classification Comments: This association is more protected and more mesic than *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271). It occurs at lower elevations and on more protected topographic positions than *Quercus rubra / (Kalmia latifolia, Rhododendron catawbiense, Rhododendron maximum) / Galax urceolata* Forest (CEGL007299). It is much less diverse than *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267), lacking the diverse herbaceous and woody components found in that association. Stands similar to this association but with significant cover by *Tsuga canadensis* in the canopy layers are classified as *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is an outlier in the southernmost extent of the Central Appalachians; it is uncommon along the AT. It ranges from south of the New River in Virginia through the Cumberlands and Southern Ridge and Valley and into the Southern Blue Ridge. It was sampled in Virginia at Brushy Mountain and Pearis Mountain West.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is uncommon throughout the region and along the trail. It was sampled in North Carolina and at Brushy Mountain in Virginia.

Global Range: This community occurs in the Southern Blue Ridge of northeastern Georgia, northwestern South Carolina, north through eastern Tennessee, western North Carolina, and southwestern Virginia. It extends into the Cumberlands and Southern Ridge and Valley of Kentucky, Virginia and West Virginia. Its range also extends into the upper Piedmont of North Carolina.
Nations: US
States/Provinces: GA, KY, NC, SC, TN, VA:S3?, WV
TNC Ecoregions: 50:P, 51:C, 52:C, 59:?
USFS Ecoregions (1994/95): M221Ab:CCC, M221B:C?, M221Ca:CCC, M221Cc:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Gauley River, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Monongahela, Nantahala, Pisgah, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCOM
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 1 observation point): APPA.0990, APPA.1180.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 16 accuracy assessment points): APPA.0610, APPA.1015, APPA_AA_0137, APPA_AA_0162, APPA_AA_0164, APPA_AA_0323, APPA_AA_0333, APPA_AA_0357, APPA_AA_0485, APPA_AA_0707, APPA_AA_0754, APPA_AA_0994, APPA_AA_1150, APPA_AA_1214, APPA_AA_1252, APPA_AA_1338, APPA_AA_1390, APPA_AA_1455, APPA_AA_1519.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson, R. White and S.C. Gawler
References: Allard 1990, Eyre 1980, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Simon pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Vanderhorst et al. 2010, White 2003, White 2006

[CEGL008523] *Quercus prinus - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest

Translated Name: **Chestnut Oak - Northern Red Oak / Blue Ridge Blueberry - (Pink Azalea) Forest**
Common Name: **Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus prinus* - *Quercus rubra* Forest Alliance (A0250)

ELEMENT CONCEPT

Global Summary: This community is documented primarily from the northern Blue Ridge and its eastern foothills, from Amherst County in west-central Virginia to the Catoctin Mountains of northern Maryland, and extending into northeastern West Virginia. It is likely to be more widespread, but certain topographic and/or soil conditions on the northern Blue Ridge may favor its development and abundance there. This community occupies sites intermediate between the xeric, oligotrophic sites of chestnut oak/heath forests and the somewhat sheltered, submesic, subacidic sites of other montane mixed oak and oak-hickory forests. It occurs on chiefly convex, moderately steep middle to upper slopes, ridge crests, and boulderfields with southeastern to northwestern exposures. Soils are subxeric or xeric and strongly infertile. Many sites have high cover of boulders, cobbles, gravel, or mineral soil. Underlying bedrock includes massive quartzite of the Chilhowee group, various members of the northern Blue Ridge gneissic granitic complex, and less frequently metabasalt of the Catoctin Formation. This type spans a very broad range of elevations, from <300 m to nearly 1100 m (<1000-3600 feet). *Quercus prinus* and *Quercus rubra* generally codominate the overstory, but either species may dominate discrete areas within stands. Minor canopy associates include *Quercus*

velutina, Quercus alba, Betula lenta, Carya spp., *Robinia pseudoacacia*, and *Pinus strobus*. *Acer rubrum* cover may equal or exceed that of the diagnostic oak species in stands with recent harvesting. The shrub layer is dominated by patchy *Vaccinium pallidum, Vaccinium stamineum, Rhododendron periclymenoides*, and *Kalmia latifolia*. *Acer pensylvanicum* and *Smilax rotundifolia* may be present in minor amounts. A suite of low-cover, xerophytic herbs is characteristic, including *Houstonia longifolia, Campanula divaricata, Potentilla canadensis, Lysimachia quadrifolia, Carex pensylvanica, Aureolaria laevigata*, and *Hieracium paniculatum*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This dry chestnut oak - northern red oak forest occurs on exposed, convex higher-elevation (610-914 m [2,000-3,000 feet]), moderately steep, middle to upper slopes, ridge crests, and boulderfields with southeastern to northwestern exposures. It was sampled at six locations in the Central Appalachians. The sites are mid and upper slopes and summits with southeastern or northwestern aspects. Soils are well-drained clay loam, sandy loam and silt loam. The unvegetated surface is dominated by leaf litter with some downed wood and occasional exposed bedrock, large/small rocks and/or bare soil. Evidence of disturbance includes past logging/clearing, trails and ditches, grazing/browsing, and the presence of exotic plant species.

Global Environment: This community type occurs on chiefly convex, moderately steep middle to upper slopes, ridge crests, and boulderfields with southeastern to northwestern exposures. Soils are subxeric or xeric and strongly infertile. Many sites have high cover of boulders, cobbles, gravel, or mineral soil. Underlying bedrock includes massive quartzite of the Chilhowee group, various members of the northern Blue Ridge gneissic granitic complex, and less frequently metabasalt of the Catoctin Formation. This type spans a very broad range of elevations, from <300 m to nearly 1100 m (<1000-3600 feet). Although *Quercus prinus* generally occurs at elevations below 915 m (3000 feet) in the northern Blue Ridge of Virginia (Harrison et al. 1989, Stephenson and Adams 1989), it often extends upslope on more xeric sites (e.g., Whittaker 1956). Virtually all stands have experienced a history of logging and the loss of *Castanea dentata* as an overstory dominant.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This dry-mesic oak forest is codominated by *Quercus prinus* and *Quercus rubra*. The subcanopy includes *Carya glabra, Acer rubrum, Prunus serotina, Nyssa sylvatica*, and/or *Sassafras albidum*. *Acer rubrum* cover may equal or exceed that of the diagnostic oak species in stands with recent harvesting. Common shrubs include *Vaccinium stamineum, Vaccinium pallidum, Viburnum acerifolium*, and sometimes patchy *Kalmia latifolia* and/or *Rhododendron periclymenoides*. Herbs on rocky soils include *Aralia nudicaulis, Houstonia longifolia*, and *Campanula divaricata*; *Dennstaedtia punctilobula* is more common on deeper soils.

Global Vegetation: *Quercus prinus* and *Quercus rubra* generally codominate the overstory, but either species may dominate discrete areas within stands. *Acer rubrum* cover may equal or exceed that of the diagnostic oak species in stands with recent harvesting. Minor canopy associates include *Quercus velutina, Betula lenta, Carya* spp., *Robinia pseudoacacia, Quercus alba*, and *Pinus strobus*. *Acer rubrum* is the most constant and abundant species of the subcanopy, which also contains *Sassafras albidum, Prunus serotina, Nyssa sylvatica*, and *Acer pensylvanicum* (mostly at higher elevations). Patchy dominance by *Vaccinium pallidum, Vaccinium stamineum, Rhododendron periclymenoides*, and *Kalmia latifolia* characterizes the shrub layer. *Acer pensylvanicum* and *Smilax rotundifolia* may be present in minor amounts. A number of low-cover, xerophytic herbs are characteristic where soil development and rock cover permit, including *Houstonia longifolia, Campanula divaricata, Potentilla canadensis, Lysimachia quadrifolia, Carex pensylvanica, Aureolaria laevigata*, and *Hieracium paniculatum*. *Medeola virginiana* and *Monotropa uniflora* may also be present. *Aralia nudicaulis* is occasionally a patch-dominant on dry, bouldery sites. On other sites with better soil development, *Dennstaedtia punctilobula* nearly dominates the herb stratum. Mean species richness of 28 plots is 40 taxa per 400 square meters, much higher than that of other oak/heath types in the Central Appalachians region.

Global Dynamics: *Castanea dentata* abounds in the shrub layer of some stands, which undoubtedly reflects the former importance of this species in the canopy. Both *Acer rubrum* and *Robinia pseudoacacia* may have increased following logging; the presence of the latter suggests disturbance in recent decades, and the persistence of the former may indicate contemporary fire exclusion.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer rubrum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*, *Vaccinium stamineum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Campanula divaricata*, *Carya glabra*, *Chimaphila maculata*, *Houstonia longifolia*, *Nyssa sylvatica*, *Prunus serotina*, *Quercus prinus*, *Quercus rubra*, *Sassafras albidum*, *Vaccinium pallidum*
Global: *Aureolaria laevigata*, *Carex virescens*, *Castanea dentata*, *Hieracium paniculatum*, *Lysimachia quadrifolia*, *Quercus prinus*, *Quercus rubra*, *Rhododendron periclymenoides*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Ailanthus altissima* (Medium), *Lonicera japonica* (High/Medium)
Global: Vulnerable Plants: *Tsuga caroliniana* (G3); **Other Plants**: *Kalmia latifolia* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (2-Oct-2006). The type occupies a fairly narrow geographic range on the northern Blue Ridge but is locally common within the range. Many occurrences are protected on national park lands. In West Virginia, it is documented from Camp Dawson in Preston County, and from Harpers Ferry National Historic Park. Sites with similar exposure and parent material occur on local peaks of Shenandoah National Park, the Peaks of Otter region, and the northern terminus of the Southern Blue Ridge near Roanoke, at the southern limit of the distribution of charnockitic bedrock.

RELATED CONCEPTS

Global Similar Types:
- *Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest (CEGL007230) is a broadly defined association from the Southern Blue Ridge.
- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299)
- *Quercus prinus - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum*) Forest (CEGL006282) ranges from Maine to Virginia.
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057) is common in the Central Appalachians, possibly ranging north to New Jersey.
- *Quercus rubra - Quercus prinus - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (CEGL008514)
- *Tsuga canadensis - Fagus grandifolia - Quercus (prinus, alba)* Forest (CEGL006474)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This association represents mixed oak / sparse heath vegetation on very rocky, somewhat sheltered sites. Plots span the full length of the Northern Blue Ridge, from just north of Roanoke to Harpers Ferry; often in the elevational range of 610 to 1,070 m (2,000-3,500 feet). It is likely to occur along the AT on the Maryland Blue Ridge. This type has never been documented on sedimentary rocks of the Ridge and Valley, and appears to be wholly associated with metamorphic rocks (metasedimentary, granitic, and metabasaltic) of the Blue Ridge and its major foothills in the western Piedmont.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Analysis of 28 plots from Virginia, Maryland, and West Virginia provided the basis for this type's current circumscription. This community type bears some similarity to a number of units in the

USNVC. *Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest (CEGL007230) is a broadly defined association from the Southern Blue Ridge. It differs from the present community type in the presence of several Southern Appalachian endemics (*Gaylussacia ursina, Halesia tetraptera, Magnolia fraseri*) whose range does not extend to the Northern Blue Ridge and by the general absence (except for *Lysimachia quadrifolia*) of the xerophytic herbs characteristic of this type. *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057) is common in the Central Appalachians, possibly ranging north to New Jersey. This association represents mixed oak / sparse heath vegetation on very rocky, somewhat sheltered sites. *Acer pensylvanicum, Hamamelis virginiana*, and *Carya* spp., which are characteristic of CEGL006057, are relatively unimportant in stands of the present type. *Quercus prinus - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum)* Forest (CEGL006282), which ranges from Maine to Virginia, is characterized by a low, speciose ericaceous layer and lacks the herbaceous species diagnostic of this community type.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is found from the Northern Blue Ridge to just north of Roanoke to Harpers Ferry to the Catoctin Mountains of northern Maryland, extending into northeastern West Virginia. It was sampled in Potomac Wayside and Hogwallow Flats (Shenandoah National Park) in Virginia and at Loudoun Heights and Harpers Ferry in West Virginia.
Global Range: This community is documented only from the northern Blue Ridge and its eastern foothills, from Amherst County in west-central Virginia to the Catoctin Mountains of northern Maryland, and Preston, Mineral, and Randolph counties in West Virginia. Within this range, it is widely distributed and frequently a large-patch type. It is likely to be more widespread, but certain topographic and/or soil conditions on the northern Blue Ridge may favor its development there. The absence of either broad southern Appalachian endemics or species with more northern affinities distinguishes this type from more southern and northern vegetation types.
Nations: US
States/Provinces: MD, VA:S3S4, WV
TNC Ecoregions: 52:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CPP, M221Ba:CCP, M221Bb:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, C&O Canal, Catoctin Mountain, Harpers Ferry, Shenandoah); USFS (George Washington)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCAO
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (4 plots; 2 observation points; 1 accuracy assessment point): APPA.0231, APPA.0448, APPA.0454, APPA.0458, APPA.1254, APPA.1258, APPA_AA_0783.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming, P.P. Coulling, S.C. Gawler
References: Abrams 1992, Coulling and Rawinski 1999, Eyre 1980, Fleming 2002a, Fleming 2002b, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Fleming et al. 2007b, Harrison 2004, Harrison et al. 1989, Newell 1997, Stephenson and Adams 1989, Vanderhorst 2001a, Vanderhorst and Streets 2006, Whittaker 1956, Young et al. 2009

[CEGL004817] *Quercus rubra - Quercus prinus - Magnolia (acuminata, fraseri) / Acer pensylvanicum* Forest

Translated Name: **Northern Red Oak - Chestnut Oak - (Cucumber-tree, Mountain Magnolia) / Striped Maple Forest**
Common Name: **Southern Appalachian Montane Northern Red Oak - Chestnut Oak Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus prinus - Quercus rubra* Forest Alliance (A0250)

ELEMENT CONCEPT

Global Summary: This mixed northern red oak - chestnut oak forest is known from the northern part of the Southern Appalachians and extreme southern part of the Central Appalachians in southwestern Virginia and adjacent parts of West Virginia and Tennessee. It occurs on submesic slopes at various topographic positions and aspects from 600 to 1200 m (2000-4000 feet) elevation. Geologic substrate includes various sedimentary rocks, quartzite, granitic rocks, biotite gneiss, and feldspathic metagraywacke. Soils are deep, extremely acidic, and infertile. Vegetation is a mixed oak forest with a well-developed canopy 30 m or more tall in mature stands. *Quercus rubra* and *Quercus prinus* are the most characteristic canopy dominants, usually occurring in mixed stands with minor associates of *Magnolia acuminata, Magnolia fraseri, Quercus alba, Betula lenta, Acer rubrum, Carya* spp., *Fagus grandifolia, Tsuga canadensis*, and *Liriodendron tulipifera*. *Acer pensylvanicum* is the leading small tree/shrub dominant, with frequent associates of *Oxydendrum arboreum, Pinus strobus, Amelanchier arborea, Amelanchier laevis, Castanea dentata* (sprouts), *Hamamelis virginiana, Rhododendron maximum, Ilex montana, Viburnum acerifolium*, and *Vaccinium pallidum*. The herb layer is typically patchy to sparse, with *Medeola virginiana, Galax urceolata, Convallaria majuscula, Thelypteris noveboracensis*, and *Dennstaedtia punctilobula* occasionally attaining 5% cover in a plot; at higher elevations, the ferns may dominate strongly and cover more substantial areas. Other relatively constant but low-cover herbs include *Dioscorea quaternata, Eurybia divaricata, Solidago curtisii, Polygonatum biflorum, Polystichum acrostichoides, Conopholis americana, Clintonia umbellulata, Viola hastata, Uvularia puberula, Chamaelirium luteum, Zizia trifoliata*, and *Carex appalachica*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This Southern Appalachian mixed oak montane forest ranges in elevation from 600 to 1,200 m (2,000-4,000 feet). It was sampled at six locations in the Central Appalachian project area. Sites range from gentle to steep, lower to upper slopes and ridgetops with mostly western and northern aspects. Soils are mesic to dry-mesic moderately well- to well-drained clay loam, loam, sandy loam, and clay loam. The unvegetated surface is dominated by leaf litter with some downed wood and occasional (sometimes significant) large/small rocks and bare soil. Evidence of disturbance includes possible past logging, trails, and some hemlock woolly adelgid damage.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This mixed oak forest is distributed extensively between about 610 and 1,220 m (2,000-4,000 feet) elevation on the southern Virginia Blue Ridge and somewhat less extensively in the drier Ridge and Valley region to the west. It occurs on submesic to near mesic slopes with deep, acidic soils. Sites range from gentle to steep lower to upper slopes and ridgetops with mostly western and northern aspects. Soils are mesic to dry-mesic moderately well- to well-drained clay loam, loam, sandy loam, and clay loam. The unvegetated surface is dominated by leaf litter with some downed wood and occasion (sometimes significant) large/small rocks and bare soil. Evidence of disturbance includes possible past logging, trails, and some hemlock woolly adelgid damage.

Global Environment: This community type occurs on submesic slopes at elevations from 600 to 1200 m (2000-4000 feet) in the northern part of the Southern Appalachians. It occurs on various topographic positions from lower to upper slopes and crests, in deep, infertile soils. Parent material at known sites includes Ordovician siltstones and shale, Devonian shale and sandstone, quartzite, conglomerate sandstone and shale, interbedded quartzite and dolomite, charnockite, layered pyroxene granulite, biotite gneiss, and feldspathic metagraywacke. Among 26 plot-sampling sites, slope profiles are usually convex in at least one direction while surface substrate averaged 8% boulders and small stones, 4% decaying wood, 1% mineral soil, and 87% leaf litter and duff. Aspect was variable among the plots, but eastern aspects are rare. Soil samples collected from plots are extremely acidic (mean pH = 4.2), with low calcium and magnesium, and high iron and aluminum levels.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus rubra* is typically dominant or codominant with *Quercus prinus* in the canopy with a subcanopy dominated by *Acer rubrum* with *Magnolia fraseri* or *Magnolia acuminata* present. *Acer pensylvanicum, Acer rubrum, Oxydendrum arboreum*, and *Amelanchier arborea* are common in the understory. Common and/or abundant shrubs include *Castanea dentata, Hamamelis virginiana, Rhododendron maximum, Vaccinium* spp., and *Viburnum acerifolium*. Herbs are sparse but diverse; common species include *Dioscorea quaternata, Eurybia divaricata, Goodyera pubescens, Medeola virginiana, Polygonatum biflorum, Polystichum acrostichoides, Solidago curtisii*, and *Uvularia puberula*. Southern Appalachian species such as *Oxydendrum arboreum, Rhododendron calendulaceum, Rhododendron maximum* (scattered), *Galax urceolata, Convallaria majuscula*, and *Viola hastata* are conspicuous. In addition, this community supports VA-state critically imperiled *Heuchera caroliniana*.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: In this community, *Quercus rubra* is typically dominant or codominant with *Quercus prinus* in the canopy with a subcanopy of *Magnolia fraseri* or *Magnolia acuminata*. *Acer pensylvanicum* is dominant in the short-tree layer. Other common tree species include *Acer rubrum, Oxydendrum arboreum*, and *Tsuga canadensis*. Common and/or abundant shrubs include *Amelanchier arborea, Castanea dentata, Hamamelis virginiana, Rhododendron maximum, Vaccinium* spp., and *Viburnum acerifolium*. Herbs are sparse but diverse; common species include *Dioscorea quaternata, Eurybia divaricata, Goodyera pubescens, Medeola virginiana, Polygonatum biflorum, Polystichum acrostichoides, Solidago curtisii*, and *Uvularia puberula*. This community also supports VA-state critically imperiled *Heuchera caroliniana*.
Global Vegetation: Mature stands have a well-developed canopy of trees 30 m or more tall. *Quercus rubra* is the leading overstory dominant, with only slightly higher density and basal area than *Quercus prinus*. Most stands are mixed, although either species can dominate small areas. One or both of the magnolias, *Magnolia acuminata* or *Magnolia fraseri*, are usually important in the overstory or understory. Minor canopy associates vary and can include *Quercus alba, Betula lenta, Acer rubrum, Carya* spp., *Fagus grandifolia, Tsuga canadensis*, and *Liriodendron tulipifera*. Most of the preceding species may be present in the understory, along with *Acer pensylvanicum, Oxydendrum arboreum, Pinus strobus, Amelanchier arborea* and *Amelanchier laevis*, and sprouts of *Castanea dentata*. The most consistently important small tree / shrub is *Acer pensylvanicum*, attaining densities >500 stems/ha in some stands. Other shrubs that are less constant but sometimes important include *Hamamelis virginiana, Rhododendron maximum, Ilex montana, Viburnum acerifolium*, and *Vaccinium pallidum*. The herb layer is often patchy to sparse, with *Medeola virginiana, Galax urceolata, Convallaria majuscula, Thelypteris noveboracensis*, and *Dennstaedtia punctilobula* occasionally attaining 5% cover in a plot. In the higher part of the elevational range, however, the latter two ferns may greatly dominate the herb layer and cover more substantial areas. Other relatively constant but low-cover herbs include *Dioscorea quaternata, Eurybia divaricata, Solidago curtisii, Polygonatum biflorum, Polystichum acrostichoides, Conopholis americana, Clintonia umbellulata, Viola hastata, Uvularia puberula, Chamaelirium luteum, Zizia trifoliata*, and *Carex appalachica*.
Global Dynamics: The frequency of *Castanea dentata* sprouts in this community type suggests that it was formerly an important tree in the overstory mix. Extensive logging during the late 19th and early 20th centuries, along with removal of *Castanea* by chestnut blight, no doubt favored the oaks in regenerated stands. Many mature, contemporary stands of this vegetation type are now exhibiting classic symptoms of oak decline, with very poor recruitment of the dominant oaks, along with abundant invasion of stand understories by shade-tolerant mesophytic trees. The latter vary from site to site but include *Acer rubrum, Fagus grandifolia, Tsuga canadensis, Pinus strobus*, and rarely, *Acer saccharum var. saccharum*. Exclusion of low-intensity fires and logging disturbances have contributed to these changes, which will likely continue barring the re-introduction of fire. A recently burned stand on Clinch Mountain in southwest Virginia exhibited atypically high cover by herbaceous species, suggesting that fires also benefit herbs by burning off litter/humus and increasing illumination though the elimination of shrubs.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Magnolia fraseri*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer pensylvanicum*, *Acer rubrum*, *Amelanchier arborea*, *Dioscorea quaternata*, *Eurybia divaricata*, *Magnolia acuminata*, *Oxydendrum arboreum*, *Polygonatum biflorum*, *Quercus prinus*, *Quercus rubra*, *Solidago curtisii*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer pensylvanicum*, *Acer rubrum*, *Amelanchier arborea*, *Castanea dentata*, *Magnolia acuminata*, *Magnolia fraseri*, *Medeola virginiana*, *Quercus prinus*, *Quercus rubra*, *Rhododendron maximum*
Global: *Acer pensylvanicum*, *Convallaria majuscula*, *Dennstaedtia punctilobula*, *Galax urceolata*, *Magnolia acuminata*, *Magnolia fraseri*, *Medeola virginiana*, *Quercus prinus*, *Quercus rubra*, *Thelypteris noveboracensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Heuchera caroliniana* (G3, globally vulnerable & VA state-critically imperiled); **Invasive/Exotic Plants**: *Rosa multiflora* (Medium/Low)
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Castanea dentata* (G4, TN state-imperiled), *Heuchera caroliniana* (G3, VA state-critically imperiled); **Invasive/Exotic Plants**: *Rosa multiflora* (Medium/Low, invasive/exotic)
Global: Vulnerable Plants: *Gentiana austromontana* (G3), *Heuchera caroliniana* (G3), *Prenanthes roanensis* (G3), *Tsuga caroliniana* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (24-Feb-2010). Although this association is known from a fairly limited geographic area, data suggest that over much of that area, it is an extensive and secure type.

RELATED CONCEPTS

Global Similar Types:

- *Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest (CEGL007230) occurs on somewhat drier sites and has a stronger white oak component.
- *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267) occurs on drier sites at generally lower elevations, and has a stronger component of low-elevation species.
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057) has a more northerly range in the Central Appalachians, lacks Southern Appalachian species, and occupies sheltered rocky slopes and weathered boulderfields.
- *Quercus rubra - Acer rubrum / Pyrularia pubera / Thelypteris noveboracensis* Forest (CEGL006192) occurs in the southern part of the Southern Appalachians and generally lacks *Quercus prinus*.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Southern Appalachian Montane Northern Red Oak - Chestnut Oak Forest (CEGL004817) and Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057) are related, but floristically quite different types. Geography drives the differences, and there is an area at the northern end of the range for CEGL004817 and the southern end of the range for CEGL6057 in which the Southern Appalachian species drop out and stands may be difficult to place. Along the AT, that area is roughly in Giles County, Virginia. Unequivocal CEGL006057 ranges south along the AT to Craig County, then becomes transitional to CEGL004817 in Giles County. South of the New River, this vegetation class is represented by CEGL004817.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: *Quercus rubra* is the leading canopy dominant, with *Quercus prinus* a close second; most stands are mixed but either oak can dominate small areas. One or both of the magnolias, *Magnolia acuminata* and/or *Magnolia fraseri*, are often important in the overstory or understory. A variety of other trees, including *Quercus alba, Tsuga canadensis, Liriodendron, Fagus grandifolia*, and *Carya* spp. can sometimes be important in the overstory or understory. *Acer pensylvanicum* is consistently the most important small tree/shrub, attaining densities of >500 stems/ha in some stands. *Oxydendrum arboreum* is less constant but often common. Heaths are not prevalent, but sometimes patchy. Herbs are patchy to sparse; *Medeola virginiana, Convallaria majuscula, Galax urceolata*, and *Thelypteris noveboracensis* occasionally attain 5% cover in a plot.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: Similar to Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057), which is more common in the Central Appalachians.

Global Classification Comments: Classification of this type is supported by analysis of an 1100-plot Southern Appalachian dataset compiled for the Appalachian Trail vegetation mapping project (Fleming and Patterson 2009a). This community is represented by 27 plots and was intensively compared with similar types using cluster analysis, statistical analysis, and NMS ordinations, and found to be distinctive, both compositionally and environmentally. Additional data were collected in southwest Virginia after the Appalachian Trail analysis. The 33 Virginia plots of this type were also included in a statewide analysis of montane oak and oak-hickory vegetation in Virginia, and again formed a distinctive group (Fleming and Patterson 2009b).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from the northern part of the Southern Appalachians to the extreme southern part of the Central Appalachians in southwestern Virginia (Giles County and south from the New River). In the Central Appalachian project area of the AT, it was sampled at Angels Rest, Brushy Mountain, Locust Mountain, and Quebec Branch in Virginia.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is widespread in southwestern Virginia, with an additional 3 plots from Tennessee and North Carolina and one plot from southeastern West Virginia. It was sampled in North Carolina, Tennessee, and at Bobby's Ridge, Comers Creek, Hurricane Creek, Hurricane Mountain, Lost Mountain, and Straight Mountain in Virginia.
Global Range: This association is known from the northern part of the Southern Appalachians and extreme southern part of the Central Appalachians in southwestern Virginia and adjacent parts of West Virginia and Tennessee. The full range south and west of Virginia is not known and needs additional investigation. The type should be sought in northern North Carolina, as it is a major type in Virginia within a few miles of the border. Within the known range, it is a large-patch type that covers extensive areas on the Southern Blue Ridge. It is more localized in the Ridge and Valley and Cumberland Mountains, where it favors the higher ridges.
Nations: US
States/Provinces: NC, TN, VA:S3S4, WV
TNC Ecoregions: 50:C, 51:C, 59:C
USFS Ecoregions (1994/95): 221Ja:CCC, M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway); USFS (Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCOM
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (6 plots; 12 accuracy assessment points): APPA.0059, APPA.0093, APPA.0100, APPA.0486, APPA.0991, APPA.0993, APPA_AA_0252, APPA_AA_0285, APPA_AA_0288, APPA_AA_0360, APPA_AA_0423, APPA_AA_0429, APPA_AA_0571, APPA_AA_0903, APPA_AA_1100, APPA_AA_1241, APPA_AA_1478, APPA_AA_1514.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (11 plots; 2 observation points; 5 accuracy assessment points): APPA.0251, APPA.0255, APPA.0260, APPA.0265, APPA.0311, APPA.0320, APPA.0578, APPA.0634, APPA.1010, APPA.1014, APPA.1016, APPA.1112, APPA.1113, APPA_AA_0976, APPA_AA_1139, APPA_AA_1161, APPA_AA_1254, APPA_AA_1545.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009a*, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2007b, Southeastern Ecology Working Group n.d., VDNH unpubl. data

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[CEGL003890] *Vitis aestivalis* Vine-Scrub

Translated Name: **Summer Grape Vine-Scrub**
Common Name: **Montane Grape Opening**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus prinus* - *Quercus rubra* Forest Alliance (A0250)

ELEMENT CONCEPT

Global Summary: This community is strongly dominated by the vine *Vitis aestivalis*. In Great Smoky Mountains National Park, examples occur on steep to very steep, northerly, middle to upper slopes at intermediate elevations between 610 and 1070 m (2000-3500 feet). All areas sampled showed evidence of disturbance by wind, ice, or logging. *Vitis aestivalis* vines, extremely thick in patches and covering nearly every tree as well as the ground, have 50-100% coverage. Trees in the canopy and subcanopy have 0-50% coverage and vary from site to site. The shrub layer is sparse. The herb layer is sparse to moderate, decreasing with vine coverage. Herbaceous composition varies from site to site. Beneath the vine canopy, coarse woody debris and tip-up mounds are typical. The dynamics of this community are poorly understood. It apparently originates from disturbance, such as an ice or wind storm, and can persist for decades. Examples can range in size from less than one to ten hectares.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This native vineland originates from disturbance, such as logging or an ice or wind storm, and can persist for decades. This community can range in size from less than one to ten hectares.
Global Environment: In the Great Smoky Mountains National Park, this community occurs on steep to very steep, northerly, middle to upper slopes at intermediate elevations between 610 and 1070 m (2000-3500 feet) (MacKenzie 1993).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This community is represented by grapevine-dominated patches located in forests (so-called "grapeholes"), usually with greater than 25% coverage in various strata of the native *Vitis aestivalis*, and with a patchy canopy of trees.
Global Vegetation: This community is strongly dominated by the vine *Vitis aestivalis*. These vines, extremely thick in patches and covering nearly every tree as well as the ground, have 50-100% coverage. Trees in the canopy and subcanopy have 0-50% coverage and vary from site to site, but typical species include *Acer rubrum, Acer saccharum, Halesia tetraptera var. monticola*, and *Liriodendron tulipifera*. The shrub layer is sparse. The herb layer is sparse to moderate, decreasing with vine coverage. Herbaceous composition varies from site to site but is typical of mesic forests in the area. Some of the more common species from the sampled areas in Great Smoky Mountains National Park are *Ageratina altissima var. altissima, Amphicarpaea bracteata, Arisaema triphyllum ssp. triphyllum, Polystichum acrostichoides, Sanguinaria canadensis*, and *Viola* spp. Beneath the vine canopy, coarse woody debris and tip-up mounds are typical.
Global Dynamics: The dynamics of this community are poorly understood. It apparently originates from disturbance, such as an ice or wind storm; and can persist for decades. This community can range in size from less than a hectare to ten hectares. All areas sampled showed evidence of disturbance by wind, ice, or logging.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Liana	*Vitis aestivalis*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Liana	*Vitis aestivalis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Vitis aestivalis*
Global: *Vitis aestivalis*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (9-Sep-2015). This is an uncommon community. It is of limited extent within its range and its occurrence could be limited by specific disturbance regimes.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This vineland is expected to occur in the AT corridor in the Southern Appalachians.
Global Classification Comments: This community is important for wildlife, especially bears. In the Great Smoky Mountains, forests previously occupying sites that support this community are mesic forest types, such as cove forests or mesic forest dominated by chestnut oak and red oak. Forests on steep, mesic sites may be more susceptible to treefall and gap formation.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This vineland is expected to occur in the AT corridor in the Southern Appalachians.
Global Range: This community is known from the Great Smoky Mountains of North Carolina and Tennessee and the Cumberland Mountains of Tennessee and Kentucky.
Nations: US
States/Provinces: KY, NC, TN
TNC Ecoregions: 50:P, 51:C
USFS Ecoregions (1994/95): M221Dd:CCC, M222Ab:PPP
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Cumberland Gap, Great Smoky Mountains); USFS (Cherokee)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: Although this community was not sampled, it is reported to occur within the AT corridor in the Southern Blue Ridge project area.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A.S. Weakley and M. Pyne
References: MacKenzie 1993, MacKenzie 1993*, Peet et al. unpubl. data, Schafale 1998b, Schafale 2002, Schafale 2012, Southeastern Ecology Working Group n.d., TDNH unpubl. data, White 2006

A3116 *Quercus rubra - Quercus alba* Montane Forest Alliance

Alliance Summary Description: This alliance includes *Quercus rubra*-dominated forest vegetation of high elevations (over 1070 m [3500 feet]), as well as more restricted vegetation of montane landscapes dominated by *Quercus alba*, in the Central and Southern Appalachians. A closed to very open canopy has trees that are often gnarled and stunted, especially on ridge crests. *Quercus rubra* is often the only canopy tree, but other species may have minor importance, including *Acer rubrum, Betula alleghaniensis, Betula lenta, Crataegus flabellata*, and *Crataegus punctata*. *Quercus alba* is a significant component of forests at high elevations in Virginia's Ridge and Valley and at the lower elevations of associations in the Southern Blue Ridge. Forests in this alliance have variable physiognomies, ranging from open herb-dominated understories to understories dominated by dense ericaceous shrubs. If a subcanopy is present, typical species include canopy species plus *Acer pensylvanicum, Amelanchier arborea, Halesia tetraptera, Hamamelis virginiana*, and *Ilex montana*. The shrub stratum is dominated by *Kalmia latifolia*, occurring as patches or with continuous cover (>25%). In some parts of this forest's range, *Gaylussacia ursina* is dominant in the often dense low-shrub stratum. In forests with little or no shrub cover, herbaceous cover is dense and diverse, composed of sedges, ferns, and tall herbs, with dominance varying within and among occurrences. Where shrub cover is dense, the herbaceous stratum is not diverse and is typically very sparse with scattered forbs. Forests typically occur over well-drained, loamy soils underlain by Precambrian gneisses, schists, and granites. Soils supporting these forests tend to have relatively high base status. Forests occur on most of the major mountain ranges of the Southern Appalachians at elevations of 1070-1525 m (3500-5000 feet) on broad

ridges, mid to upper slope positions, and on steep rocky slopes at the heads of coves. Forests are also known from the central (on granitic crests) and Northern Blue Ridge (on middle to upper convex slopes) and in the northern Ridge and Valley. Damage by ice storms is probably the most common form of natural disturbance in these montane forests.

[CEGL008506] *Quercus rubra - (Quercus alba) / Ilex montana / Dennstaedtia punctilobula - Lysimachia quadrifolia* Forest

Translated Name: **Northern Red Oak - (White Oak) / Mountain Holly / Eastern Hay-scented Fern - Whorled Yellow Loosestrife Forest**

Common Name: **Central Appalachian Northern Red Oak Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus rubra* - *Quercus alba* Montane Forest Alliance (A3116)

Element Concept

Global Summary: This community type is known primarily from both the Northern Blue Ridge and Ridge and Valley provinces in the southern part of the Central Appalachians. Stands are restricted to elevations above 915 m (3000 feet). Prevailing aspect varies, but most examples are located on gentle to only moderately steep ridge crests and upper slopes. Soils are frequently bouldery and moderately to strongly infertile, with low base status. *Quercus rubra* is the principal dominant species in the overstory, with *Quercus alba* as a frequent but usually low-cover associate, often in a subcanopy layer. Canopy trees often exhibit stunted growth and sparse cover; the stature of these so-called "red oak orchards" reflects the harsh conditions of frequent wind and destructive ice storms. The abundance of *Castanea dentata* in the understory suggests its former importance in stands of this type. In localized stands, *Quercus velutina* or *Tsuga canadensis* share overstory dominance with *Quercus rubra*. The shrub layer is generally sparse to patchy, although a less common variant contains a dense ericaceous shrub layer. Composition of the herb layer varies considerably and usually features patch-dominance by one or more ferns and graminoids.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This high-elevation northern red oak forest occurs on gentle to moderately steep ridge crests and upper slopes and is restricted to elevations above 915 m (3,000 feet). It was sampled at seven locations in the Central Appalachians in northern Virginia. Sites range from gentle to somewhat steep upper slopes and summits with westerly, northerly and southerly aspects. Soils are well-drained silt loam and loam. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. Evidence of disturbance includes wind/ice damage, grazing/browsing, gypsy moth damage, chestnut blight, fire, and the presence of exotic plant species.

Global Environment: Stands are primarily restricted to elevations above 915 m (3000 feet). Prevailing aspect varies, but most examples are located on gentle to only moderately steep ridge crests and upper slopes. Soils are frequently bouldery and moderately to strongly infertile, with low base status. In the Blue Ridge, stands are underlain by mafic and felsic parent material, including metabasalt, layered pyroxene granulite, charnockite, and charnockite gneiss. The Ridge and Valley stands occur on a complex of clastic sedimentary and metasedimentary formations. Most stands likely experience frequent high winds and ice damage. The composition and structure of nearly all examples of this community type in Virginia have been altered by logging in the late 19th and early 20th centuries and by the loss of *Castanea dentata* as an important component in the 1930s.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus rubra* dominates the canopy with up to 75% cover. Canopy and subcanopy associates include *Acer rubrum, Betula lenta, Prunus serotina, Tsuga canadensis*, and/or *Quercus velutina*. The sparse to patchy shrub layer includes *Acer pensylvanicum, Ilex montana, Kalmia latifolia, Rubus allegheniensis var. allegheniensis, Ribes rotundifolium, Castanea dentata*, and/or *Hamamelis virginiana*. *Deschampsia flexuosa, Dennstaedtia punctilobula, Carex pensylvanica*, and *Lysimachia quadrifolia* are characteristic in the herb layer. This community lacks species from the Southern Appalachians.

Global Vegetation: *Quercus rubra* is the principal dominant species in the overstory, with *Quercus alba* as a frequent but usually low-cover associate, often in a subcanopy layer. Many stands have a stunted, somewhat open canopy. The abundance of *Castanea dentata* in the understory suggests its former importance in stands of this type. Tree associates in the canopy and subcanopy can include *Acer rubrum, Betula alleghaniensis, Betula lenta, Prunus serotina, Tsuga canadensis, Quercus velutina*, and *Quercus prinus*, which is mostly restricted to elevations lower than those at which this type prevails. The shrub layer is generally sparse to patchy; *Acer pensylvanicum, Ilex montana, Kalmia latifolia, Castanea dentata*, and *Hamamelis virginiana* are the most frequent species. Other tall shrubs occurring with lower cover and/or frequency include *Ribes rotundifolium, Rubus allegheniensis, Rhododendron prinophyllum, Corylus cornuta var. cornuta*, and *Prunus virginiana*. *Vaccinium pallidum* and *Vaccinium stamineum* are infrequent low shrubs, but sometimes comprise 10% or more of the herb layer. An uncommon variant of this community type, usually occupying sharply convex landforms with soils shallow to bedrock, contains a dense shrub layer composed largely of *Kalmia latifolia*. Herbaceous composition varies considerably and usually features patch-dominance by one or more of the following: *Dennstaedtia punctilobula, Carex pensylvanica, Lysimachia quadrifolia*, and *Deschampsia flexuosa*. *Calamagrostis porteri* is a patch-dominant grass in a very small percentage of stands. Other characteristic herbs of this community are *Ageratina altissima, Agrostis perennans, Amianthium muscitoxicum, Aralia nudicaulis, Asclepias exaltata, Dioscorea quaternata, Eurybia divaricata (= Aster divaricatus), Hieracium paniculatum, Maianthemum canadense, Pedicularis canadensis, Potentilla canadensis, Prenanthes altissima, Prenanthes trifoliolata, Smilax herbacea, Solidago arguta var. arguta*, and *Solidago curtisii*. Many additional herbs occur at low cover and constancy. Species richness of plot-sampled stands ranges from 13 to 62 taxa per 400 square meters (mean = 40).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Herb (field)	Graminoid	*Carex pensylvanica*, *Deschampsia flexuosa*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Herb (field)	Graminoid	*Carex pensylvanica*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer pensylvanicum*, *Betula lenta*, *Carex pensylvanica*, *Dennstaedtia punctilobula*, *Ilex montana*, *Kalmia latifolia*, *Lysimachia quadrifolia*, *Quercus alba*, *Quercus rubra*, *Rubus allegheniensis* var. *allegheniensis*, *Vaccinium pallidum*
Global: *Acer pensylvanicum*, *Amianthium muscitoxicum*, *Carex pensylvanica*, *Castanea dentata*, *Corylus cornuta*, *Dennstaedtia punctilobula*, *Deschampsia flexuosa*, *Hamamelis virginiana*, *Ilex montana*, *Kalmia latifolia*, *Lysimachia quadrifolia*, *Quercus alba*, *Quercus rubra*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Poa compressa* (High/Low), *Rumex acetosella* (Medium/Low), *Taraxacum officinale*
Global: Vulnerable Plants: *Aconitum reclinatum* (G3), *Gentiana austromontana* (G3), *Poa saltuensis* (G5, VA state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (24-Feb-2010). This type appears to be limited to a small geographic area of approximately 16 counties and approximately 20,000 square kilometers in northwestern Virginia and adjacent West Virginia. Within that region, it is restricted to the highest ridges, where habitats are patchy. If this type is found to be more widespread in West Virginia, Maryland, and/or Pennsylvania, a revision of the global rank may be warranted.

RELATED CONCEPTS

Global Similar Types:

- *Quercus rubra - Carya ovata - Fraxinus americana / Actaea racemosa - Hydrophyllum virginianum* Forest (CEGL008518) higher diversity, more fertile soils, and a significant component of *Carya*.
- *Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis)* Forest (CEGL007300) is the Southern Appalachian analogue, with a similar environmental setting and composition, but containing a component of distinctly Southern Appalachian species such as *Galax urceolata, Rhododendron calendulaceum, Vaccinium erythrocarpum, Vaccinium simulatum*.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Along the AT, this community is known only from higher elevation areas of the Northern Blue Ridge north of Roanoke, such as the Peaks of Otter and Apple Orchard Mountain / Thunder Ridge. It is very similar to Southern Appalachian High-Elevation Red Oak Forest (Deciduous Shrub Type) (CEGL007300) but lacks all of the Southern Appalachian species.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: The Salt Pond Mountain - Potts Mountain area above Mountain Lake (across the valley from Peters Mountain) in Virginia has typical Southern Appalachian High-Elevation Red Oak Forest (Deciduous Shrub Type) (CEGL007300). Shortly north of there, all of the characteristic Southern Appalachian plants such as *Vaccinium erythrocarpum* and *Rhododendron calendulaceum* drop out, and *Quercus rubra* stands further north in Virginia change to Central Appalachian Northern Red Oak Forest (CEGL008506).
Global Classification Comments: The most constant (≥60%) woody species in 53 samples classified as this association, in order of descending constancy, are *Quercus rubra, Acer pensylvanicum, Ilex montana, Prunus serotina var. serotina, Betula lenta, Quercus alba, Kalmia latifolia, Castanea dentata*, and *Hamamelis virginiana*. The most constant herbaceous species are *Dennstaedtia punctilobula, Lysimachia quadrifolia, Dioscorea quaternata, Carex pensylvanica, Prenanthes altissima*, and *Solidago curtisii*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is known from near Roanoke north to Shenandoah National Park in Virginia. Plots in the AT corridor exist from Shenandoah National Park's Hightop Mountain, Hogback Mountain, Marys Rock, Pollack Knob, and Thunder Hill.
Global Range: This type appears to be limited to a small geographic area of approximately 16 counties and approximately 20,000 square kilometers in northwestern Virginia and adjacent West Virginia. Within that region, it is restricted to the highest ridges, where habitats are patchy. If this type is found to be more widespread in West Virginia, Maryland, and/or Pennsylvania, a revision of the global rank may be warranted.
Nations: US
States/Provinces: VA:S3, WV
TNC Ecoregions: 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Shenandoah); USFS (George Washington, Jefferson, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCRO
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (7 plots; 31 accuracy assessment points): APPA.0202, APPA.0203, APPA.0204, APPA.0205, APPA.0206, APPA.0236, APPA.0341, APPA_AA_0083, APPA_AA_0130, APPA_AA_0136, APPA_AA_0226, APPA_AA_0263, APPA_AA_0281, APPA_AA_0317, APPA_AA_0352, APPA_AA_0426, APPA_AA_0439, APPA_AA_0480, APPA_AA_0493, APPA_AA_0495, APPA_AA_0502, APPA_AA_0518, APPA_AA_0523, APPA_AA_0613, APPA_AA_0655, APPA_AA_0678, APPA_AA_0773, APPA_AA_0818, APPA_AA_0952, APPA_AA_0957, APPA_AA_0979, APPA_AA_0983, APPA_AA_1061, APPA_AA_1123, APPA_AA_1288, APPA_AA_1424, APPA_AA_1449, APPA_AA_1495.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and K.D. Patterson

References: Eyre 1980, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Rawinski et al. 1996, VDNH 2003, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL007299] *Quercus rubra / (Kalmia latifolia, Rhododendron catawbiense, Rhododendron maximum) / Galax urceolata* Forest

Translated Name: **Northern Red Oak / (Mountain Laurel, Catawba Rosebay, Great Laurel) / Beetleweed Forest**

Common Name: **Southern Appalachian High-Elevation Red Oak Forest (Evergreen Shrub Type)**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus rubra* - *Quercus alba* Montane Forest Alliance (A3116)

Element Concept

Global Summary: This community occurs on most of the major mountain ranges of the Southern Appalachians at elevations of 1070-1646 m (3500-5400 feet) on ridges and mid to upper slopes, commonly with southern and southeastern exposures. Outliers occur in the southern part of the Central Appalachians, on the highest ridges of the Ridge and Valley and Blue Ridge in southwest Virginia. This montane community includes forest vegetation with *Quercus rubra* making up at least 75% of the tree canopy and with greater than 20% shrub cover, which may be continuous to patchy. More than 50% of the total shrub cover is evergreen, although deciduous shrubs may be present. Typical shrub dominants include *Kalmia latifolia, Rhododendron catawbiense*, and *Rhododendron maximum*. The herbaceous stratum is not diverse and is typically very sparse with scattered forbs and woody seedlings, including *Galax urceolata, Solidago curtisii (= Solidago caesia var. curtisii), Epigaea repens, Dennstaedtia punctilobula, Conopholis americana, Thelypteris noveboracensis, Clintonia umbellulata, Eurybia divaricata (= Aster divaricatus)*, and *Dioscorea villosa*. On exposed sites this community commonly contains acidic rock outcrop communities and montane shrublands as inclusions, and may grade into forests dominated by *Tsuga caroliniana, Pinus rigida, Pinus pungens*, and *Quercus prinus*. At higher elevations, this forest often occurs adjacent to, or grades into, forests dominated by *Picea rubens, Abies fraseri*, or northern hardwood species (*Aesculus flava, Betula alleghaniensis, Fagus grandifolia,*).

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This high-elevation Southern Appalachian northern red oak forest occurs from 1,070-1,525 m (3,500-5,000 feet) elevation on broad ridges and mid to upper slopes with variable exposures. Outliers occur in the southern part of the Central Appalachians, on the highest ridges of the Ridge and Valley and Blue Ridge in southwest Virginia.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This high-elevation red oak forest occurs higher than 1,065 m (3,500 feet) in the Southern Blue Ridge and occurs on upper gentle to steep slopes, ridges and summits. Soils are moderately well- to well-drained silt loam and loam. The unvegetated surface is dominated by leaf litter with some rocks and downed wood. Evidence of disturbance includes wind/ice damage, and the presence of exotic plant species.

Global Environment: This community occurs on most of the major mountain ranges of the Southern Appalachians at elevations of 1070-1646 m (3500-5400 feet) on ridges and mid- to upper-slope positions, commonly with south and southeast exposures. Outliers occur in the southern part of the Central Appalachians, on the highest ridges of the Ridge and Valley and Blue Ridge in southwest Virginia. DeLapp (1978) found that this community type occurs on most slope aspects but was most commonly found on southeast and south exposures. Of the 13 plot samples from the Appalachian Trail classification project, 60% were on crests and interfluves; the remaining samples had variable slope exposures (Fleming and Patterson 2009a). This community occurs over well-drained soils underlain by Precambrian gneisses, schists and granites. These soils are classified as Typic, Umbric, or Lithic Dystrochrepts, and Typic Haplumbrepts (Golden 1974). Soils supporting this forest with a mainly evergreen shrub understory are slightly more acidic than *Quercus rubra*-dominated forests with deciduous shrub understories (DeLapp 1978).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus rubra* dominates the tree canopy with greater than 75% cover, and *Acer rubrum* dominates the subcanopy. The shrub layer, which may be continuous to patchy, is dominated by evergreen shrubs including *Kalmia latifolia, Rhododendron catawbiense*, and *Rhododendron maximum*. The herb layer is sparse, but *Galax urceolata* is usually present.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is largely dominated by *Quercus rubra* (usually greater than 75%); additional common and/or abundant trees may include *Acer rubrum, Nyssa sylvatica, Prunus serotina, Quercus alba*, and *Tsuga canadensis*. The dense shrub layer is dominated by ericaceous species *Kalmia latifolia, Rhododendron calendulaceum, Rhododendron maximum*, and *Vaccinium corymbosum*. The herb layer is generally sparse, but *Galax urceolata* is ubiquitous. In addition, this community supports NC-state imperiled *Lonicera canadensis*, GA-state critically imperiled *Sibbaldiopsis tridentata* and *Sorbus americana*, and GA-state-imperiled *Prunus pensylvanica*.
Global Vegetation: Stands of this montane community of the Southern Appalachians are dominated by *Quercus rubra* which makes up at least 75% of the tree canopy. Stands typically have greater than 20% shrub cover, which may be continuous to patchy. More than 50% of the total shrub cover is evergreen, although deciduous shrubs may be present. Typical shrub dominants include *Kalmia latifolia, Rhododendron catawbiense*, and *Rhododendron maximum*. The herbaceous stratum is not diverse and is typically very sparse with scattered forbs and woody seedlings, including *Galax urceolata, Solidago curtisii (= Solidago caesia var. curtisii), Epigaea repens, Dennstaedtia punctilobula, Conopholis americana, Thelypteris noveboracensis, Clintonia umbellulata, Eurybia divaricata (= Aster divaricatus)*, and *Dioscorea villosa*. Many species in this community are endemic to the Southern Blue Ridge or have the bulk of their worldwide range in that region. Some of these endemic species include *Abies fraseri, Aesculus flava, Ageratina altissima var. roanensis, Euphorbia purpurea, Leucothoe recurva, Prenanthes roanensis, Rhododendron catawbiense, Rhododendron vaseyi, Silene ovata*, and *Solidago curtisii*.
Global Dynamics: The canopy is probably rarely removed completely by natural disturbance; however, small canopy gaps are caused by individual tree death. Occurrences of this community on exposed slopes and south- and west-facing ridges are subject to lightning-caused fires and damage by ice and wind. Damage by icestorms is probably the most common form of natural disturbance. *Quercus rubra* reproduction and survival are optimal in canopy gaps with little regeneration under the forest canopy, hence these forests will eventually succeed to forests with mixed canopy composition of *Quercus rubra, Betula alleghaniensis, Acer rubrum*, and *Fagus grandifolia*. Many *Quercus rubra*-dominated stands of today were, prior to the chestnut blight in the 1930s, dominated or codominated by *Castanea dentata* with scattered *Quercus rubra* and *Acer rubrum* in the canopy (Golden 1974). The fungus *Endothia parasitica* eliminated *Castanea dentata* in the upper canopy, subsequently releasing the subcanopy *Quercus rubra*, which eventually resulted in a nearly pure upper canopy of large *Quercus rubra*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*, *Rhododendron catawbiense*
Herb (field)	Flowering forb	*Galax urceolata*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*
Herb (field)	Flowering forb	*Galax urceolata*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Hamamelis virginiana*
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron catawbiense*, *Rhododendron maximum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Herb (field)	Flowering forb	*Galax urceolata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Galax urceolata*, *Hamamelis virginiana*, *Ilex montana*, *Kalmia latifolia*, *Quercus rubra*, *Rhododendron catawbiense*, *Rhododendron maximum*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer rubrum*, *Galax urceolata*, *Kalmia latifolia*, *Quercus rubra*, *Rhododendron catawbiense*, *Rhododendron maximum*
Global: *Acer rubrum*, *Galax urceolata*, *Hamamelis virginiana*, *Ilex montana*, *Kalmia latifolia*, *Quercus rubra*, *Rhododendron catawbiense*, *Rhododendron maximum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Lonicera canadensis* (G5, NC state-imperiled), *Prunus pensylvanica* (G5, GA state-imperiled), *Sibbaldiopsis tridentata* (G5, GA state-critically imperiled), *Sorbus americana* (G5, GA state-critically imperiled); **Invasive/Exotic Plants**: *Rumex acetosella* (Medium/Low, invasive/exotic)
Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Calystegia catesbeiana* (G3), *Carex roanensis* (G2G3, Southern Blue Ridge endemic), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Hypericum buckleii* (G3), *Krigia montana* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Silene ovata* (G3, Southern Blue Ridge endemic), *Tsuga caroliniana* (G3), *Vaccinium hirsutum* (G3); **Other Plants**: *Aesculus flava* (G5, Southern Blue Ridge endemic), *Botrychium lanceolatum* var. *angustisegmentum* (G5T4), *Calamagrostis porteri* (G4), *Clematis occidentalis* (G5), *Clethra acuminata* (G4, Southern Blue Ridge endemic), *Helianthemum bicknellii* (G5), *Helianthemum propinquum* (G4), *Leucothoe recurva* (G4G5, Southern Blue Ridge endemic), *Lonicera dioica* (G5), *Prunus virginiana* (G5), *Pyrola americana* (G5), *Rhododendron prinophyllum* (G5), *Solidago curtisii* (G4G5, Southern Blue Ridge endemic), *Streptopus lanceolatus var. roseus* (G5T4), *Vaccinium erythrocarpum* (G5, Southern Blue Ridge endemic)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (4-Jan-2000). This community is uncommon but not rare. It is secure within its range.

RELATED CONCEPTS

Global Similar Types:
- *Quercus alba / Kalmia latifolia* Forest (CEGL007295)
- *Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest (CEGL006286)
- *Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis)* Forest (CEGL007300) has greater than 20% shrub cover but with more than 50% of the shrub cover composed of deciduous species.
- *Quercus rubra / Carex pensylvanica - Ageratina altissima var. roanensis* Forest (CEGL007298) has less than 20% shrub cover and a herb stratum dominated by ferns, tall forbs, and sedges.
- *Quercus rubra / Rhododendron catawbiense - Rhododendron arborescens* Woodland (CEGL004503) occurs at higher elevations, in more extreme environments, sometimes adjacent to CEGL007299.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Soils collected from plots of this group in the Southern Appalachians have extraordinarily low manganese values. Red oak forests with dense *Rhododendron catawbiense* shrub layers that occur in the Apple Orchard Mountain - Thunder Hill region of the Northern Blue Ridge in Virginia are placed here, even though considerably disjunct from the stands south of Virginia. However, this type has been poorly inventoried in southwest Virginia and likely occurs somewhere on the Southern Blue Ridge or higher ridges of the Ridge and Valley.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: No plots were sampled in the Central Appalachian project area; however, this community is known to occur there (G. Fleming pers. comm.).
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Soils collected from plots of this group have extraordinarily low Mn values. This type has been poorly inventoried in southwest Virginia and likely occurs somewhere on the Southern Blue Ridge or higher ridges of the Ridge and Valley.

Global Classification Comments: This community includes forest vegetation with *Quercus rubra* making up at least 75% of the tree canopy and with greater than 20% shrub cover. More than 50% of the total shrub cover is evergreen, although deciduous shrubs may be present. Typical evergreen shrub species in this community include *Kalmia latifolia, Rhododendron catawbiense*, and *Rhododendron maximum*. The most constant species (>60%) in 13 plots classified as this association from North Carolina, Tennessee and Virginia, in order of descending constancy, are *Quercus rubra, Kalmia latifolia, Rhododendron maximum, Acer rubrum, Ilex montana, Galax urceolata, Castanea dentata, Tsuga canadensis, Rhododendron calendulaceum*, and *Prunus serotina var. serotina* (Fleming and Patterson 2009a).

Two varieties of *Quercus rubra* occur within the range of this community, *Quercus rubra var. ambigua* and *Quercus rubra var. rubra* (Kartesz 1999). Although the two varieties are known to occur together (Rohrer 1983), *Quercus rubra var. ambigua* occurs mostly at elevations greater than 1000 m (3300 feet), while *Quercus rubra var. rubra* occurs at elevations less than 1000 m (3300 feet) (Weakley 1997). The two varieties are based upon morphological differences in the leaves and acorns (Fernald 1950, Coker and Totten 1945); however, studies of foliar flavonoid composition in different *Quercus rubra* populations suggest that varietal distinction may not be warranted (McDougal and Parks 1984). Even though most studies of *Quercus rubra*-dominated vegetation do not distinguish *Quercus rubra* at the varietal level, it is likely, given the elevation range of this community, that the dominant species in this forest is *Quercus rubra var. ambigua*.

Similar *Quercus rubra*-dominated forests occur in the southern Appalachian Mountains. Forests with less than 75% *Quercus rubra* in the canopy are classified in other forest alliances. In Georgia this type occurs on the north side of Rabun Bald, where it grades into *Quercus rubra / Rhododendron catawbiense - Rhododendron arborescens* Woodland (CEGL004503) in more extreme areas.

Element Distribution

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is common in the Southern Appalachians, with outliers occurring in the southern part of the Central Appalachians, on the highest ridges of the Ridge and Valley and Blue Ridge in southwestern Virginia.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: All occurrences along the AT are from the Great Smoky Mountains and south. This community was sampled in Georgia, including Chattahoochee National Forest, and in North Carolina on Nantahala National Forest at Albert Mountain, Big Spring Gap, Little Lodgepole Mountain, Standing Indian Mountain, Wayah Bald, Wine Spring Bald, and Yellow Mountain.
Global Range: This community occurs on most of the major mountain ranges of the Southern Appalachians in North Carolina, Tennessee, Georgia, and Virginia. This community could possibly range into South Carolina.
Nations: US
States/Provinces: GA, NC, SC?, TN, VA:S2?
TNC Ecoregions: 50:C, 51:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Nantahala, Pisgah)

Element Sources

Appalachian National Scenic Trail Map-Class Code: FROH
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: This community was observed in the Central Appalachian project area by UMESC mappers in the summer of 2011 and during accuracy assessment. Identification was confirmed by Gary Fleming from VDNH.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (6 accuracy assessment points): APPA_AA_0077, APPA_AA_0348, APPA_AA_0677, APPA_AA_1191, APPA_AA_1339, APPA_AA_1501.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (11 plots; 4 observation points; 8 accuracy assessment points): APPA.0021, APPA.0118, APPA.0119, APPA.0120, APPA.0122, APPA.0123, APPA.0124, APPA.0143, APPA.0150, APPA.0154, APPA.0157, APPA.0537, APPA.1068, APPA.1104, APPA.1132, APPA_AA_0043, APPA_AA_0081, APPA_AA_0239, APPA_AA_0454, APPA_AA_0743, APPA_AA_0875, APPA_AA_1333, APPA_AA_1459.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson

References: Allard 1990, Ambrose 1990a, CAP pers. comm. 1998, Coker and Totten 1945, DeLapp 1978, Eyre 1980, Fernald 1950, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming pers. comm., Golden 1974, Kartesz 1999, McDougal and Parks 1984, McNab and Browning 1993, NatureServe Ecology - Southeastern U.S. unpubl. data, Patterson 1994, Peet et al. unpubl. data, Pittillo and Smathers 1979, Pyne 1994, Rawinski 1992, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, Stephenson and Adams 1989, TDNH unpubl. data, USFS 1988, Weakley 1997, Whigham 1969, Whittaker 1956

[CEGL007300] *Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis)* Forest

Translated Name: **Northern Red Oak / (Upland Highbush Blueberry, Flame Azalea) / (Eastern Hay-scented Fern, New York Fern) Forest**

Common Name: **Southern Appalachian High-Elevation Red Oak Forest (Deciduous Shrub Type)**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus rubra* - *Quercus alba* Montane Forest Alliance (A3116)

Element Concept

Global Summary: This community includes forest vegetation with *Quercus rubra* making up at least 75% of the tree canopy and with greater than 20% shrub cover, which may be continuous to patchy. More than 50% of the total shrub cover is deciduous, although evergreen shrubs may be present. Typical shrub dominants include *Rhododendron calendulaceum, Vaccinium simulatum, Vaccinium erythrocarpum, Ilex montana, Gaylussacia ursina, Rubus canadensis, Corylus cornuta*, and *Lyonia ligustrina*. The herbaceous stratum is diverse and is predominantly a mix of sedges, ferns, and tall herbs, including *Ageratina altissima var. roanensis, Athyrium filix-femina ssp. asplenioides, Clintonia umbellulata, Collinsonia canadensis, Conopholis americana, Dennstaedtia punctilobula, Dioscorea villosa, Eurybia divaricata (= Aster divaricatus), Laportea canadensis, Lysimachia quadrifolia, Medeola virginiana, Monarda fistulosa, Oclemena acuminata (= Aster acuminatus), Potentilla canadensis, Prenanthes roanensis, Silene stellata, Solidago curtisii (= Solidago caesia var. curtisii),* and *Thelypteris noveboracensis*. Herbaceous dominance varies within and between occurrences. This community occurs on most of the major mountain ranges of the Southern Appalachians at elevations of 1070-1525 m (3500-5000 feet) on broad ridges and mid to upper slope positions, commonly with southeastern and southern exposures. At higher elevations this forest often occurs adjacent to or grades into forests dominated by *Picea rubens, Abies fraseri*, or northern hardwood species such as *Aesculus flava, Betula alleghaniensis,* and *Fagus grandifolia*. In some areas, this community is found adjacent to montane shrublands and grasslands. At low elevations, on dry sites, this community may grade into forests dominated by a mixture of *Quercus* species.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This high-elevation northern red oak community occurs from 1,070-1,525 m (3,500-5,000 feet) elevation on broad ridges and mid to upper slopes with mostly northern and western aspects but any are possible. Soils are mesic to dry-mesic, moderately well- to well-drained loam, sandy loam, clay loam, and silt loam. The unvegetated surface is dominated by leaf litter with some downed wood and occasional (sometimes significant) large rocks. Evidence of disturbance includes past logging and chestnut blight damage.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This high-elevation red oak community is found at elevations above 1,065 m (3,500 feet). It occurs on upper slopes, ridges and summits with primarily northern and western aspects. Soils are mesic to dry-mesic, moderately well- to well-drained loam, sandy loam, clay loam, and silt loam. The unvegetated surface is dominated by leaf litter with some downed wood and occasional (sometimes significant) large rocks. Evidence of disturbance includes past logging and chestnut blight damage.

Global Environment: This community occurs at elevations of 1070-1525 m (3500-5000 feet) on broad ridges and mid- to upper-slope positions. DeLapp (1978) found that this community occurs on most slope aspects but was most commonly found on southeast and south exposures. Of the 43 plot samples from the Appalachian Trail classification project, about half are on crests and interfluves; the remaining samples have variable slope exposures (Fleming and

Patterson 2009a). This community occurs over well-drained soils underlain by Precambrian gneisses, schists and granites. These soils are classified as Typic, Umbric, or Lithic Dystrochrepts, and Typic Haplumbrepts (Golden 1974). Soils supporting this forest with a mainly deciduous shrub understory are slightly less acidic than *Quercus rubra*-dominated forests with evergreen shrub understories (DeLapp 1978).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is largely dominated by *Quercus rubra* (usually greater than 75% but as low as 50%), lacks *Carya* species, but sometimes has substantial amounts of *Quercus prinus*. Additional common tree species include *Acer pensylvanicum, Acer rubrum, Betula lenta, Magnolia acuminata*, and *Quercus alba*. The shrub layer is mainly deciduous (although evergreen species may be present) and includes *Amelanchier laevis, Castanea dentata, Ilex montana, Rhododendron calendulaceum, Vaccinium erythrocarpum*, and *Vaccinium simulatum*. The herb layer is generally sparse but diverse; *Clintonia umbellulata, Conopholis americana, Dennstaedtia punctilobula, Dioscorea quaternata, Medeola virginiana, Prenanthes altissima, Solidago curtisii, Thelypteris noveboracensis*, and *Uvularia puberula* are common.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is largely dominated by *Quercus rubra* (usually greater than 75% but as low as 50%), and lacks *Carya* species, but sometimes has substantial amounts of *Quercus prinus*. Additional common tree species include *Acer pensylvanicum, Acer rubrum, Betula lenta, Magnolia acuminata*, and *Quercus alba*. The shrub layer is mainly deciduous (although evergreen species may be present) and includes *Amelanchier laevis, Castanea dentata, Ilex montana, Rhododendron calendulaceum, Vaccinium erythrocarpum*, and *Vaccinium simulatum*. The herb layer is generally sparse but diverse; *Clintonia umbellulata, Conopholis americana, Dennstaedtia punctilobula, Dioscorea quaternata, Medeola virginiana, Prenanthes altissima, Solidago curtisii, Thelypteris noveboracensis*, and *Uvularia puberula* are common. This community also supports TN-state imperiled *Stachys clingmanii* (also considered globally imperiled), *Dichanthelium latifolium, Polygonatum biflorum var. commutatum*, and *Stenanthium gramineum var. micranthum*.

Global Vegetation: This forest is dominated by *Quercus rubra* with other species making up less than 25% of the canopy cover. Other canopy and subcanopy trees may include *Acer pensylvanicum, Acer rubrum, Amelanchier laevis, Betula alleghaniensis, Betula lenta, Castanea dentata* (root sprouts), *Fagus grandifolia, Halesia tetraptera, Hamamelis virginiana, Ilex montana, Magnolia acuminata*, and, on more exposed sites, *Quercus prinus*. At higher elevations, this community may contain *Picea rubens*. The shrub layer may be continuous to patchy but has at least 20% cover and more than 50% of the total shrub cover is deciduous, although evergreen shrubs may be present. Typical shrub dominants include *Rhododendron calendulaceum, Vaccinium simulatum, Vaccinium erythrocarpum, Hamamelis virginiana, Ilex montana, Gaylussacia ursina, Rubus canadensis, Corylus cornuta*, and *Lyonia ligustrina*. In Virginia examples, *Vaccinium erythrocarpum* often occurs as a very low, clonal shrub, only a few inches tall. Other shrubs occur with lower frequency and may include *Kalmia latifolia, Rhododendron catawbiense*, and *Rhododendron maximum*. *Rubus allegheniensis* occurs in disturbed openings and in seeps. The herbaceous stratum is diverse and is predominantly a mix of sedges, ferns and tall herbs. Herbaceous dominance varies within and among occurrences. Typical herbaceous species include *Ageratina altissima var. roanensis, Athyrium filix-femina ssp. asplenioides, Clintonia umbellulata, Collinsonia canadensis, Conopholis americana, Dennstaedtia punctilobula, Dichanthelium latifolium, Dioscorea quaternata, Eurybia divaricata (= Aster divaricatus), Houstonia purpurea, Laportea canadensis, Lysimachia quadrifolia, Medeola virginiana, Monarda fistulosa, Oclemena acuminata (= Aster acuminatus), Potentilla canadensis, Prenanthes roanensis, Smilax herbacea, Silene stellata, Solidago curtisii (= Solidago caesia var. curtisii)*, and *Thelypteris noveboracensis*. Many species in this community are endemic to the Southern Blue Ridge or have the bulk of their worldwide range in that region. Some of these endemics include *Abies fraseri, Aesculus flava, Ageratina altissima var. roanensis, Carex roanensis, Clethra acuminata, Euphorbia purpurea, Leucothoe recurva, Prenanthes roanensis, Rhododendron catawbiense, Rhododendron vaseyi, Silene ovata, Solidago curtisii*, and *Vaccinium erythrocarpum*.

Global Dynamics: The canopy is probably rarely removed completely by natural disturbance however, small canopy gaps are caused by individual tree death. Occurrences of this community on exposed slopes and south- and west-facing ridges are subject to lightning-caused fires and damage by ice and wind. Damage by icestorms is probably the most common form of natural disturbance.

Quercus rubra reproduction and survival are optimal in canopy gaps with little regeneration under the forest canopy, hence these forests will eventually succeed to forests with mixed canopy composition of *Quercus rubra, Betula alleghaniensis, Acer rubrum*, and *Fagus grandifolia*. Many *Quercus rubra*-dominated stands of today were, prior to the chestnut blight in the 1930s, dominated or codominated by *Castanea dentata* with scattered *Quercus rubra* and *Acer rubrum* in the canopy (Golden 1974). The fungus *Endothia parasitica* eliminated *Castanea dentata*

in the upper canopy, subsequently releasing the subcanopy *Quercus rubra*, which eventually resulted in a nearly pure upper canopy of large *Quercus rubra*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Ilex montana*
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer pensylvanicum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Rhododendron calendulaceum*, *Vaccinium simulatum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium erythrocarpum*, *Vaccinium pallidum*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium erythrocarpum*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris noveboracensis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Hamamelis virginiana*, *Ilex montana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Rhododendron calendulaceum*, *Vaccinium simulatum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus canadensis*, *Vaccinium erythrocarpum*, *Vaccinium pallidum*
Herb (field)	Flowering forb	*Ageratina altissima* var. *roanensis*
Herb (field)	Graminoid	*Carex pensylvanica*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer pensylvanicum*, *Acer rubrum*, *Dennstaedtia punctilobula*, *Ilex montana*, *Medeola virginiana*, *Quercus rubra*, *Rhododendron calendulaceum*, *Thelypteris noveboracensis*, *Vaccinium erythrocarpum*, *Vaccinium pallidum*, *Vaccinium simulatum*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer pensylvanicum*, *Castanea dentata*, *Clintonia umbellulata*, *Medeola virginiana*, *Quercus rubra*, *Rhododendron calendulaceum*, *Thelypteris noveboracensis*, *Vaccinium erythrocarpum*, *Vaccinium simulatum*
Global: *Acer rubrum*, *Ageratina altissima* var. *roanensis*, *Carex pensylvanica*, *Dennstaedtia punctilobula*, *Hamamelis virginiana*, *Ilex montana*, *Quercus rubra*, *Rhododendron calendulaceum*, *Rubus canadensis*, *Thelypteris noveboracensis*, *Vaccinium erythrocarpum*, *Vaccinium pallidum*, *Vaccinium simulatum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Castanea dentata* (G4, TN state-imperiled), *Dichanthelium latifolium* (G5, NC state-imperiled), *Polygonatum biflorum* var. *commutatum* (G5T5, TN state-imperiled), *Stachys clingmanii* (G2, globally imperiled & TN-state critically imperiled), *Stenanthium gramineum* var. *micranthum* (G4G5TNR, NC state-imperiled)
Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Calystegia catesbeiana* (G3), *Carex roanensis* (G2G3, Southern Blue Ridge endemic), *Chelone cuthbertii* (G3, Southern Blue Ridge endemic), *Coreopsis latifolia* (G3), *Delphinium exaltatum* (G3), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Gentiana austromontana* (G3), *Helianthus glaucophyllus* (G3G4), *Hypericum mitchellianum* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Robinia viscosa* var. *hartwegii* (G3T2), *Silene ovata* (G3, Southern Blue Ridge endemic), *Stachys clingmanii* (G2), *Trillium simile* (G3), *Vaccinium*

hirsutum (G3); **Other Plants**: *Aesculus flava* (G5, Southern Blue Ridge endemic), *Botrychium lanceolatum* var. *angustisegmentum* (G5T4), *Calamagrostis porteri* (G4), *Clematis occidentalis* (G5), *Clethra acuminata* (G4, Southern Blue Ridge endemic), *Helianthemum bicknellii* (G5), *Helianthemum propinquum* (G4), *Leucothoe recurva* (G4G5, Southern Blue Ridge endemic), *Lonicera dioica* (G5), *Prunus virginiana* (G5), *Pyrola americana* (G5), *Rhododendron catawbiense* (G5, Southern Blue Ridge endemic), *Rhododendron prinophyllum* (G5), *Solidago curtisii* (G4G5, Southern Blue Ridge endemic), *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (31-Dec-1997). This community is uncommon but not rare. It is secure within its range.

RELATED CONCEPTS

Global Similar Types:

- *Quercus alba / Kalmia latifolia* Forest (CEGL007295)
- *Quercus rubra - (Quercus alba) / Ilex montana / Dennstaedtia punctilobula - Lysimachia quadrifolia* Forest (CEGL008506) is a Central Appalachian high-elevation red oak forest.
- *Quercus rubra - Acer rubrum / Pyrularia pubera / Thelypteris noveboracensis* Forest (CEGL006192)
- *Quercus rubra / (Kalmia latifolia, Rhododendron catawbiense, Rhododendron maximum) / Galax urceolata* Forest (CEGL007299) has greater than 20% shrub cover but with more than 50% of the shrub cover composed of evergreen species.
- *Quercus rubra / Carex pensylvanica - Ageratina altissima var. roanensis* Forest (CEGL007298) has less than 20% shrub cover and an herb stratum dominated by ferns, tall forbs, and sedges.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: These are high-elevation red oak forests with a deciduous shrub layer and abundant fern cover. Virginia examples in the southern part of the mapping area are compositionally similar to those further south, but often have relatively high cover of very low, clonal *Vaccinium erythrocarpum*, a few inches tall. Whether this is due to excessive deer browse or some other factor is hard to assess.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: The Salt Pond Mountain - Potts Mountain area above Mountain Lake (across the valley from Peters Mountain) in Virginia has typical Southern Appalachian High-Elevation Red Oak Forest (Deciduous Shrub Type) (CEGL007300). Shortly north of there, all of the characteristic Southern Appalachian plants such as *Vaccinium erythrocarpum* and *Rhododendron calendulaceum* drop out, and *Quercus rubra* stands further north in Virginia become Central Appalachian Northern Red Oak Forest (CEGL008506).
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: High-elevation red oak forests with a deciduous shrub layer and abundant fern cover. Virginia examples in the northern part of the study area are compositionally similar to those further south, but often have relatively high cover of very low, clonal *Vaccinium erythrocarpum* a few inches tall. Whether this is due to excessive deer browse or some other factor is very hard to assess.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: This community has less diverse canopies than cove forests.
Global Classification Comments: This community includes forest vegetation with *Quercus rubra* making up at least 75% of the tree canopy and with greater than 20% shrub cover. More than 50% of the total shrub cover is deciduous, although evergreen shrubs may be present. Typical deciduous shrub species in this community include *Rhododendron calendulaceum, Vaccinium simulatum, Vaccinium erythrocarpum, Ilex montana, Gaylussacia ursina, Rubus canadensis, Corylus cornuta*, and *Lyonia ligustrina*. The most constant species (≥70%) in 43 plot samples classified as this association from North Carolina, Tennessee, and Virginia, in descending order of constancy, are *Quercus rubra, Acer rubrum, Castanea dentata, Acer pensylvanicum, Rhododendron calendulaceum, Thelypteris noveboracensis, Dioscorea quaternata, Medeola virginiana, Ilex montana*, and *Dennstaedtia punctilobula* (Fleming and Patterson 2009a).

Two varieties of *Quercus rubra* occur within the range of this community, *Quercus rubra var. ambigua* and *Quercus rubra var. rubra* (Kartesz 1999). Although the two varieties are known to occur together (Rohrer 1983), *Quercus rubra var. ambigua* occurs mostly at elevations greater than 1000 m (3300 feet), while *Quercus rubra var. rubra* occurs at elevations less than 1000 m (3300 feet) (Weakley 1997). The two varieties are based upon

morphological differences in the leaves and acorns (Fernald 1950, Coker and Totten 1945); however, studies of foliar flavonoid composition in different *Quercus rubra* populations suggest that varietal distinction may not be warranted (McDougal and Parks 1984). Even though most studies of *Quercus rubra*-dominated vegetation do not distinguish *Quercus rubra* at the varietal level, it is likely, given the elevational range of this community, that the dominant species in this forest is *Quercus rubra var. ambigua*.

Similar vegetation may occur in the Cumberland Mountains (Black Mountain, Cumberland Mountain, Kentucky); for more information, see Braun (1950) and Black Mountain paper (Braun 1940). Kentucky occurrences lack *Gaylussacia ursina, Corylus cornuta, Prenanthes roanensis*, and occur at 1067 to 1160 m (3500-3800 feet) elevation (M. Evans pers. comm.).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from the Southern Blue Ridge north into southwestern Virginia. The northernmost known stand on the AT is on Kelly Knob in Craig County, Virginia, west of Roanoke. It is abundant on Salt Pond Mountain and Potts Mountain above Mountain Lake in Giles County. It was sampled in Virginia at Angels Rest, Garden Mountain, Glade Mountain, Kelly Knob, Locust Mountain, Lone Pine Peak, Pearis Mountain West, Pine Swamp Branch, and Potts Mountain.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Locally common along the AT in most high-elevation parts of the Southern Blue Ridge, this community was sampled at 32 locations in the park in North Carolina, Tennessee and Virginia. Sites include, in North Carolina, Great Smoky Mountains National Park (Doe Knob, Greer Knob), Nantahala National Forest (Little Lodgepole Mountain, Standing Indian Mountain, Wayah Bald, Wine Spring Bald, and Yellow Mountain); in Tennessee, Great Smoky Mountains National Park; and in Virginia at Bobby's Ridge and Hurricane Mountain.
Global Range: This community occurs on most of the major mountain ranges of the Southern Appalachians in North Carolina, Tennessee, Georgia, and Virginia. It may possibly range into Kentucky's Cumberland Mountains and into West Virginia.
Nations: US
States/Provinces: GA, KY?, NC, TN, VA:S3, WV
TNC Ecoregions: 50:C, 51:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FROH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (11 plots; 1 observation point; 16 accuracy assessment points): APPA.0055, APPA.0080, APPA.0461, APPA.0478, APPA.0479, APPA.0489, APPA.0491, APPA.0495, APPA.0496, APPA.0498, APPA.1023, APPA.1156, APPA_AA_0092, APPA_AA_0106, APPA_AA_0120, APPA_AA_0182, APPA_AA_0328, APPA_AA_0615, APPA_AA_0619, APPA_AA_0645, APPA_AA_0761, APPA_AA_0852, APPA_AA_0862, APPA_AA_1006, APPA_AA_1016, APPA_AA_1091, APPA_AA_1351, APPA_AA_1480.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (16 plots; 4 observation points; 14 accuracy assessment points): APPA.0056, APPA.0117, APPA.0121, APPA.0138, APPA.0140, APPA.0142, APPA.0145, APPA.0153, APPA.0156, APPA.0160, APPA.0173, APPA.0181, APPA.0258, APPA.0299, APPA.1011, APPA.1013, APPA.1069, APPA.1074, APPA.1117, APPA.1130, APPA_AA_0004, APPA_AA_0023, APPA_AA_0051, APPA_AA_0071, APPA_AA_0194, APPA_AA_0366, APPA_AA_0478, APPA_AA_0552, APPA_AA_0643, APPA_AA_0710, APPA_AA_0859, APPA_AA_0985, APPA_AA_1078, APPA_AA_1111.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson
References: Allard 1990, Ambrose 1990a, Braun 1940, Braun 1950, CAP pers. comm. 1998, Coker and Totten 1945, DeLapp 1978, Evans 1991, Evans et al. 2009, Evans, M. pers. comm., Eyre 1980, Fernald 1950, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Golden 1974, Kartesz 1999, McDougal and Parks 1984, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Pyne 1994, Rawinski 1992, Rohrer 1983, Schafale 1998b,

Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, Stephenson and Adams 1989, TDNH unpubl. data, USFS 1988, Weakley 1997, Whigham 1969, Whittaker 1956

[CEGL007298] *Quercus rubra / Carex pensylvanica - Ageratina altissima var. roanensis* Forest

Translated Name: **Northern Red Oak / Pennsylvania Sedge - Appalachian White Snakeroot Forest**
Common Name: **High-Elevation Red Oak Forest (Tall Herb Type)**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus rubra* - *Quercus alba* Montane Forest Alliance (A3116)

Element Concept

Global Summary: This community occurs on most of the major mountain ranges of the Southern Appalachians in North Carolina and Tennessee, at elevations over 1400 m (4500 feet) on broad ridges, and on steep rocky slopes at the heads of coves, often with northern or southeastern aspects. It includes forest vegetation with a closed to very open canopy, where *Quercus rubra* makes up at least 75% of the tree canopy and with less than 20% shrub cover. Canopy trees may be gnarled and stunted, especially on ridge crests. Other canopy species may include *Acer rubrum, Crataegus punctata, Crataegus flabellata, Betula alleghaniensis, Betula lenta*, and, at high elevations, *Picea rubens*. An open subcanopy contains canopy species plus *Hamamelis virginiana, Amelanchier arborea, Acer pensylvanicum, Halesia tetraptera*, and *Ilex montana*. Herbaceous cover is dense and diverse, composed of sedges, ferns, and tall herbs, with dominance varying within and between occurrences. Typical herbaceous dominants include *Carex pensylvanica, Ageratina altissima var. roanensis, Thelypteris noveboracensis, Dennstaedtia punctilobula, Eurybia chlorolepis (= Aster chlorolepis), Oclemena acuminata (= Aster acuminatus)*, and *Laportea canadensis*. This forest often occurs adjacent to or grades into forests dominated by *Picea rubens, Abies fraseri*, or northern hardwood species (*Betula alleghaniensis, Fagus grandifolia, Aesculus flava)*. In some areas, this community is found adjacent to montane shrublands and grasslands. This community is often referred to as a "Subalpine Oak Orchard Forest."

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This high-elevation northern red oak forest occurs above 1,065 m (3,500 feet) in North Carolina and 945 m (3,100 feet) in Virginia. It is found on moderate to steep upper slopes, ridges and summits with mostly western aspects. Soils are mesic to dry-mesic, moderately well- to well-drained loam and silt loam. The unvegetated surface is dominated by leaf litter with some downed wood and occasional large/small rocks. Evidence of disturbance includes past logging and hemlock woolly adelgid damage. Stands can be stunted, reduced in height by harsh weather.
Global Environment: This community occurs at elevations over 1400 m (4500 feet) on broad ridges and on steep rocky slopes at the heads of coves, often with north or southeast aspects. Occurrences of this community on exposed slopes and south- and west-facing ridges are subject to lightning-caused fires and damage by ice and wind. Damage by ice storms is probably the most common form of natural disturbance. This community occurs over well-drained, loamy soils underlain by Precambrian gneisses, schists, and granites. These soils are classified as Typic, Umbric, or Lithic Dystrochrepts, and Typic Haplumbrepts (Golden 1974). Soils supporting this community tend to have relatively high base status.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is largely dominated by *Quercus rubra* (usually greater than 75%) and lacks *Carya* species. Additional common and/or abundant trees may include *Acer rubrum, Acer saccharum, Betula alleghaniensis, Fraxinus americana*, and *Prunus serotina*. Shrubs are generally sparse and insignificant. Herbs include *Carex pensylvanica, Danthonia compressa, Dennstaedtia punctilobula, Eupatorium purpureum, Eurybia chlorolepis, Laportea canadensis, Lysimachia quadrifolia, Oclemena acuminata, Solidago curtisii*, and *Thelypteris noveboracensis*. In addition, this community supports TN-state critically imperiled *Angelica atropurpurea* and TN-state imperiled *Ageratina altissima var. roanensis* and *Eupatorium steelei*.
Global Vegetation: This community includes forest vegetation, with a closed to very open canopy, where *Quercus rubra* makes up at least 75% of the tree canopy and with less than 20% shrub cover. Canopy trees may be gnarled and stunted, especially on ridge crests. Other canopy species may include *Acer rubrum, Crataegus punctata,*

Crataegus flabellata, Betula alleghaniensis, Betula lenta, and, at high elevations, *Picea rubens*. An open subcanopy contains canopy species plus *Hamamelis virginiana, Amelanchier arborea, Acer pensylvanicum, Halesia tetraptera*, and *Ilex montana*. Herbaceous cover is dense and diverse, composed of sedges, ferns, and tall herbs, with dominance varying within and among occurrences. Typical herbaceous dominants include *Carex pensylvanica, Ageratina altissima var. roanensis, Thelypteris noveboracensis, Dennstaedtia punctilobula, Eurybia chlorolepis (= Aster chlorolepis), Oclemena acuminata (= Aster acuminatus)*, and *Laportea canadensis*. Many species in this community are endemic to the Southern Blue Ridge or have the bulk of their worldwide range in that region. Some of these endemics include *Abies fraseri, Aesculus flava, Ageratina altissima var. roanensis, Carex roanensis, Clethra acuminata, Euphorbia purpurea, Leucothoe recurva, Prenanthes roanensis, Rhododendron catawbiense, Rhododendron vaseyi, Silene ovata, Solidago curtisii (= Solidago lancifolia)*, and *Vaccinium erythrocarpum*.
Global Dynamics: The canopy is probably rarely removed completely by natural disturbance; however, small canopy gaps are caused by individual tree death. Occurrences of this community on exposed slopes and south- and west-facing ridges are subject to lightning-caused fires and damage by ice and wind. Damage by ice storms is probably the most common form of natural disturbance.

Quercus rubra reproduction and survival is optimal in canopy gaps with little regeneration under the forest canopy, hence these forests will eventually succeed to forests with mixed canopy composition of *Quercus rubra, Betula alleghaniensis, Acer rubrum*, and *Fagus grandifolia*. Many *Quercus rubra*-dominated stands of today were, prior to the chestnut blight in the 1930s, dominated or codominated by *Castanea dentata* with scattered *Quercus rubra* and *Acer rubrum* in the canopy (Golden 1974). The fungus *Endothia parasitica* eliminated *Castanea dentata* in the upper canopy, subsequently releasing the subcanopy *Quercus rubra*, which eventually resulted in a nearly pure upper canopy of large *Quercus rubra*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Prunus serotina*, *Quercus rubra*
Herb (field)	Flowering forb	*Ageratina altissima* var. *roanensis*, *Solidago curtisii*
Herb (field)	Graminoid	*Carex pensylvanica*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris noveboracensis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Herb (field)	Flowering forb	*Ageratina altissima* var. *roanensis*
Herb (field)	Graminoid	*Carex pensylvanica*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Prunus serotina*, *Quercus rubra*, *Solidago curtisii*, *Thelypteris noveboracensis*
Global: *Ageratina altissima* var. *roanensis*, *Carex pensylvanica*, *Dennstaedtia punctilobula*, *Quercus rubra*, *Thelypteris noveboracensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4, TN state-imperiled), *Angelica atropurpurea* (G5, TN state-critically imperiled), *Eupatorium steelei* (G4, NC state-imperiled); **Invasive/Exotic Plants**: *Convallaria majalis*
Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Calystegia catesbeiana* (G3), *Carex roanensis* (G2G3, Southern Blue Ridge endemic), *Coreopsis latifolia* (G3), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Gentiana austromontana* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Silene ovata* (G3, Southern Blue Ridge endemic); **Other Plants**: *Aesculus flava* (G5, Southern Blue Ridge endemic), *Botrychium lanceolatum* var. *angustisegmentum* (G5T4), *Calamagrostis porteri* (G4), *Clematis occidentalis* (G5), *Clethra acuminata* (G4, Southern Blue Ridge endemic), *Helianthemum bicknellii* (G5), *Helianthemum propinquum* (G4), *Leucothoe recurva* (G4G5, Southern Blue Ridge endemic), *Lonicera dioica* (G5), *Prunus virginiana* (G5), *Pyrola americana* (G5), *Rhododendron catawbiense* (G5, Southern

Blue Ridge endemic), *Rhododendron prinophyllum* (G5), *Solidago curtisii* (G4G5, Southern Blue Ridge endemic), *Streptopus lanceolatus var. roseus* (G5T4), *Vaccinium erythrocarpum* (G5, Southern Blue Ridge endemic)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (30-Apr-1998). This community is relatively secure within its range, but has a naturally restricted habitat. Red oak decline is affecting occurrences of this community; fire may be needed for stand establishment.

RELATED CONCEPTS

Global Similar Types:

- *Crataegus punctata - Crataegus flabellata* Ruderal Forest (CEGL004184)
- *Quercus rubra / (Kalmia latifolia, Rhododendron catawbiense, Rhododendron maximum) / Galax urceolata* Forest (CEGL007299) has greater than 20% shrub cover but with more than 50% of the shrub cover composed of evergreen species.
- *Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis)* Forest (CEGL007300) has greater than 20% shrub cover but with more than 50% of the shrub cover composed of deciduous species.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Some examples may have a *Crataegus* (hawthorn) understory [see Southern & Central Appalachian Ruderal Hawthorn Forest (CEGL004184) for *Crataegus*-dominated stands].
Global Classification Comments: This community includes forest vegetation with *Quercus rubra* making up at least 75% of the tree canopy and with less than 20% shrub cover. Herbaceous stratum dominance varies within and among occurrences but is composed of sedges, ferns and tall herbs. Typical herbaceous dominants include *Carex pensylvanica, Ageratina altissima var. roanensis, Thelypteris noveboracensis, Dennstaedtia punctilobula, Eurybia chlorolepis, Oclemena acuminata*, and *Laportea canadensis*. In three plots classified as this association in the Appalachian Trail classification project, herbs present in all samples are *Angelica triquinata, Carex pensylvanica, Clintonia umbellulata, Smilax herbacea, Solidago curtisii*, and *Thelypteris noveboracensis*. Woody species with 100% constancy are *Acer rubrum, Acer pensylvanicum, Ilex montana, Prunus serotina var. serotina*, and *Quercus rubra* (Fleming and Patterson 2009a).

Two varieties of *Quercus rubra* occur within the range of this community, *Quercus rubra var. ambigua* and *Quercus rubra var. rubra* (Kartesz 1999). Although the two varieties are known to occur together (Rohrer 1983), *Quercus rubra var. ambigua* occurs mostly at elevations greater than 1000 m (3300 feet), while *Quercus rubra var. rubra* occurs at elevations less than 1000 m (3300 feet) (Weakley 1997). The two varieties are based upon morphological differences in the leaves and acorns (Fernald 1950, Coker and Totten 1945); however, studies of foliar flavonoid composition in different *Quercus rubra* populations suggest that varietal distinction may not be warranted (McDougal and Parks 1984). Even though most studies of *Quercus rubra*-dominated vegetation do not distinguish *Quercus rubra* at the varietal level, it is likely, given the elevational range of this community, that the dominant species in this forest is *Quercus rubra var. ambigua*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was documented in North Carolina and Hughes Gap in Pisgah National Forest in Tennessee.
Global Range: This community occurs on most of the major mountain ranges of the Southern Appalachians in North Carolina and Tennessee.
Nations: US
States/Provinces: NC, TN
TNC Ecoregions: 50:P, 51:C, 59:?
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FROH
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 4 observation points; 12 accuracy assessment points): APPA.0115, APPA.0606, APPA.1095, APPA.1096, APPA.1125, APPA.1126, APPA_AA_0005, APPA_AA_0187, APPA_AA_0274, APPA_AA_0450, APPA_AA_0462, APPA_AA_0512, APPA_AA_0543, APPA_AA_1151, APPA_AA_1181, APPA_AA_1327, APPA_AA_1367, APPA_AA_1543.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson
References: Allard 1990, CAP pers. comm. 1998, Coker and Totten 1945, DeLapp 1978, Eyre 1980, Fernald 1950, Fleming and Patterson 2009a, Golden 1974, Kartesz 1999, McDougal and Parks 1984, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Pyne 1994, Rohrer 1983, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, USFS 1988, Weakley 1980, Weakley 1997, Whittaker 1956

A0624 *Quercus rubra - Quercus prinus* Woodland Alliance

Alliance Summary Description: This alliance includes woodland communities occurring on acidic, talus slopes or rocky slopes of higher elevations (e.g., from 300-800 m [1000-2620 feet] in New England and to 1370 m [4500 feet] in West Virginia). *Quercus rubra* is sometimes dominant but usually occurs in association with *Acer rubrum, Betula lenta, Quercus alba, Quercus prinus*, and others. Canopies are often stunted. The shrub layer may include, in the northern part of the range, *Acer spicatum, Hamamelis virginiana, Kalmia latifolia, Rhus typhina*, and *Sambucus racemosa var. racemosa (= Sambucus racemosa ssp. pubens)*, while in the southern part of the range, *Gaylussacia ursina, Leucothoe recurva, Menziesia pilosa, Rhododendron arborescens, Rhododendron calendulaceum, Rhododendron catawbiense, Rhododendron maximum, Vaccinium simulatum*, and *Viburnum nudum var. cassinoides* are more typical. Herbs include *Aralia nudicaulis, Carex pensylvanica, Corydalis sempervirens, Deschampsia flexuosa, Maianthemum canadense, Oclemena acuminata (= Aster acuminatus), Polypodium virginianum*, and *Pteridium aquilinum var. latiusculum*. This vegetation is known from the Appalachian Mountains, from New York and New England, south to the Blue Ridge of North Carolina. Soils are shallow and acidic.

[CEGL006565] *Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland

Translated Name: **Sweet Birch - Chestnut Oak / Virginia Creeper Woodland**
Common Name: **Sweet Birch - Chestnut Oak Talus Woodland**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus rubra* - *Quercus prinus* Woodland Alliance (A0624)

ELEMENT CONCEPT

Global Summary: This talus or rocky slope woodland community occurs in the central Appalachian Mountains and extends west to the Western Allegheny Plateau in Pennsylvania. The substrate is generally quartzite or sandstone talus. Sites are usually steeply sloping, but the type also sometimes occurs on gentler benches and ridge crests. Soils, where present, are shallow, organic, acidic and infertile. The canopy is of variable cover but generally open with gnarled, widely spaced trees. Characteristic trees are birches, primarily *Betula lenta* but less frequently including *Betula papyrifera, Betula populifolia*, or *Betula alleghaniensis*, as well as *Nyssa sylvatica*. Other tree associates may include *Tsuga canadensis, Acer rubrum, Carya glabra, Quercus prinus, Quercus alba, Quercus rubra, Quercus velutina*, or *Quercus coccinea*. Typical shrubs include *Acer spicatum, Acer pensylvanicum, Amelanchier arborea, Castanea dentata, Kalmia latifolia, Hamamelis virginiana, Menziesia pilosa, Ribes rotundifolium, Vaccinium angustifolium, Vitis* spp., *Toxicodendron radicans, Smilax rotundifolia*, and *Parthenocissus quinquefolia*. Ferns characterize the herb layer and may include *Dryopteris marginalis, Polypodium virginianum, Woodsia obtusa*, or *Asplenium platyneuron*. The forbs *Aralia nudicaulis, Heuchera* spp., and *Scutellaria saxatilis* are also well-adapted to the bouldery habitats. Lichens, especially the rock-tripes *Lasallia papulosa* and *Umbilicaria mammulata* and the foliose species *Flavoparmelia baltimorensis*, characterize the nonvascular layer.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This dry, acidic boulderfield or sandstone talus slope woodland occurs on substrates of fractured rock from 100 to 1,025 m (300-3,360 feet) elevation. It was sampled at nine locations in the Central Appalachian project area. Sites are generally somewhat steep to steep upper slopes with mostly northwestern or variable slopes depending on location. Soils are dry to xeric, rapidly drained sand and sandy loam, where there is soil development. The unvegetated surface consists of large blocky quartzite outcrops many with near-vertical faces, interrupted by sections of large colluvium which collect at bases of the outcrops. Leaf litter, downed wood, and bare soil are also common. Bryophytes may cover up to 30% of the rock surface. Evidence of disturbance includes past fire, past logging, erosion in the form of debris slides, trails, and gypsy moth damage.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This dry, acidic boulderfield or sandstone talus slope woodland occurs on substrates of fractured rock from 336-462 m (1,104-1,515 feet) elevation along the Pennsylvania-New Jersey-New York borders. It can have low vegetation cover and high rock cover. It was sampled at Culvers Gap South and High Point South in New Jersey and Bellvale Mountain North in New York in the Lower New England project area. The sites are dry, steep to somewhat steep, mid and upper slopes or rock outcrops with rapidly drained sandy loam soil. The unvegetated surface consists of large rocks (often lichen-covered) and leaf litter, with small amounts of exposed bedrock and downed wood.

Global Environment: Sites include the edges of very large, unvegetated (except for lichens), scarcely weathered block fields, as well as a variety of more weathered boulderfields and slopes covered by coarse to fine, bouldery colluvium. Much of the bouldery rubble is weathered from resistant quartzite or sandstone caprock. The elevation range of plot-sampled stands in Virginia is 100 to 1025 m (300-3360 feet). Slope position and aspect are variable, while associated landforms include landslide scarps, slide masses, concave hollow heads, and incised hollow bottoms. Mean cover of exposed boulders at Virginia sampling sites is 72%. In this very rocky environment, soil is limited to local, interstitial, root-rich duff deposits, or to "pads" of moss and underlying, thin, organic / sandy material that have developed on wide, flat boulder surfaces. Interstitial air spaces between boulders may be prevalent for 1.0 m or more below the surface. Soils are largely organic and usually extremely acidic and infertile. There is often some heterogeneity of boulder depth and weathering, as well as of microclimate and soil moisture, within boulderfields. In general, sites are somewhat xeric and show little evidence of subsurface drainage. However, this regime is ameliorated by higher elevations and north aspects, which probably slow evaporation and increase the moisture-holding capacity of the bouldery substrate.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: Physiognomy varies from nearly closed forest to very sparse woodland; gnarled and usually stunted *Betula lenta, Quercus prinus*, and/or *Quercus rubra* are characteristic of the open woodland canopy. Other common tree species may include *Prunus serotina, Pinus strobus, Sassafras albidum* and/or *Acer rubrum*. *Hamamelis virginiana* is a common tall shrub, and *Vaccinium pallidum* a common short shrub. *Parthenocissus quinquefolia* is a characteristic vine and *Aralia nudicaulis* is a common herb. *Polypodium virginianum* covers rocks and loose colluvium along with dense lichen cover. In addition, this community supports VA-state critically imperiled *Cornus canadensis* and VA-state imperiled *Betula papyrifera var. cordifolia*.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: Gnarled specimens of *Betula lenta, Quercus prinus*, and/or *Quercus rubra* are characteristic canopy species. *Hamamelis virginiana, Sorbus americana*, and/or *Kalmia latifolia* are common tall shrubs, and *Vaccinium pallidum* is a common dwarf-shrub. *Parthenocissus quinquefolia* is a characteristic vine, *Polypodium virginianum* a characteristic fern. High lichen cover is typical. In addition, this community supports NJ state-imperiled *Sorbus americana*.

Global Vegetation: Physiognomy varies from nearly closed forest to open woodland with widely spaced trees. The canopy is dominated by more-or-less gnarled specimens of *Betula lenta* and *Quercus prinus* generally <20 m tall. *Betula lenta* is usually the sole dominant of less weathered, steeper, more unstable boulderfield habitats, while a greater variety of trees is often codominant with *Betula lenta* on more weathered and stable habitats. Other overstory associates that may be important on some sites are *Quercus rubra, Nyssa sylvatica, Betula populifolia, Betula papyrifera var. cordifolia, Carya glabra, Tsuga canadensis*, and *Betula alleghaniensis*. The presence of well-preserved, fallen boles indicates that *Castanea dentata* was important on some boulderfields prior to the arrival of chestnut blight (Fleming and Moorhead 2000). *Acer rubrum* and *Nyssa sylvatica* are scattered canopy associates and frequent understory species. The typically open shrub layer contains *Acer pensylvanicum, Acer spicatum, Amelanchier arborea, Castanea dentata* sprouts, *Hamamelis virginiana, Ilex montana, Kalmia latifolia, Menziesia pilosa* (at the southern end of the range), and *Ribes rotundifolium*. The ground layer consists almost entirely of low-

statured shrubs, particularly *Menziesia pilosa* and *Vaccinium angustifolium*, and/or scattered to abundant vines of *Parthenocissus quinquefolia, Vitis* spp., *Toxicodendron radicans*, and *Smilax rotundifolia*. True herbs are very sparse and restricted to mossy pockets or flat boulders; typical species are *Dryopteris marginalis, Polypodium appalachianum, Deschampsia flexuosa*, and *Danthonia spicata*. In the southern portion of the range, *Heuchera* spp. and *Scutellaria saxatilis* are characteristic herbs. Bryophyte cover ranges up to 65% in some microhabitats. The rock-tripes *Lasallia papulosa* and *Umbilicaria mammulata*, and the foliose species *Flavoparmelia baltimorensis*, are generally the most conspicuous lichens. The combination of surficial boulder cover and nutrient-poor substrate results in a notably low mean species richness (n = 24 taxa per 400 square meters) in Virginia and Maryland plot samples of this type.

Global Dynamics: This boulderfield woodland represents a long-term sere in the geomorphic and vegetational progression from exposed, lichen-dominated block fields to fully forested mountain slopes with well-developed mineral soils. In addition to edaphic stresses, trees of these habitats are subject to frequent damage from wind and ice storms. This community often occurs in patch-mosaics with open, lichen-covered boulderfields that lack vascular plants. Boundaries between the boulderfield woodlands and adjacent forests are often obscure, with composition gradually changing along with substrate conditions and soil depth. This type frequently intergrades with several communities of the Mixed Oak / Heath Forests group, especially *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057) of somewhat sheltered, often very rocky slopes. In Virginia, this association reaches optimal development on sideslopes of linear sandstone and quartzite strike ridges in the Ridge and Valley, and on the western, metasedimentary flank of the northern Blue Ridge. Landsliding and debris avalanches, which generate and regenerate boulderfield environments, are dominant erosional processes in these landscapes (Hack and Goodlett 1960).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula lenta*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Herb (field)	Flowering forb	*Aralia nudicaulis*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula lenta*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Herb (field)	Fern (Spore-bearing forb)	*Polypodium virginianum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula lenta*, *Quercus prinus*
Herb (field)	Liana	*Parthenocissus quinquefolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Betula lenta*, *Hamamelis virginiana*, *Parthenocissus quinquefolia*, *Quercus prinus*, *Vaccinium pallidum*

Appalachian National Scenic Trail (Lower New England Project Area): *Betula lenta*, *Hamamelis virginiana*, *Polypodium virginianum*, *Quercus prinus*, *Quercus rubra*, *Vaccinium pallidum*

Global: *Acer spicatum*, *Aralia nudicaulis*, *Betula lenta*, *Betula papyrifera* var. *cordifolia*, *Dryopteris marginalis*, *Menziesia pilosa*, *Parthenocissus quinquefolia*, *Polypodium appalachianum*, *Quercus prinus*, *Ribes rotundifolium*, *Scutellaria saxatilis*, *Vaccinium angustifolium*, *Vitis* spp.

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Betula papyrifera* var. *cordifolia* (G5T5, VA state-imperiled), *Cornus canadensis* (G5, VA state-critically imperiled)

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Sorbus americana* (G5, NJ state-imperiled)

Global: Vulnerable Plants: *Betula papyrifera* var. *cordifolia* (G5T5, VA state-rare), *Gymnocarpium appalachianum* (G3), *Heuchera americana* var. *hispida* (G5T3?), *Scutellaria saxatilis* (G3); **Other Plants**: *Hamamelis virginiana* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (23-May-2011). Although this community type occurs in small patches over a limited geographic range, there are probably more than 200 sites (if not many hundreds of sites) in Virginia and West Virginia alone. Moreover, stands occupy rugged habitats that are not prone to anthropogenic disturbances.

RELATED CONCEPTS

Global Similar Types:

- *Betula alleghaniensis - Quercus rubra / Polypodium virginianum* Woodland (CEGL006584)
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057) of somewhat sheltered, often very rocky slopes.
- *Quercus rubra - Betula lenta / Polypodium virginianum* Woodland (CEGL006585)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Often occurs adjacent to Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299) in the Central Appalachians.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: It occurs locally in quartzite areas along the length of the Northern Blue Ridge in Virginia (south to near Roanoke) and forms very large patches on many of the linear Ridge and Valley sandstone strike ridges between the New River and Roanoke. However, the AT is generally located on crests and in areas where you would be unlikely to encounter this type. South of Shenandoah National Park, there are plots near the AT in the James River Face Wilderness (Rockbridge County, Virginia).
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Examples of this community in New Jersey and New York are very rocky with large talus blocks with high bryophyte/lichen cover. Many have dense young *Betula lenta* in the subcanopy.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This vegetation type is broadly defined and exhibits considerable geographic and elevational variation. It is also poorly represented by plot data, and additional sampling is needed, particularly of lower elevation and south-slope stands. Even with limited data, potential variants of the type in Virginia were proposed by Fleming and Moorhead (2000). A variant of sheltered north slopes in which *Tsuga canadensis* is codominant with *Betula lenta* and/or *Quercus* spp. has been reported from Virginia by Hupp (1983) and from Pennsylvania by Fike (1999), but may be referable to bouldery variants of *Tsuga canadensis - Quercus prinus - Betula lenta* Forest (CEGL006923). Many Virginia populations of the state-rare, northern tree *Betula papyrifera var. cordifolia* are associated with this community type.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is found throughout the Central Appalachians from the Blue Ridge and Ridge and Valley sections of Pennsylvania, Virginia, West Virginia, and Maryland, extending northeast to the Pennsylvania-New Jersey border. It was sampled in Shenandoah National Park in Virginia, in Washington County, Maryland, and in Cumberland and Franklin counties, Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Culvers Gap South and High Point South in New Jersey and at Bellvale Mountain North, New York.
Global Range: This community occurs locally throughout the Blue Ridge and Ridge and Valley sections of Pennsylvania, Virginia, West Virginia, and Maryland, extending northeast to the Pennsylvania-New Jersey border and New York.
Nations: US
States/Provinces: MD, NJ, NY, PA, VA:S3S4, WV
TNC Ecoregions: 49:C, 59:C, 60:P, 61:C
USFS Ecoregions (1994/95): 212Fc:PPP, 221Bd:CCC, 221D:CC, 221Ea:CCC, M221Ac:CCC, M221Bf:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Blue Ridge Parkway, C&O Canal, Catoctin Mountain, Delaware Water Gap, Harpers Ferry, Shenandoah, Valley Forge); USFS (George Washington, Jefferson, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW, WROT
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (7 plots; 2 observation points; 14 accuracy assessment points): APPA.0235, APPA.0505, APPA.0511, APPA.0512, APPA.0526, APPA.0527, APPA.0528, APPA.1223, APPA.1224, APPA_AA_0022, APPA_AA_0097, APPA_AA_0124, APPA_AA_0131, APPA_AA_0167, APPA_AA_0371, APPA_AA_0434, APPA_AA_0717, APPA_AA_1007, APPA_AA_1093, APPA_AA_1298, APPA_AA_1510, APPA_AA_1540, APPA_AA_1544.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 observation points; 7 accuracy assessment points): APPA.1340, APPA.1352, APPA.1386, APPA_AA_1965, APPA_AA_2416, APPA_AA_2562, APPA_AA_2583, APPA_AA_2771, APPA_AA_3090, APPA_AA_3240.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming, P. Coulling, S.C. Gawler
References: Anderson et al. 1998*, Eastern Ecology Working Group n.d., Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2006, Fleming et al. 2007a, Hack and Goodlett 1960, Harrison 2004, Harrison 2011, Hupp 1983, Lea 2003, Lea 2004, Perles et al. 2007, Podniesinski et al. 2005b, Rawinski et al. 1996, Russell and Schuyler 1988, VDNH 2003, Walz 1996, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL006640] *Carya glabra* Woodland

Translated Name: **Pignut Hickory Woodland**
Common Name: **Ridgetop Pignut Hickory Woodland**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus rubra* - *Quercus prinus* Woodland Alliance (A0624)

ELEMENT CONCEPT

Global Summary:

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This open pignut hickory woodland is found along ridgetops often with exposed bedrock.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Carya glabra* is the sole dominant in canopy. Dominant shrubs include *Quercus ilicifolia, Vaccinium angustifolium, Vaccinium pallidum*, and *Gaylussacia baccata*. *Carex pensylvanica* and *Deschampsia flexuosa* are characteristic herbs.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya glabra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Quercus ilicifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium angustifolium*, *Vaccinium pallidum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Carex pensylvanica*, *Carya glabra*, *Deschampsia flexuosa*
Global:

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (22-Oct-2015).

RELATED CONCEPTS

CLASSIFICATION

Status: Provisional
Classification Confidence:

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: No data are available.
Nations: US
States/Provinces: NJ, PA
TNC Ecoregions:
Federal Lands: NPS (Appalachian Trail [Lower New England])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FOHG
Appalachian National Scenic Trail (Lower New England Project Area) Plots: None.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay and M. Russo
Global Description Author(s):
References: Eastern Ecology Working Group n.d.*

[CEGL008526] *Quercus prinus / Quercus ilicifolia / Danthonia spicata* Woodland

Translated Name: **Chestnut Oak / Bear Oak / Poverty Oatgrass Woodland**
Common Name: **Central Appalachian Xeric Shale Woodland (Chestnut Oak / Mixed Herbs Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus rubra* - *Quercus prinus* Woodland Alliance (A0624)

ELEMENT CONCEPT

Global Summary: The known range of this vegetation type includes the extreme northern end of the Southern Blue Ridge, the western flank of the Northern Blue Ridge, and the Ridge and Valley region of Virginia and Maryland. The likely global range encompasses the entire Central Appalachian extent of these provinces in Virginia, West Virginia, Maryland, and Pennsylvania. Stands are generally confined to low elevations, up to about 840 m (2760 feet), but exceptionally to 1100 m (3600 feet). Habitats are mostly steep, south- to west-facing, middle to upper slopes with abundant shale outcrops, loose stones, and exposed mineral soils. However, substrates appear to be relatively stable and lack the ongoing erosional processes of shale barrens, which these habitats often border on the landscape. Slope shape is typically convex in at least one direction. Site moisture potential is very low. This community is an open to very open woodland dominated by *Quercus prinus*. Overstory trees are often stunted and gnarled. *Quercus rubra* and *Carya glabra* are constant, usually minor canopy associates that attain codominance with *Quercus prinus* locally. *Pinus virginiana* is an important canopy associate in some situations, but is entirely absent from other stands of the type. Understory tree layers are sparse, consisting mostly of younger reproduction of the canopy species. *Quercus ilicifolia, Vaccinium stamineum*, and *Vaccinium pallidum* are the chief species of a patchy shrub layer, which may also include *Rosa carolina, Amelanchier arborea*, and *Viburnum rafinesquianum*. *Quercus ilicifolia* usually forms open colonies in this community type, rather than the dense thickets characteristic in pyrophytic pine-oak/heath vegetation. The herb layer is typically quite patchy and sparse but contains a surprising diversity of xerophytic graminoids and forbs.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This Central Appalachian xeric shale woodland occurs on steep south- to west-facing, mid to upper slopes with abundant outcrops at low elevations, up to about 840 m (2,760 feet) in the shale barrens of the Central Appalachians. It was sampled once in the park at 491 m on a steep southwest-facing midslope with rapidly drained soil. The unvegetated

surface contains exposed bedrock, small rocks and leaf litter. Disturbances include past fires, trails and a nearby road.

Global Environment: With the exception of one site underlain by Tuscarora quartzite, plot-sampling locations are underlain by Devonian and Ordovician shales or Cambrian metashale, metasiltstone, and phyllite of the Hampton and Harper's Formations. Stands are generally confined to low elevations, up to about 840 m (2760 feet), but exceptionally reach 1100 m (3600 feet). Habitats are mostly steep (mean in plots = 23°), south to west-facing, middle to upper slopes with abundant outcrops, loose stones, and exposed mineral soils. However, substrates appear to be relatively stable and lack the ongoing erosional processes of shale barrens, which these habitats often border on the landscape. Slope shape is typically convex in at least one direction. Site moisture potential is very low. Soils are shallow, extremely acidic (mean pH = 4.4), with low calcium and magnesium levels, and high levels of iron and aluminum.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This woodland is codominated by *Quercus prinus* and *Pinus virginiana*. *Pinus strobus* is common in the canopy. *Smilax glauca* and *Smilax rotundifolia* are characteristic vines. *Quercus ilicifolia* is characteristic in the shrub layer. Other common shrubs include *Diospyros virginiana, Rhus copallinum, Vaccinium pallidum*, and *Vaccinium stamineum*. A patchy to moderately dense herbaceous understory is dominated by *Carex pensylvanica, Coreopsis verticillata, Danthonia spicata, Solidago bicolor*, and *Schizachyrium scoparium*.

Global Vegetation: This community is an open to very open woodland dominated by *Quercus prinus*. Overstory trees are often stunted and gnarled. *Quercus rubra* and *Carya glabra* are constant, usually minor canopy associates that attain codominance with *Quercus prinus* locally. *Pinus virginiana* is an important canopy associate in some situations, but is entirely absent from other stands of the type. Understory tree layers are sparse, consisting mostly of younger reproduction of the canopy species. *Quercus ilicifolia, Vaccinium stamineum*, and *Vaccinium pallidum* are the chief species of a patchy shrub layer, which may also include *Rosa carolina, Amelanchier arborea*, and *Viburnum rafinesquianum*. *Quercus ilicifolia* usually forms open colonies in this community type, rather than the dense thickets characteristic in pyrophytic pine-oak/heath vegetation. The herb layer is typically quite patchy and sparse, but contains a surprising diversity of xerophytic graminoids and forbs. The most characteristic herbs are *Danthonia spicata, Carex pensylvanica, Solidago bicolor, Houstonia longifolia, Hieracium greenii, Symphyotrichum undulatum (= Aster undulatus), Potentilla canadensis, Penstemon canescens*, and *Polygonatum biflorum*. Species that are less constant but locally important include *Paronychia montana, Parthenium integrifolium, Silene caroliniana ssp. pensylvanica, Aureolaria laevigata, Coreopsis major, Campanula divaricata, Solidago erecta, Cunila origanoides, Antennaria virginica, Phlox latifolia, Helianthus laevigatus*, and *Liatris pilosa (= Liatris graminifolia)*. Scattered individuals of shale barren endemics such as *Packera antennariifolia (= Senecio antennariifolius)* and *Clematis albicoma* occasionally occur in this community, particularly where stands border well-developed shale barrens, but are not characteristic. Species richness of plot-sampled stands ranges from 16 to 64 taxa per 400 square meters (mean = 33).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Herb (field)	Flowering forb	*Coreopsis verticillata*
Herb (field)	Graminoid	*Carex pensylvanica*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Herb (field)	Graminoid	*Carex pensylvanica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Carex pensylvanica*, *Coreopsis verticillata*, *Danthonia spicata*, *Pinus virginiana*, *Quercus ilicifolia*, *Quercus prinus*, *Schizachyrium scoparium*
Global: *Carya glabra*, *Coreopsis verticillata*, *Danthonia spicata*, *Hieracium greenii*, *Houstonia longifolia*, *Parthenium integrifolium*, *Pinus virginiana*, *Quercus ilicifolia*, *Solidago bicolor*, *Viola pedata*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Buckleya distichophylla* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (24-Feb-2010). The known range of this shale woodland includes the extreme northern end of the Southern Blue Ridge, the western flank of the Northern Blue Ridge, and the Ridge and Valley region of Virginia and Maryland. This community is probably more widespread than documented, although still fairly range-limited, and forms large patches in some shale landscapes. It is of likely occurrence in West Virginia and Pennsylvania.

RELATED CONCEPTS

Global Similar Types:

- *Pinus rigida - Quercus prinus / Gaylussacia baccata / Carex pensylvanica* Woodland (CEGL004821)
- *Pinus virginiana - Quercus prinus / Quercus ilicifolia / (Hieracium greenii, Viola pedata)* Woodland (CEGL008525) is a *Pinus virginiana*-dominated shale woodland with very sparse understory and herb layers, and dense colonies of *Cladonia* spp. on the soil surface; one of the most barren of shale communities.
- *Pinus virginiana / Vaccinium pallidum / Schizachyrium scoparium - Carex pensylvanica* Woodland (CEGL003624) is a *Pinus virginiana*-dominated shale woodland of the Southern Appalachians.
- *Quercus prinus - Pinus virginiana - (Pinus pungens) / Schizachyrium scoparium - Dichanthelium depauperatum* Woodland (CEGL008540) is a more diverse mixed woodland associated with sandstone, siltstone, and other non-shale outcrops.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community is associated with shale landscapes from Craig County, Virginia, through Maryland and possibly into Pennsylvania. It is rare along the AT north of Roanoke due to the lack of shale substrates over most of its length.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: This community type is floristically similar to *Pinus virginiana - Quercus prinus / Quercus ilicifolia / (Hieracium greenii, Viola pedata)* Woodland (CEGL008525) but differs in the dominance of hardwoods (versus *Pinus virginiana*) and in its much greater herbaceous diversity and overall species richness (n = 33 versus 15 per 400 square meters). Edaphic stresses are probably the most important ecological factor maintaining this woodland, but many stands have undoubtedly been influenced by periodic fires as well, which may account for some of the compositional differences with CEGL008525. Although soil samples collected from plots of both community types were similar in pH and base status, we suspect that differences in soil fertility, texture, and/or stability may also distinguish these types. More intensive study of the environmental differences between the two units is warranted. In a regional analysis (1134 plots from Georgia, North Carolina, Tennessee, Virginia) for the Southern Appalachian portion of the Appalachian Trail, a small group of nine plots was classified as this association (Fleming and Patterson 2009a). This association is represented by a total of 18 plots (12 Virginia, 6 Maryland).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is found in the shale barrens of the Central Appalachians (along and near the AT in Craig, Bedford, and Rockbridge counties, Virginia); it is endemic to the Ridge and Valley region, and absent along the AT north of Roanoke due to the lack of shale substrates over most of its length. The only AT site sampled is at Trout Creek in Craig County, Virginia.
Global Range: The known range of this community includes the extreme northern end of the Southern Blue Ridge, the western flank of the Northern Blue Ridge, and the Ridge and Valley region of Virginia and Maryland. The likely global range encompasses the entire Central Appalachians extent of these provinces in Virginia, West Virginia, Maryland, and Pennsylvania.
Nations: US
States/Provinces: MD, PA?, VA:S3, WV?
TNC Ecoregions: 51:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ab:CCC, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WPOS
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 4 accuracy assessment points): APPA.0361, APPA_AA_0267, APPA_AA_0799, APPA_AA_1194, APPA_AA_1444.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming and P. Coulling
References: Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Harrison 2004, Harrison 2011, Rawinski et al. 1996

[CEGL006074] *Quercus prinus / Rhus* spp. / *Deschampsia flexuosa* Woodland

Translated Name: **Chestnut Oak / Sumac species / Wavy Hairgrass Woodland**
Common Name: **Shale Talus Slope Woodland**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus rubra* - *Quercus prinus* Woodland Alliance (A0624)

ELEMENT CONCEPT

Global Summary: This association consists of variably structured vegetation occurring on harsh, steep, unstable shale talus and cliffs from New Jersey to Vermont. Physiognomy ranges from woodland to shrubland to herbaceous, with areas of very sparse vegetation. Heat, drought and lack of soil development prevent the establishment of many species and limit the community to crevice-rooting herbaceous plants and widely scattered small trees and shrubs. Vegetation cover is variable and patchy. Typical tree species include *Quercus prinus, Pinus strobus*, and *Juniperus virginiana*. Shrubs include scattered *Vaccinium pallidum, Rhus typhina, Rhus glabra, Gaylussacia baccata*, and *Amelanchier arborea*. The herbaceous layer ranges from absent to nearly 30% cover in patches, and consists of drought-tolerant graminoids such as *Deschampsia flexuosa, Carex pensylvanica*, and *Danthonia spicata*, as well as drought-tolerant forbs such as *Comandra umbellata, Solidago arguta, Baptisia tinctoria*, and *Tephrosia virginiana*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This bouldery woodland occurs on unstable shale talus with shallow, very well-drained loamy soils. It was sampled once in New York in the Lower New England project area. The site is a steep southeast-facing lower slope at 183 m (600 feet) elevation. Large slabs of lichen-covered bedrock and boulders are exposed at the surface. Soil is very shallow and is developed mainly in cracks between boulders or in exposed bedrock. The unvegetated surface consists of leaf litter, with small amounts of exposed bedrock and large/small rocks.
Global Environment: Unstable shale talus with shallow, very well-drained soils occurring on harsh, steep, unstable slopes and cliffs from New Jersey to Vermont.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy is dominated by *Carya glabra* and *Fraxinus americana* along with *Carya ovata, Juniperus virginiana*, and *Quercus prinus*. *Acer pensylvanicum* dominates the understory. Herbs include *Anthoxanthum odoratum* (exotic), *Carex albursina*, and *Carex swanii*.
Global Vegetation: *Quercus prinus, Pinus strobus*, and *Juniperus virginiana* form the canopy. Shrubs include scattered *Vaccinium pallidum, Rhus typhina, Rhus glabra, Gaylussacia baccata*, and *Amelanchier arborea*. The herbaceous layer ranges from absent to nearly 30% cover in patches, and consists of drought-tolerant graminoids such as *Deschampsia flexuosa, Carex pensylvanica*, and *Danthonia spicata*, as well as drought-tolerant forbs such as *Comandra umbellata, Solidago arguta, Baptisia tinctoria*, and *Tephrosia virginiana*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya glabra*, *Quercus prinus*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus occidentalis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana*, *Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rhus glabra*, *Rhus typhina*
Herb (field)	Graminoid	*Carex pensylvanica*, *Deschampsia flexuosa*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Juniperus virginiana*, *Quercus prinus*
Global: *Deschampsia flexuosa*, *Quercus prinus*, *Rhus glabra*, *Rhus typhina*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Anthoxanthum odoratum*, *Rosa multiflora* (Medium/Low)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (23-May-2011). Approximately 80 occurrences occupying 12 square km (2910 acres) are estimated rangewide. This vegetation has a somewhat limited range in four states. Although the steep slopes and unstable substrate supporting this vegetation do not attract developers, some degradation is likely to be caused by any development occurring on ridgetops. In addition, large cliffs overtopping scree slopes in general are attractive to rock climbers who can cause trampling of this fragile vegetation.

RELATED CONCEPTS

Global Similar Types:
- *Penstemon hirsutus* Sparse Vegetation (CEGL006535)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The plot is located between a chestnut oak forest upslope and a red-cedar woodland downslope. The vegetation of the plot includes species from adjacent communities. Given the abundance of *Juniperus virginiana* outside the plot, the plot is representative of the global association.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at West Mountain in New York.
Global Range: Currently described only from New York, it is also reported from New Jersey, Pennsylvania and Vermont.
Nations: US
States/Provinces: NY:S3, PA, VT
TNC Ecoregions: 60:C, 61:C, 64:P
USFS Ecoregions (1994/95): 212Ed:CCC, 212Fb:CCC, 212Fc:CCC, 221Bc:CCC, 221Bd:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Saratoga)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WROT
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: The single plot was sampled in the Lower New England project area. It is located between a chestnut oak forest upslope and a red-cedar woodland downslope. The vegetation of the plot includes species from both adjacent communities. Given the abundance of *Juniperus virginiana* outside the plot, the plot is representative of the global association.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot): APPA.0677.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, NRCS 2004a, Perles et al. 2007, Rawinski 1984a, Thompson and Sorenson 2000

[CEGL006134] *Quercus rubra - (Quercus prinus) / Vaccinium* spp. / *Deschampsia flexuosa* Woodland

Translated Name: **Northern Red Oak - (Chestnut Oak) / Blueberry species / Wavy Hairgrass Woodland**
Common Name: **Red Oak / Heath Woodland Rocky Summit**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus rubra - Quercus prinus* Woodland Alliance (A0624)

Element Concept

Global Summary: This dry, acidic oak woodland occurs on rocky upper slopes and summits from New England south to the highest peaks in West Virginia. Typical settings are low- to mid-elevation summits and south-facing, upper slopes. Elevations of known occurrences range from near sea level to about 610 m (0-2000 feet) in New England, and to 1370 m (4500 feet) in West Virginia. Soils are shallow, well-drained, acidic, nutrient-poor gravels and coarse sands, often with prominent exposed bedrock. Canopy cover is variable, ranging from open and patchy to closed depending on site conditions. It overtops a dwarf-shrub layer that is frequently extensive and a sparse tall-shrub layer. Herb cover is patchy and variable. Bryoid cover is minor, scattered patches on the rocky substrate. The canopy is dominated by scattered, often stunted *Quercus rubra* with minor associates depending on geography and often including *Quercus velutina, Quercus prinus, Betula populifolia, Betula papyrifera, Betula lenta*, and *Acer rubrum* or *Quercus coccinea* in more coastal regions. *Quercus rubra* tends to be the only oak at the northern end of the range. *Pinus strobus, Pinus rigida*, or other conifers may be present, but only in minor amounts. The dwarf-shrub layer is strongly dominated by heaths, especially *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium myrtilloides*, and *Gaylussacia baccata* with *Gaylussacia frondosa, Comptonia peregrina*, and *Kalmia angustifolia* also common. Tall shrubs may include *Quercus ilicifolia, Hamamelis virginiana, Amelanchier* spp., and *Prunus pensylvanica*. The herbaceous layer is composed of *Deschampsia flexuosa, Danthonia spicata, Carex lucorum, Pteridium aquilinum, Comandra umbellata, Melampyrum lineare, Polygala paucifolia, Epigaea repens, Gaultheria procumbens*, and *Aralia nudicaulis*. The bryophyte layer includes *Polytrichum commune, Leucobryum glaucum*, and others.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This oak / heath woodland or forest occurs on rocky upper slopes and low- to mid-elevation summits, and ranges from the Central Appalachians north through the Northern Appalachians. Elevations range from 375-567 m (1,235-1,860 feet) in New England. Sites are steep to somewhat steep upper slopes and summits (rock outcrops) with mostly northern and southern aspects. Soils are dry rapidly drained to well-drained sandy loam and loam. The unvegetated surface consists of leaf litter, with variable amounts of exposed bedrock, large/small rocks and downed wood. Evidence of disturbance includes the presence of exotic plants.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This red oak woodland occurs on rocky upper slopes and summits from New England south to the highest peaks in West Virginia. Typical settings are low- to mid-elevation summits and south-facing, upper slopes. Elevations of known occurrences range from near sea level to about 610 m (0-2,000 feet) in New England, and to 1370 m (4,500 feet) in West Virginia. Soils are shallow, well-drained, acidic, nutrient-poor gravels and coarse sands, often with prominent exposed bedrock.

Global Environment: This red oak woodland occurs on rocky upper slopes and summits from New England south to the highest peaks in West Virginia. Typical settings are low- to mid-elevation summits and south-facing, upper slopes. Elevations of known occurrences range from near sea level to about 610 m (0-2000 feet) in New England, and to 1370 m (4500 feet) in West Virginia. Soils are shallow, well-drained, acidic, nutrient-poor gravels and coarse sands, often with prominent exposed bedrock.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Quercus rubra* is dominant or codominant with *Quercus prinus, Quercus velutina*, and/or *Acer rubrum*; *Pinus* spp. and *Betula* spp. may be present. *Castanea dentata, Amelanchier laevis*, and *Sassafras albidum* are characteristic understory species. Canopies are often composed of stunted individuals. *Quercus ilicifolia, Vaccinium angustifolium, Vaccinium*

pallidum, and/or *Gaylussacia baccata* dominate the shrub layer. *Deschampsia flexuosa, Danthonia spicata, Cypripedium acaule, Aralia nudicaulis*, and *Pteridium aquilinum* are characteristic in the herb layer.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The open and patchy canopy overtops a sparse tall-shrub layer, and the dwarf-shrub layer is frequently extensive. Herb cover is patchy and variable. Bryoid cover is minor, scattered patches on the rocky substrate. The canopy is dominated by scattered, often stunted *Quercus rubra* with minor associates depending on geography and often including *Quercus velutina, Quercus prinus, Betula populifolia, Betula papyrifera, Betula lenta*, and *Acer rubrum* with *Quercus coccinea* in more coastal regions. *Pinus strobus, Pinus rigida*, or other conifers may be present, but only in minor amounts. The dwarf-shrub layer is strongly dominated by heaths, especially *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium myrtilloides*, and *Gaylussacia baccata* with *Gaylussacia frondosa, Comptonia peregrina*, and *Kalmia angustifolia* also common. Tall shrubs may include *Quercus ilicifolia, Hamamelis virginiana, Amelanchier* spp., and *Prunus pensylvanica*. The herbaceous layer is comprised of *Deschampsia flexuosa, Danthonia spicata, Carex lucorum, Pteridium aquilinum, Comandra umbellata, Melampyrum lineare, Polygala paucifolia, Epigaea repens, Gaultheria procumbens*, and *Aralia nudicaulis*. The bryophyte layer includes *Polytrichum commune, Leucobryum glaucum*, and others.
Global Vegetation: The open and patchy canopy overtops a sparse tall-shrub layer, and dwarf-shrub layer is frequently extensive. Herb cover is patchy and variable. Bryoid cover is minor, scattered patches on the rocky substrate. The canopy is dominated by scattered, often stunted *Quercus rubra* with minor associates depending on geography and often including *Quercus velutina, Quercus prinus, Betula populifolia, Betula papyrifera, Betula lenta*, and *Acer rubrum* with *Quercus coccinea* in more coastal regions. *Pinus strobus, Pinus rigida*, or other conifers may be present, but only in minor amounts. The dwarf-shrub layer is strongly dominated by heaths, especially *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium myrtilloides*, and *Gaylussacia baccata* with *Gaylussacia frondosa, Comptonia peregrina*, and *Kalmia angustifolia* also common. Tall shrubs may include *Quercus ilicifolia, Hamamelis virginiana, Amelanchier* spp., and *Prunus pensylvanica*. The herbaceous layer is composed of *Deschampsia flexuosa, Danthonia spicata, Carex lucorum, Pteridium aquilinum, Comandra umbellata, Melampyrum lineare, Polygala paucifolia, Epigaea repens, Gaultheria procumbens*, and *Aralia nudicaulis*. The bryophyte layer includes *Polytrichum commune, Leucobryum glaucum*, and others.
Global Dynamics: Droughty soils and increased light on the forest floor due to relatively open canopy allow drier species to predominate. Fire may be necessary to maintain *Quercus rubra* over time at more dry-mesic sites.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium angustifolium*, *Vaccinium pallidum*
Herb (field)	Graminoid	*Deschampsia flexuosa*
Herb (field)	Fern (Spore-bearing forb)	*Pteridium aquilinum*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Quercus ilicifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium angustifolium*, *Vaccinium myrtilloides*, *Vaccinium pallidum*
Herb (field)	Graminoid	*Deschampsia flexuosa*
Herb (field)	Fern (Spore-bearing forb)	*Pteridium aquilinum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Quercus ilicifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium angustifolium*, *Vaccinium myrtilloides*, *Vaccinium pallidum*
Herb (field)	Graminoid	*Deschampsia flexuosa*
Herb (field)	Fern (Spore-bearing forb)	*Pteridium aquilinum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Deschampsia flexuosa*, *Quercus rubra*, *Vaccinium angustifolium*, *Vaccinium pallidum*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Deschampsia flexuosa*, *Quercus rubra*, *Vaccinium angustifolium*, *Vaccinium pallidum*
Global: *Deschampsia flexuosa*, *Quercus rubra*, *Vaccinium angustifolium*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Poa compressa* (High/Low), *Rumex acetosella* (Medium/Low)
Global: Invasive/Exotic Plants: *Poa compressa* (High/Low), *Rumex acetosella* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (20-May-2011). There are nearly 300 estimated occurrences of this vegetation rangewide, occupying over 3000 square km. However, threats to this association are many. Continued residential and commercial development, road construction, and lack of land-use planning will continue to decrease the amount of this vegetation if left unchecked. As a large-patch to matrix-forming vegetation type, one of the largest threats is fragmentation. In addition, repeated gypsy moth infestations can damage, if not destroy, this vegetation. Invasive species, however, are not generally a threat.

RELATED CONCEPTS

Global Similar Types:
- (*Pinus strobus, Quercus rubra*) / *Danthonia spicata* Acidic Bedrock Scrub Grassland (CEGL005101)
- *Betula alleghaniensis - Quercus rubra / Polypodium virginianum* Woodland (CEGL006584)
- *Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest (CEGL006506)
- *Quercus rubra - Betula lenta / Polypodium virginianum* Woodland (CEGL006585)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Not all examples in New York and New Jersey are woodlands; some are more forested. Most sites are very rocky with talus boulders.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This association was documented from one observation point with no environmental or floristic data collected. This association is also not known from areas this far north, therefore, it cannot be confirmed to exist on the trail in this ecoregion.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Massachusetts at East Mountain State Forest, in New York at Bellvale Mountain North, Black Mountain - Harriman State Park, Canopus Lake North/Fahnestock State Park, and Minnewaska Region Plots, and in Vermont at Clarendon Ridge.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association has only been documented from Black Brook Notch in Maine, but due to a lack of data its occurrence cannot be confirmed.
Global Range: This red oak woodland occurs on low- to mid-elevation summits and south-facing, steep upper slopes from New England south to Pennsylvania and New Jersey.
Nations: US
States/Provinces: CT, MA, ME:S4, NH, NJ, NY, PA, VT
TNC Ecoregions: 59:C, 60:C, 61:C, 62:?, 63:C, 64:C
USFS Ecoregions (1994/95): 212Cb:CCC, 212Da:CCP, 212Dc:CCP, 212Fa:CCP, 212Fb:CCP, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Af:CCC, 221Ah:CCP, 221Ai:CCC, 221Ak:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Db:C??, M212Ba:CCC, M212Bb:CCP, M212Bd:CCC, M212Cb:CCC, M212Dc:CCP, M212De:CCC, M212Ea:CCP, M212Eb:CCP, M212F:CP, M221Aa:CPP, M221Ac:CPP, M221Bb:CPP, M221Da:CPP

Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Upper Delaware); USFWS (Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WROT
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 4 observation points; 37 accuracy assessment points): APPA.0028, APPA.0962, APPA.1384, APPA.1390, APPA.1419, APPA.1420, APPA_AA_1642, APPA_AA_1663, APPA_AA_1783, APPA_AA_1861, APPA_AA_1894, APPA_AA_1971, APPA_AA_2009, APPA_AA_2031, APPA_AA_2044, APPA_AA_2120, APPA_AA_2164, APPA_AA_2213, APPA_AA_2304, APPA_AA_2317, APPA_AA_2344, APPA_AA_2362, APPA_AA_2411, APPA_AA_2465, APPA_AA_2512, APPA_AA_2547, APPA_AA_2571, APPA_AA_2586, APPA_AA_2610, APPA_AA_2640, APPA_AA_2652, APPA_AA_2673, APPA_AA_2750, APPA_AA_2782, APPA_AA_2843, APPA_AA_2954, APPA_AA_3058, APPA_AA_3076, APPA_AA_3121, APPA_AA_3292, APPA_AA_3344, APPA_AA_3349, APPA_AA_3355.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 observation point; 2 accuracy assessment points): APPA.1548, APPA_AA_2086, APPA_AA_2229.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler, S.L. Neid and E. Largay
References: Breden et al. 2001, CAP pers. comm. 1998, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Fike 1999, Fleming 1985, Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, Lundgren 1999a, Metzler and Barrett 2001, Metzler and Barrett 2003, Metzler and Barrett 2006, NAP pers. comm. 1998, Northern Appalachian Ecology Working Group 2000, Perles et al. 2008, Rawinski 1984a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006585] *Quercus rubra - Betula lenta / Polypodium virginianum* Woodland

Translated Name: **Northern Red Oak - Sweet Birch / Rock Polypody Woodland**
Common Name: **Oak - Birch Talus Slope Woodland**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus rubra - Quercus prinus* Woodland Alliance (A0624)

ELEMENT CONCEPT

Global Summary: This acidic, large-boulder talus slope woodland occurs in Lower New England and the Allegheny Plateau south to the northern Piedmont. The substrate is large boulders, with vascular plants confined to coarse-textured soils in crevices. Sites are at low to mid elevations, from near sea level to about 520 m (1700 feet). Soils are thin, patchy, and nutrient-poor. The hardwood canopy is very patchy, with open talus interspersed with wooded areas. Canopy closure overall is usually less than 50%. Shrubs are patchy and may form thickets in openings. The herb layer is sparse overall, although dense patches may occur where some soil is available; bryophytes are likewise sparse. The ground cover is exposed talus, moss-covered boulders, and deciduous litter. The tree canopy is dominated by a variable mixture of oak and birch species, including *Quercus rubra* and *Betula lenta*. White oaks such as *Quercus alba* and *Quercus prinus* may occur. The understory is composed of scattered and clumped tall shrubs and small trees, including *Acer spicatum, Acer pensylvanicum, Rubus* spp., *Viburnum acerifolium*, and *Ribes* spp. Ericaceous shrubs are not generally prevalent, but when present may include *Vaccinium angustifolium, Gaylussacia baccata*, or *Kalmia angustifolia*. Vines are particularly characteristic, and include *Parthenocissus quinquefolia, Parthenocissus vitacea, Toxicodendron radicans, Toxicodendron rydbergii, Celastrus scandens*, and *Polygonum cilinode*. Scattered ferns and herbs are *Dryopteris marginalis, Polypodium virginianum, Pteridium aquilinum, Maianthemum racemosum, Eurybia macrophylla (= Aster macrophyllus), Deschampsia flexuosa, Carex pensylvanica, Carex lucorum, Corydalis sempervirens, Solidago bicolor, Solidago caesia*, and *Aralia nudicaulis*. Bryophytes include *Polytrichum commune, Leucobryum glaucum, Umbilicaria* spp., and *Cladina* spp. This association is characterized by the patchy deciduous canopy, with *Betula* spp. common and *Ostrya virginiana* sparse or absent, and by the lack of rich-site indicator herbs.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This northern hardwood - oak talus slope woodland occurs on thin soils at low to mid elevations, from near sea level to about 520 m (0-1,700 feet). The ground cover is exposed talus, moss- and lichen-covered boulders, and deciduous litter. It was sampled once in the Central Appalachian project area in northern Pennsylvania on a moderate, northwest-facing lower slope of a ravine with rapidly drained soil. The unvegetated surface consists of a mix of exposed bedrock, leaf litter and downed wood. Evidence of disturbance includes numerous hemlock snags from hemlock woolly adelgid-induced mortality.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This acidic large-boulder talus slope woodland occurs in the Northern Appalachians, Lower New England, and south to the northern Piedmont at low to mid elevations, from near sea level to about 520 m (0-1,700 feet). The sampled site is a very stony, steep north-facing midslope with somewhat poorly drained sandy loam soil. The unvegetated surface is codominated by leaf litter and large rocks, with lesser amounts of small rocks and downed wood. No evidence of disturbance was reported.

Global Environment: This acidic, large-boulder talus slope woodland occurs in the Lower New England, and Allegheny Plateau, south to the northern Piedmont. The substrate is large boulders, with vascular plants confined to coarse-textured soils in crevices. Sites are at low to mid elevations, from near sea level to about 520 m (0-1700 feet). Soils are thin, patchy, and nutrient-poor.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Betula alleghaniensis* and *Quercus rubra* are codominant in the canopy. *Betula lenta* is also common. Scattered *Kalmia latifolia* may be present over an herb layer dominated by *Polypodium virginianum* and *Dryopteris marginalis*. Other shrubs include *Acer pensylvanicum, Hamamelis virginiana*, and saplings from the canopy. *Tsuga canadensis* snags may be abundant in some stands where *Tsuga canadensis* was codominant until adelgid defoliation.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Quercus rubra* and *Betula alleghaniensis* are codominant in the canopy. *Kalmia latifolia* is the dominant tall shrub. Herbs are sparse but include *Dryopteris marginalis* and *Polypodium virginianum*.

Global Vegetation: The hardwood canopy is very patchy, with open talus interspersed with wooded areas. Canopy closure overall is usually less than 50%. Shrubs are patchy and may form thickets in openings. The herb layer is sparse overall, although dense patches may occur where some soil is available; bryophytes are likewise sparse. The ground cover is exposed talus, moss-covered boulders, and deciduous litter. The tree canopy is dominated by a variable mixture of oak and birch species, including *Quercus rubra* and *Betula lenta*. White oaks such as *Quercus alba* and *Quercus prinus* may occur. The understory is composed of scattered and clumped tall shrubs and small trees, including *Acer spicatum, Acer pensylvanicum, Rubus* spp., *Viburnum acerifolium*, and *Ribes* spp. Ericaceous shrubs are not generally prevalent, but when present may include *Vaccinium angustifolium, Gaylussacia baccata*, or *Kalmia angustifolia*. Vines are particularly characteristic, and include *Parthenocissus quinquefolia, Parthenocissus vitacea, Toxicodendron radicans, Toxicodendron rydbergii, Celastrus scandens*, and *Polygonum cilinode*. Scattered ferns and herbs are *Dryopteris marginalis, Polypodium virginianum, Pteridium aquilinum, Maianthemum racemosum, Eurybia macrophylla (= Aster macrophyllus), Deschampsia flexuosa, Carex pensylvanica, Carex lucorum, Corydalis sempervirens, Solidago bicolor, Solidago caesia*, and *Aralia nudicaulis*. Bryophytes include *Polytrichum commune, Leucobryum glaucum, Umbilicaria* spp., and *Cladina* spp.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Betula lenta*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris marginalis*, *Polypodium virginianum*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*, *Quercus rubra*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris marginalis*, *Polypodium virginianum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Betula lenta*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris marginalis*, *Polypodium virginianum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Betula alleghaniensis*, *Betula lenta*, *Dryopteris marginalis*, *Polypodium virginianum*, *Quercus rubra*
Appalachian National Scenic Trail (Lower New England Project Area): *Betula alleghaniensis*, *Dryopteris marginalis*, *Kalmia latifolia*, *Polypodium virginianum*, *Quercus rubra*
Global: *Betula alleghaniensis*, *Polypodium virginianum*, *Quercus rubra*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (2-Dec-2014).

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Tilia americana - Fraxinus americana / Ostrya virginiana / Geranium robertianum* Woodland (CEGL005058)
- *Betula alleghaniensis - Quercus rubra / Polypodium virginianum* Woodland (CEGL006584)
- *Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland (CEGL006565)
- *Quercus rubra - (Quercus prinus) / Vaccinium* spp. / *Deschampsia flexuosa* Woodland (CEGL006134)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type was formerly included in CEGL006320. A similar type, *Betula alleghaniensis - Quercus rubra / Polypodium virginianum* Woodland (CEGL006584), occurs in the Northern Appalachian (Laurentian-Acadian) region.

This type possibly could occur in southern Ontario, but *Betula lenta* is a rare species in Canada, and a minor component of the forest stand it occurs in. According to Zoladeski and Hayes (2013), "In Ontario, Cherry Birch [*Betula lenta*] is thought to have always been a minor component of forests at its historical and extant locations; nonetheless, its population has declined by 72%, from 50 trees observed in 1967 to 14 trees in 2005. Presently, there are only two sites [near St. Catharines], in proximity to each other, together harbouring probably not more than 18 individuals... In Ontario, the forest where Cherry Birch was observed in 2010 is composed of Red Oak (*Quercus rubra*), Sugar Maple (*Acer saccharum*), Black Cherry (*Prunus serotina*) and Eastern Hop-hornbeam (*Ostrya virginiana*)."

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is found in the High Allegheny Plateau in northern Pennsylvania and in New York in the Lower New England project area. It was sampled in Northampton County, Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Nuclear Lake in New York.
Global Range: This woodland occurs in Lower New England and the Allegheny Plateau, south to the northern Piedmont.
Nations: CA?, US
States/Provinces: CT, MA, NY, ON?, PA, VT
TNC Ecoregions: 60:C, 61:C

USFS Ecoregions (1994/95): 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCC, 221Al:CCC, 221Ba:CCC, 221Bd:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW, WROT
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot): APPA.0655.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 5 accuracy assessment points): APPA.0686, APPA_AA_1826, APPA_AA_1935, APPA_AA_2039, APPA_AA_2448, APPA_AA_2718.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler and D. Faber-Langendoen
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Metzler and Barrett 2001, Metzler and Barrett 2006, Northern Appalachian Ecology Working Group 2000, Rawinski 1984a, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zoladeski and Hayes 2013

A2048 *Quercus velutina - Quercus alba* Eastern Forest Alliance

Alliance Summary Description: Forests in this alliance represent dry oak forests characterized by dominance or codominance by some combination of *Quercus alba, Quercus coccinea*, and/or *Quercus velutina*. *Quercus velutina* is characteristic and constant. Stands are generally closed-canopy and characterized by some combination of *Quercus alba, Quercus coccinea, Quercus rubra*, and/or *Quercus velutina*. In addition, *Carya alba, Carya glabra, Carya ovata, Pinus echinata, Pinus virginiana, Quercus prinus*, and *Quercus stellata* are common associates. Other common associates can include *Acer rubrum var. rubrum, Quercus falcata, Quercus macrocarpa* (within its range), and *Sassafras albidum*. Typical understory trees include *Betula lenta, Oxydendrum arboreum*, and *Sassafras albidum*. *Ilex opaca* is an associate in portions of the Piedmont. The shrub layer is usually strongly dominated by ericaceous species, including *Gaylussacia baccata, Kalmia latifolia, Rhododendron calendulaceum, Rhododendron periclymenoides, Vaccinium angustifolium, Vaccinium pallidum*, and occasionally including *Hamamelis virginiana* and *Viburnum acerifolium*. The herbaceous composition varies considerably over the wide range of this alliance. Some common herbs include *Antennaria plantaginifolia, Carex blanda, Carex pensylvanica, Conopholis americana, Cypripedium acaule, Danthonia spicata, Desmodium nudiflorum, Dioscorea villosa, Gaultheria procumbens, Hieracium venosum, Maianthemum racemosum, Medeola virginiana, Polygonatum biflorum, Prenanthes altissima, Schizachyrium scoparium, Solidago odora*, and *Thelypteris noveboracensis*. These forests occupy dry, nutrient-poor sites on sandy or rocky soil, upper slopes, and ridgetops; the alliance also includes red maple - oak or red maple - pine forests that developed over serpentine bedrock but have sufficient duff development that serpentine chemistry is not evident in the vegetation. This alliance is wide-ranging, with a center of distribution in the Central Appalachians, south to the Southern Blue Ridge; to Cumberland, Western Allegheny, and High Allegheny plateaus; west and north to the Great Lakes; and east through Lower New England / Northern Piedmont, and the Piedmont.

[CEGL006018] *Quercus (velutina, alba) / Vaccinium pallidum / Pteridium aquilinum* High Allegheny Plateau, Western Allegheny Plateau Forest

Translated Name: **(Black Oak, White Oak) / Blue Ridge Blueberry / Western Brackenfern High Allegheny Plateau, Western Allegheny Plateau Forest**
Common Name: **Allegheny Plateau Oak Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus velutina* - *Quercus alba* Eastern Forest Alliance (A2048)

ELEMENT CONCEPT

Global Summary: This closed-canopy, dry deciduous forest of portions of the High Allegheny Plateau, Western Allegheny Plateau, portions of the central Appalachian Mountains, and southern New England, occurs on sandy or rocky soil on dry upper slopes and terraces of sandstone, shale, granite, gneiss, and other acidic parent materials. The tree canopy is dominated by a mixture of *Quercus velutina, Quercus alba, Quercus rubra, Quercus coccinea, Acer rubrum*, and *Quercus prinus*. Associates include *Carya glabra, Carya ovata, Nyssa sylvatica, Sassafras albidum, Betula lenta*, and *Prunus serotina*. *Castanea dentata* was formerly common in this forest. The understory is characterized by *Nyssa sylvatica*, and in the southwestern portion of the range by *Oxydendrum arboreum*. The low-shrub layer is characterized by ericaceous shrubs such as *Vaccinium pallidum, Vaccinium angustifolium, Vaccinium stamineum, Gaylussacia baccata, Kalmia latifolia*, and *Rhododendron periclymenoides*, as well as *Viburnum acerifolium*. Typical species of the herbaceous layer include *Pteridium aquilinum, Carex pensylvanica, Oryzopsis asperifolia, Gaultheria procumbens, Hieracium venosum, Cypripedium acaule, Krigia biflora, Polygala paucifolia, Trientalis borealis*, and *Waldsteinia fragarioides*. Disturbance such as windthrow and logging favor *Quercus velutina* and *Betula lenta*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This mixed oak / heath forest occurs on sandy or rocky soil on dry upper slopes and terraces of sandstone or shale.
Global Environment: This closed-canopy, dry deciduous forest of unglaciated portions of the High Allegheny Plateau, Western Allegheny Plateau, portions of the central Appalachian Mountains, and southern New England, occurs on sandy or rocky soil on dry upper slopes and terraces of sandstone or shale.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The tree canopy is dominated by a mixture of *Quercus velutina, Quercus alba*, and *Quercus rubra*. The low-shrub layer is characterized by ericaceous shrubs such as *Vaccinium pallidum, Vaccinium angustifolium, Gaylussacia baccata*, and *Kalmia latifolia*. The herbaceous layer may include *Cypripedium acaule, Carex pensylvanica, Hieracium venosum, Pteridium aquilinum*, and *Trientalis borealis*.

Global Vegetation: The tree canopy is dominated by a mixture of *Quercus velutina, Quercus alba, Quercus rubra, Quercus coccinea, Acer rubrum*, and *Quercus prinus*. Associates include *Carya glabra, Carya ovata, Nyssa sylvatica, Sassafras albidum, Betula lenta*, and *Prunus serotina*. *Castanea dentata* was formerly common in this forest. The understory is characterized by *Nyssa sylvatica*, and in the western portion of the range by *Oxydendrum arboreum*. The low-shrub layer is characterized by ericaceous shrubs such as *Vaccinium pallidum, Vaccinium angustifolium, Vaccinium stamineum, Gaylussacia baccata, Kalmia latifolia*, and *Rhododendron periclymenoides*, as well as *Viburnum acerifolium*. Typical species of the herbaceous layer include *Pteridium aquilinum, Carex pensylvanica, Oryzopsis asperifolia, Hieracium venosum, Gaultheria procumbens, Cypripedium acaule, Krigia biflora, Polygala paucifolia, Trientalis borealis*, and *Waldsteinia fragarioides*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus rubra*, *Quercus velutina*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium angustifolium*, *Vaccinium pallidum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Quercus alba*, *Quercus coccinea*, *Quercus prinus*, *Quercus rubra*, *Quercus velutina*
Tree subcanopy	Broad-leaved deciduous tree	*Nyssa sylvatica*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Rhododendron periclymenoides*, *Vaccinium angustifolium*, *Vaccinium pallidum*, *Vaccinium stamineum*, *Viburnum acerifolium*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Kalmia latifolia*, *Quercus alba*, *Quercus velutina*, *Vaccinium pallidum*
Global: *Quercus alba*, *Quercus velutina*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Quercus velutina - Quercus alba / Vaccinium (angustifolium, pallidum) / Carex pensylvanica* Forest (CEGL005030)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was added to the classification to cover mixed oak / heath forests common in southern Lower New England. It was observed in New Jersey and Massachusetts during mapping reconnaissance by UMESC and Lesley Sneddon during the summer of 2012. No plots or observation points were collected for this vegetation association.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed in New Jersey and Massachusetts during Lower New England mapping reconnaissance in the summer of 2012.
Global Range: This association occurs on the High Allegheny Plateau of New York and Pennsylvania, the Western Allegheny Plateau of Pennsylvania and eastern Ohio, southern Lower New England, and extends south to the central Appalachian Mountains.
Nations: US
States/Provinces: CT, MA, MD, NJ, NY, OH, PA, RI, WV?
TNC Ecoregions: 49:C, 59:C, 60:C, 61:P
USFS Ecoregions (1994/95): 212Fa:CCP, 212Fb:CCP, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Am:CCC, 221Ba:CCC, 221Bd:CCP, 221Da:CPC, 221Ea:CPP, 221Fa:CCC, 231A:CP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bf:CCC, M221C:CP, M221Da:CPC
Federal Lands: NPS (Appalachian Trail [Lower New England])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCNO
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed in New Jersey and Massachusetts during Lower New England mapping reconnaissance in the summer of 2012 and during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (36 accuracy assessment points): APPA_AA_1652, APPA_AA_1661, APPA_AA_1678, APPA_AA_1679, APPA_AA_1709, APPA_AA_1720, APPA_AA_1761, APPA_AA_1764, APPA_AA_1810, APPA_AA_1863, APPA_AA_1969, APPA_AA_1990, APPA_AA_2160, APPA_AA_2166, APPA_AA_2183, APPA_AA_2188, APPA_AA_2314, APPA_AA_2319, APPA_AA_2417, APPA_AA_2463, APPA_AA_2497, APPA_AA_2544, APPA_AA_2647, APPA_AA_2751, APPA_AA_2781, APPA_AA_2785, APPA_AA_2845, APPA_AA_2893, APPA_AA_2903, APPA_AA_2990, APPA_AA_2992, APPA_AA_3026, APPA_AA_3125_B, APPA_AA_3157, APPA_AA_3184, APPA_AA_3253.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): L.A. Sneddon
References: Anderson 1982, Braun 1928, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Harrison 2004, Harrison 2011, Lundgren 2001, ONHD unpubl. data, Shreve 1910

[CEGL008521] ***Quercus alba - Quercus (coccinea, velutina, prinus) / Gaylussacia baccata*** **Forest**
Translated Name: **White Oak - (Scarlet Oak, Black Oak, Chestnut Oak) / Black Huckleberry Forest**
Common Name: **Low-Elevation Mixed Oak / Heath Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus velutina* - *Quercus alba* Eastern Forest Alliance (A2048)

ELEMENT CONCEPT

Global Summary: This community is a matrix forest of dry, nutrient-poor uplands of the Mid-Atlantic Piedmont Plateau, occurring locally in similar low-elevation landscapes of the Northern Blue Ridge and Ridge and Valley, Cumberland Plateau and Mid-Atlantic Coastal Plain provinces. The type is well-documented across Virginia, and to a lesser extent in Tennessee and Maryland, but probably also occurs at similar sites in West Virginia and Pennsylvania. Stands are located between 30 and 700 m (100-2300 feet) elevation on rolling to sublevel sites of Piedmont and Inner Coastal Plain uplands, mountain valleys and lower mountain slope benches. In the mountains, many documented occurrences are located on ancient alluvial fan deposits, which are especially extensive along the western foot of the Blue Ridge. The vegetation is a closed to very open oak forest with mixed and variable canopy dominance by *Quercus alba, Quercus velutina, Quercus coccinea*, and *Quercus prinus*. Various *Pinus* spp., including *Pinus virginiana, Pinus echinata, Pinus strobus*, and *Pinus rigida*, are frequent overstory associates, particularly following fire or logging disturbances. *Quercus falcata, Quercus stellata, Carya glabra*, and *Carya alba* are infrequent canopy trees. *Nyssa sylvatica, Amelanchier arborea* and, in the southern part of the range, *Oxydendrum arboreum* attain exceptional abundance and stature in these forests, dominating the subcanopy layers and occasionally reaching the overstory. *Acer rubrum* and *Sassafras albidum* are other common understory trees. In typical stands, the shrub layer is dominated by deciduous ericaceous species, herbaceous species are sparse, and species-richness is moderate to very low.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This low-elevation oak / heath forest ranges from central Pennsylvania south to the Piedmont and valley floors of the Ridge and Valley of Virginia, mostly at <460 m (<1,500 feet) elevation, rarely extending as high as 760 m (2,500 feet) on mountain ridges. It is a matrix forest of the dry, nutrient-poor uplands of the Mid-Atlantic Piedmont Plateau. It was sampled three times in Pennsylvania; once on a flat with somewhat poorly drained clay soil, and twice on moderate east- and northwest-facing midslopes with well-drained sandy loam soils. It was also sampled once on a gentle southwest-facing ridge in Virginia on silt loam sols. The unvegetated surface is dominated by leaf litter with some downed wood. Evidence of disturbance includes grazing/browsing, gypsy moth damage, and the presence of exotic plant species.

Global Environment: Stands are located between 30 and 700 m (100-2300 feet) elevation on rolling to sublevel sites of Piedmont and Inner Coastal Plain uplands, mountain valleys and lower mountain slope benches. The type is generally distributed in nutrient-poor soils of the Piedmont uplands. In the mountains, many documented occurrences are located on ancient alluvial fan deposits, which are especially extensive along the western foot of the Blue Ridge from Page County south to Rockbridge County, Virginia. Similar but smaller fans are common where incising streams drain "piedmont" landforms at the foot of Ridge and Valley strike ridges (Harbor 1996). Slopes of plot-sampled stands range from 1-13° (mean = 6°), with aspects essentially flat to westerly. Soils of these sites are deep, very oligotrophic, gravelly loams with low pH and base status. Exposed rocks of any kind (outcrops, boulders, or stones) are usually sparse to absent. Most sites appear to have a history of fires.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus alba* is characteristic in the canopy along with mixed oaks including *Quercus prinus, Quercus coccinea*, and/or *Quercus velutina*. Various *Pinus* spp., including *Pinus virginiana, Pinus echinata, Pinus strobus*, and/or *Pinus rigida*, are frequent overstory associates (but <30% in canopy - this is an oak forest, not a mixed oak-pine forest). *Acer rubrum* and *Nyssa sylvatica* are common in the subcanopy. *Rhododendron periclymenoides, Photinia melanocarpa, Gaylussacia baccata*, and *Vaccinium corymbosum* are common shrubs. *Rubus hispidus* is a common dwarf-shrub. Herbs are sparse to absent.

Global Vegetation: The vegetation is a closed to very open oak forest with mixed and variable canopy dominance by *Quercus alba, Quercus coccinea*, and *Quercus prinus*. Various *Pinus* spp., including *Pinus virginiana, Pinus*

echinata, Pinus strobus, and *Pinus rigida*, are frequent overstory associates, particularly following fire or logging disturbances. *Quercus falcata, Quercus stellata, Carya glabra*, and *Carya alba* are infrequent canopy trees. *Nyssa sylvatica, Amelanchier arborea* and, in the southern part of the range, *Oxydendrum arboreum* attain exceptional abundance and stature in these forests, dominating the subcanopy layers and occasionally reaching the overstory. *Acer rubrum* and *Sassafras albidum* are other common understory trees. The shrub layer is typically dominated by deciduous ericaceous species, with *Gaylussacia baccata, Vaccinium pallidum*, and/or *Vaccinium stamineum* consistently forming dense colonies. Less abundant or constant shrubs and vines include *Castanea pumila, Quercus ilicifolia, Kalmia latifolia, Rhododendron periclymenoides, Lyonia ligustrina, Vaccinium stamineum, Smilax glauca, Smilax rotundifolia*, and *Cornus florida*. Despite high shrub densities, a number of low-cover herbs and subshrubs occur in the type, including *Chimaphila maculata, Isotria verticillata, Uvularia puberula, Epigaea repens, Pteridium aquilinum var. latiusculum, Cypripedium acaule, Gentiana villosa, Comandra umbellata, Angelica venenosa*, and *Iris verna*. Mean species richness of 54 Virginia, Maryland, and District of Columbia plot samples is 25 taxa per 400 square meters.

Global Dynamics: Drought-prone habitats and an abundance of inflammable shrubs make this vegetation type susceptible to periodic fires. Mesophytic, fire-intolerant species such as *Fagus grandifolia, Acer rubrum*, and *Ilex opaca* are rapidly invading the understories of many Piedmont stands from which fire has been excluded for many decades.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus coccinea*, *Quercus prinus*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium pallidum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus* spp.
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus coccinea*, *Quercus prinus*
Tree subcanopy	Broad-leaved deciduous tree	*Amelanchier arborea*, *Oxydendrum arboreum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*, *Vaccinium stamineum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Gaylussacia baccata*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Pinus strobus*, *Quercus alba*, *Quercus coccinea*, *Quercus prinus*, *Quercus velutina*, *Rhododendron periclymenoides*, *Vaccinium pallidum*

Global: *Amelanchier arborea*, *Castanea pumila*, *Gaylussacia baccata*, *Isotria verticillata*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Quercus alba*, *Quercus coccinea*, *Quercus prinus*, *Quercus velutina*, *Rhododendron periclymenoides*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Polygonum caespitosum*

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (24-Jan-2005). This community is a matrix-forming vegetation type in the Virginia and Maryland Piedmont and is probably more widespread at low elevations of the central Appalachian Mountains than documentation indicates.

RELATED CONCEPTS

Global Similar Types:

- *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271) of southern Appalachians.
- *Quercus alba - (Liriodendron tulipifera, Liquidambar styraciflua) / Calycanthus floridus / Athyrium filix-femina* Forest (CEGL008428)
- *Quercus alba - Quercus falcata - (Carya pallida) / Gaylussacia frondosa* Forest (CEGL006269) of the Mid-Atlantic Coastal Plain.

- *Quercus alba - Quercus falcata / Vaccinium (arboreum, hirsutum, pallidum)* Forest (CEGL008567) described from southeastern Tennessee, with similar understory and associated species but with prominent *Quercus falcata*.
- *Quercus prinus - (Quercus coccinea) / Carya pallida / Vaccinium arboreum - Vaccinium pallidum* Forest (CEGL008431)
- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299) of the Central Appalachians and northern Piedmont.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This is a low-elevation mixed dry oak / heath forest characterized by *Quercus alba* and generally lacking *Carya* spp.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: This is a low-elevation oak / heath type that is common in the Piedmont and valley floors of the Ridge and Valley, mostly at <460 m (<1,500 feet) elevation, rarely extending as high as 760 m (2,500 feet) on mountain ridges. There are plots along/near the AT in lower-elevation stretches west of and north of Roanoke, but along most of the trail in Virginia, it is absent or occurs in very small patches. On the Northern Blue Ridge, Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest (CEGL008523) is a similar, higher-elevation forest.
Global Classification Comments: This unit is distinct among Virginia's oak/heath forests in its occurrence on low-elevation, rolling to sub-level, usually non-rocky terrain of the Piedmont and mountains. *Quercus alba*, normally a minor tree in montane oak/heath forests, is characteristic and usually codominant, while the prevalence of deciduous ericads and the presence of the low-elevation oaks *Quercus falcata* and *Quercus stellata* further distinguish the type. *Quercus prinus* and *Kalmia latifolia*, although present and occasionally abundant, are not as important in this unit as in related Central Appalachian oak/heath vegetation types, particularly *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299). The latter is generally associated with relatively steep, often rocky terrain of the Central Appalachians and dissected topography in the Piedmont. Originally, the concept of this type (CEGL008521) was restricted to "Piedmont"-like landscapes in the mountains. However, additional quantitative data analysis of a statewide (Virginia) set of 180 oak/heath plots led to a broader conceptual interpretation that includes both montane and Piedmont stands. The type is represented by 54 plots from Virginia, and 20 from Maryland and the District of Columbia. Attempts to split this unit based on the presence or absence of *Quercus prinus* have proven unworkable because significant environmental or floristic differences between the putative groups are lacking.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This forest was sampled in Cumberland County, Pennsylvania, and at Trout Creek East in Virginia.
Global Range: In parts of the Mid-Atlantic Piedmont, this is a common forest of dry, nutrient-poor uplands. It occurs less frequently in similar low-elevation landscapes of the Central Appalachians (Northern Blue Ridge and Ridge and Valley provinces), and the Cumberland Plateau in Tennessee. It reaches the eastern edge of its range in Maryland, the District of Columbia, and northern Virginia, where it extends slightly into the Coastal Plain along the fall zone. It also occurs in Pennsylvania and possibly West Virginia.
Nations: US
States/Provinces: DC, KY, MD:S5, PA, SC?, TN, VA:S5, WV?
TNC Ecoregions: 50:C, 52:C, 57:C, 58:C, 59:C, 61:C
USFS Ecoregions (1994/95): 221Db:CCC, 221Hc:CCC, 221He:CCC, 231Ae:CCC, 231Ak:CCC, 231Al:CCC, 231An:CCC, 231Ap:CCC, 232Ad:CCC, 232Br:CCC, 232Ch:CCC, 232Cj:CCC, M221Aa:CCC, M221Ab:CCC, M221Cd:CCC, M221Da:CCC
Federal Lands: DOD (Fort Belvoir, Kerr Reservoir); NPS (Appalachian Trail [Central Appalachians], Appomattox Court House, Big South Fork, C&O Canal, Colonial, Fredericksburg-Spotsylvania, George Washington Parkway, National Capital-East, Obed River, Prince William, Rock Creek, Shenandoah, Thomas Stone, Wolf Trap); USFS (Daniel Boone?, George Washington, Jefferson, Sumter (Piedmont)?, Sumter?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCOH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 plots; 2 observation points; 3 accuracy assessment points): APPA.0406, APPA.0506, APPA.1249, APPA.1250, APPA_AA_0407, APPA_AA_0568, APPA_AA_0790.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming, P. Coulling, L.A. Sneddon
References: Anderson et al. 1977, Eyre 1980, Fleming 2002a, Fleming 2002b, Fleming 2007, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 2000, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Fleming et al. 2007b, Hall and Mathews 1974, Harbor 1996, Harrison 2004, Harrison 2011, Lea et al. 2012, McCoy and Fleming 2000, Patterson 2008a, Patterson 2008c, Patterson 2008e, Rawinski et al. 1996, Schmalzer and DeSelm 1982, TDNH unpubl. data, Taverna and Patterson 2008, Walton et al. 2001, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL007691] *Quercus alba - Quercus coccinea - Quercus falcata / Kalmia latifolia - Vaccinium pallidum* Forest

Translated Name: **White Oak - Scarlet Oak - Southern Red Oak / Mountain Laurel - Blue Ridge Blueberry Forest**
Common Name: **Appalachian Montane Oak - Hickory Forest (Low-Elevation Xeric Type)**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian Oak / Chestnut Forest (G015)
Alliance	*Quercus velutina - Quercus alba* Eastern Forest Alliance (A2048)

Element Concept

Global Summary: This mixed oak association includes dry, deciduous forests of low elevations (below 915 m [3000 feet]) in the Southern Blue Ridge, associated with sandy, dry soils derived from granitic gneiss and other related acidic substrates. This association is known as a matrix forest type in the area of Brevard, North Carolina, where it occurs on open slopes and broad ridges, in a landscape of a low, rolling plateau. It may extend south into South Carolina. These forests have canopies dominated by *Quercus alba, Quercus coccinea, Quercus falcata, Quercus velutina*, and sometimes *Quercus prinus*, although other species can be present, including *Pinus echinata, Pinus virginiana*, and *Pinus rigida*. This forest is characterized by having associated species more typical of lower, non-montane areas, such as *Quercus falcata, Schizachyrium scoparium, Silphium compositum, Baptisia tinctoria*, and *Piptochaetium avenaceum*, and by the absence of species more typical in mesic, montane oak forests, including *Medeola virginiana, Maianthemum racemosum, Thelypteris noveboracensis, Athyrium filix-femina ssp. asplenioides, Dennstaedtia punctilobula*, and *Dryopteris intermedia)*. The shrub stratum can be quite open, with *Rhododendron calendulaceum* typical. *Kalmia latifolia* and *Vaccinium pallidum* are usually present in moderate abundance. *Solidago odora var. odora* and *Pteridium aquilinum var. latiusculum* are typical herb components.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This dry mixed oak-hickory forest is restricted to low elevations (below about 670 m [2,200 feet]) on sandy soils.
Global Environment: This association includes dry, deciduous forests of low elevations (below 915 m [3000 feet]) in the Southern Blue Ridge, associated with sandy, dry soils derived from granitic gneiss and other related acidic geologies. This association is known as a matrix forest type in the area of Brevard, North Carolina, where it occurs on open slopes and broad ridges, in a landscape of a low, rolling plateau.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This forest usually contains *Quercus falcata* in the canopy, along with *Quercus alba, Quercus coccinea, Quercus velutina*, and sometimes *Quercus prinus* at low cover, although other species can be present, including various *Carya* spp., as well as *Pinus echinata* and *Pinus virginiana*. In some cases, *Quercus falcata* may be an indicator, but may not be present or detectible in all stands. In some examples *Carya* spp. may have greater cover than *Quercus* spp.
Global Vegetation: These forests have canopies dominated by *Quercus alba* with other oak species including *Quercus coccinea, Quercus falcata, Quercus velutina*, and sometimes *Quercus prinus*. Other species can be present, including *Pinus echinata, Pinus virginiana*, and *Pinus rigida*. The subcanopy may contain *Oxydendrum arboreum*. This forest is characterized by having associated species more typical of lower, non-montane areas, such as *Quercus falcata, Schizachyrium scoparium, Silphium compositum, Baptisia tinctoria, Piptochaetium avenaceum*, and by the

absence of species more typical in mesic, montane oak forests (*Medeola virginiana, Maianthemum racemosum, Thelypteris noveboracensis, Athyrium filix-femina ssp. asplenioides, Dennstaedtia punctilobula, Dryopteris intermedia*). The shrub stratum can be quite open, with *Rhododendron calendulaceum* typical. *Kalmia latifolia* and *Vaccinium pallidum* are usually present in moderate abundance. *Solidago odora var. odora* and *Pteridium aquilinum var. latiusculum* are typical herb components.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Quercus velutina*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Pinus echinata*, *Pinus virginiana*, *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Quercus velutina*
Global: *Baptisia tinctoria*, *Kalmia latifolia*, *Piptochaetium avenaceum*, *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Schizachyrium scoparium*, *Silphium compositum*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (4-Oct-2004). This association is known as a matrix forest type in the area of Brevard, North Carolina, where it occurs on open slopes and broad ridges in a landscape of a low, rolling plateau. It may extend south into South Carolina and Tennessee. It does occur on public lands, but since it is on lower elevations, it would be easy to access for logging and/or conversion to other uses (i.e., pine plantations and development on private land).

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Appalachian Montane Oak - Hickory Forest (Typic Acidic Type) (CEGL007230) replaces this association (CEGL007691) above about 670 m (2,200 feet) elevation.
Global Classification Comments: This association was defined based on North Carolina occurrences. More information is needed to better describe this association and define its geographic distribution.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This forest was observed within the AT corridor in Wesser and Tanyard Gap, North Carolina, Waterville, Tennessee, at Allen Gap along the TN/NC border.
Global Range: This association is known as a matrix forest type in the area of Brevard, North Carolina. It may extend south into South Carolina. Its full range may not be known (status in Tennessee unclear).
Nations: US
States/Provinces: GA?, NC, SC?, TN?
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee?, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAMO
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (10 accuracy assessment points): APPA_AA_0016, APPA_AA_0242, APPA_AA_0452, APPA_AA_0587, APPA_AA_0621, APPA_AA_0811, APPA_AA_0943, APPA_AA_1287, APPA_AA_1471, APPA_AA_1494.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): M.P. Schafale and M. Pyne
References: NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 1998b, Schafale 1998b*, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. Data

G016. NORTHEASTERN CHINQUAPIN OAK - RED-CEDAR ALKALINE FOREST & WOODLAND

Group Summary Description: This group encompasses relatively dry calcareous forests and woodlands of temperate eastern North America, in which *Quercus muehlenbergii* is associated with a variety of hardwoods and/or *Juniperus virginiana*. Examples can occur on a variety of topographic and landscape positions, including ridgetops and upper and midslopes. It also includes relatively dry, rich woodlands of traprock habitats in the Northeast. Droughts and fires are factors determining the relative mixture of deciduous hardwood versus evergreen trees. In the Southern Ridge and Valley region, the Central Basin of Tennessee and other related areas, these forests may cover large areas; elsewhere, they occur as relatively small inclusions within a forest matrix of other oak and pine species.

A3107 *Juniperus virginiana - Fraxinus americana - Carya* spp. Woodland Alliance

Alliance Summary Description: This alliance comprises woodlands of the northeastern U.S., possibly reaching southeastern Canada, characterized by *Carya glabra, Fraxinus americana, Juniperus virginiana, Ostrya virginiana*, and *Quercus rubra*. They are known locally as traprock ridges, rocky ridge balds, rocky summits, or barrens. Physiognomy is generally patchy and open to very open canopy, with abundant forbs and grasses.

[CEGL006037] *Juniperus virginiana - Fraxinus americana / Carex pensylvanica - Cheilanthes lanosa* Open Woodland

Translated Name: **Eastern Red-cedar - White Ash / Pennsylvania Sedge - Hairy Lipfern Open Woodland**
Common Name: **Central Appalachian Circumneutral Barrens**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Northeastern Chinquapin Oak - Red-cedar Alkaline Forest & Woodland (G016)
Alliance	*Juniperus virginiana - Fraxinus americana - Carya* spp. Woodland Alliance (A3107)

ELEMENT CONCEPT

Global Summary: This barrens community occurs on steep slopes with exposed outcrops of calcareous sedimentary, metasedimentary, and metamorphic rocks of the Central Appalachians. In the Ridge and Valley province, underlying bedrock includes calcareous shales of the Jennings, Hampshire, Martinsburg, and Brallier formations, and less commonly calcareous Silurian sandstones. Blue Ridge sites are underlain by Catoctin Formation metabasalt, amphibolite, and Harpers Formation metasiltstone and phyllite. Habitats are on steep, southeast - to southwest-facing slopes at elevations from 170 to 580 m (550-1900 feet). On sites underlain by shale, soils are thin but generally better developed than other shale-barren associations. Mafic-rock sites typically have high cover (about 50%) of exposed bedrock outcrops with some areas of shallow soil development. Sandstone sites generally consist of steep, continuous pavements with thin veneers and pockets of soil. Soils from all substrates have high calcium levels; those weathered from metabasalt and amphibolite also have high magnesium and manganese levels. A patchy overstory of stunted trees may ameliorate to some degree the otherwise xeric conditions imposed by exposure and slope. Canopy closure is usually less than 30%, occasionally higher, and tends to be patchy, with herbaceous openings. Shrubs are sparse at most known locations. The herbaceous layer forms 25-90% ground cover. The canopy is codominated by *Juniperus virginiana* and *Fraxinus americana*, with other associates including *Carya glabra, Quercus prinus, Quercus stellata, Celtis tenuifolia, Amelanchier arborea, Quercus rubra*, and *Pinus virginiana*. *Rhus aromatica* is a characteristic shrub. The herbaceous layer is very diverse. *Carex pensylvanica* is

constant and dominant. *Danthonia spicata* is frequent but sparse. Other characteristic species include *Cheilanthes lanosa, Woodsia obtusa, Phacelia dubia, Deschampsia flexuosa, Solidago arguta var. harrisii (= Solidago harrisii), Schizachyrium scoparium, Phlox subulata, Silene antirrhina, Elymus hystrix (= Hystrix patula), Tradescantia virginiana, Helianthus divaricatus, Polygonum scandens var. cristatum, Polygonatum biflorum, Triodanis perfoliata, Pycnanthemum incanum, Allium cernuum*, and *Arenaria serpyllifolia*. This association is distinguished from other shale-barren types by its open physiognomy, occurrence on circumneutral to calcareous rock at low to moderate elevations, and the frequency of several characteristic herbs including *Cheilanthes lanosa, Phacelia dubia, Tradescantia virginiana*, and *Triodanis perfoliata*. In addition, *Fraxinus americana* and *Celtis tenuifolia* occur at a higher frequency in this association than in other shale-barren types.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This circumneutral barrens community is found on steep, southeast - to southwest-facing slopes with exposed basic metamorphic and other calcium-bearing outcrops at low elevations from 170 to 580 m (550-1,900 feet). It was sampled at two locations in Shenandoah National Park in Virginia on somewhat steep to steep, southwest-facing mid and upper slopes with rapidly drained clay loam and loam soils. The unvegetated surface is dominated by exposed bedrock with some leaf litter, downed wood, large/small rocks and bare soil. Evidence of disturbance includes deer grazing/browsing and the presence of exotic plant species.

Global Environment: This barrens community occurs on steep slopes with exposed outcrops of calcareous sedimentary, metasedimentary, and metamorphic rocks of the Central Appalachians. In the Ridge and Valley province, underlying bedrock includes calcareous shales of the Jennings, Hampshire, Martinsburg, and Brallier formations, and less commonly calcareous Silurian sandstones. Blue Ridge sites are underlain by Catoctin Formation metabasalt, amphibolite, and Harpers Formation metasiltstone and phyllite. Habitats are on steep, southeast - to southwest-facing slopes at elevations from 170 to 580 m (550-1900 feet). On sites underlain by shale, soils are thin but generally better developed than other shale barren associations. Mafic-rock sites typically have high cover (about 50%) of exposed bedrock outcrops with some areas of shallow soil development. Sandstone sites generally consist of steep, continuous pavements with thin veneers and pockets of soil. Soils from all substrates have high calcium levels; those weathered from metabasalt and amphibolite also have high magnesium and manganese levels.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This patchy herbaceous and scrub vegetation has an open canopy that is dominated by *Fraxinus americana*, sometimes codominant with *Juniperus virginiana*. *Rhus aromatica* and/or *Cheilanthes lanosa* are usually present. *Carex pensylvanica* is constant and dominant; *Danthonia spicata* is frequent but sparse. Other herbs can include *Sporobolus vaginiflorus, Polygonum tenue, Talinum teretifolium, Symphyotrichum oblongifolium, Dichanthelium linearifolium*, and/or *Euphorbia corollata*. This community also supports VA-state imperiled *Oligoneuron rigidum var. rigidum*.

Global Vegetation: This community type is characterized by a mixed physiognomy of scattered, stunted trees and herbaceous openings. The patchy canopy may ameliorate to some degree the otherwise xeric conditions imposed by exposure and slope. Canopy closure is usually less than 30%, occasionally higher. Shrubs are sparse at most known locations. The herbaceous layer forms 25-90% ground cover, except where broken by rock outcrops. The canopy is codominated by *Juniperus virginiana* and *Fraxinus americana*, with other associates including *Carya glabra, Quercus prinus, Quercus stellata, Celtis tenuifolia, Amelanchier arborea, Quercus rubra*, and *Pinus virginiana*. *Rhus aromatica* is a characteristic shrub. The herbaceous layer is very diverse. *Carex pensylvanica* is constant and dominant. *Danthonia spicata* is frequent but sparse. Other characteristic species include *Cheilanthes lanosa, Woodsia obtusa, Phacelia dubia, Deschampsia flexuosa, Solidago arguta var. harrisii (= Solidago harrisii), Schizachyrium scoparium, Phlox subulata, Silene antirrhina, Elymus hystrix (= Hystrix patula), Tradescantia virginiana, Helianthus divaricatus, Polygonum scandens var. cristatum, Polygonatum biflorum, Triodanis perfoliata, Pycnanthemum incanum, Allium cernuum*, and *Arenaria serpyllifolia*. Although they are very similar, expressions of this community type on shale and metabasalt exhibit some compositional differences. Shale occurrences contain a greater number of low-cover forbs and exclusively contain several shale endemics and other species common on shale barrens, including *Blephilia ciliata, Clematis albicoma, Deschampsia flexuosa, Draba ramosissima, Eriogonum allenii, Melica nitens, Minuartia michauxii, Oenothera argillicola, Packera antennariifolia*, and *Trifolium virginicum*. Occurrences on mafic outcrops tend to have stratified graminoid dominance, with *Schizachyrium scoparium* forming a taller layer over *Carex pensylvanica*. Species documented only on metabasalt and amphibolite, including *Cyperus lupulinus, Isanthus brachiatus, Muhlenbergia capillaris var. capillaris, Polygonum tenue, Oligoneuron rigidum var. rigidum (= Solidago rigida ssp. rigida), Sporobolus*

clandestinus, and *Talinum teretifolium*, are probably associated with high-magnesium soils weathered from this substrate. *Quercus stellata* is common on the few known sandstone sites. However, despite these differences, stands on all substrates share almost all of the type's characteristic species as well as a remarkable number of other specialized xerophytic species, including *Asclepias verticillata, Symphyotrichum oblongifolium (= Aster oblongifolius), Bouteloua curtipendula, Lithospermum canescens, Paronychia montana, Selaginella rupestris, Taenidia montana*, and *Triosteum perfoliatum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana* var. *virginiana*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*
Herb (field)	Graminoid	*Carex pensylvanica*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana*
Herb (field)	Graminoid	*Carex pensylvanica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Carex pensylvanica*, *Danthonia spicata*, *Dichanthelium linearifolium*, *Euphorbia corollata*, *Fraxinus americana*, *Oligoneuron rigidum* var. *rigidum*, *Polygonum tenue*, *Rhus aromatica* var. *aromatica*, *Sporobolus vaginiflorus*, *Symphyotrichum oblongifolium*, *Talinum teretifolium*

Global: *Allium cernuum*, *Arenaria serpyllifolia*, *Danthonia spicata*, *Deschampsia flexuosa*, *Elymus hystrix*, *Fraxinus americana*, *Helianthus divaricatus*, *Juniperus virginiana*, *Phacelia dubia*, *Phlox subulata*, *Polygonatum biflorum*, *Polygonum scandens* var. *cristatum*, *Pycnanthemum incanum*, *Rhus aromatica*, *Silene antirrhina*, *Solidago arguta* var. *harrisii*, *Tradescantia virginiana*, *Triodanis perfoliata*, *Woodsia obtusa*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Oligoneuron rigidum* var. *rigidum* (G5T5, VA state-imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium), *Barbarea vulgaris* (Low/Insignificant), *Hypericum perforatum* (High/Medium), *Poa compressa* (High/Low)

Global: Vulnerable Plants: *Arabis serotina* (G2), *Clematis coactilis* (G3), *Clematis viticaulis* (G1), *Melica nitens* (G5, state-rare), *Oligoneuron rigidum* var. *rigidum* (G5T5, state-rare), *Taenidia montana* (G3), *Trifolium virginicum* (G3, endemic or near-endemic shale barren plant); **Invasive/Exotic Plants**: *Arenaria serpyllifolia*; **Other Plants**: *Cheilanthes lanosa* (G5), *Schizachyrium scoparium* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (23-Nov-1998). This small-patch community likely totals less than 1000 acres rangewide in fewer than 60 occurrences. It is restricted to two subsections in the central Appalachians. Although the community is relatively isolated by its steep slope and unstable substrate, it is threatened by invasive exotics such as *Bromus sterilis, Bromus tectorum, Bromus japonicus, Centaurea biebersteinii, Lonicera japonica, Verbascum thapsus, Alliaria petiolata*, and *Ailanthus altissima*.

RELATED CONCEPTS

Global Similar Types:

- *Fraxinus americana - Carya glabra / Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland (CEGL003683) often co-occurring woodland that is more closed and dominated by deciduous trees.
- *Fraxinus americana / Physocarpus opulifolius / Carex pensylvanica - Allium cernuum - (Phacelia dubia)* Wooded Grassland (CEGL008529) mafic barren occurring at higher elevations on the Northern Blue Ridge; lacks *Juniperus virginiana* and many other low-elevation species.
- *Pinus virginiana - Juniperus virginiana - Quercus rubra / Solidago arguta var. harrisii - Opuntia humifusa* Woodland (CEGL006288) typical shale barren community developed on unstable shale slopes undercut by streams; lacks calciphilic species.
- *Pinus virginiana - Juniperus virginiana / Schizachyrium scoparium - Eriogonum allenii* Wooded Grassland (CEGL008530) grass-dominated shale barren of stabilized crests and upper slopes; much less diverse and lacking calciphilic species.

- *Pinus virginiana - Quercus prinus / Packera antennariifolia - Phlox subulata* Woodland (CEGL006562) typical shale barren community developed on unstable shale slopes undercut by streams, in the heart of shale endemism (west-central VA and adjacent WV); lacks calciphilic species.
- *Quercus prinus - Carya glabra / Cheilanthes lanosa - Carex pensylvanica - Camassia scilloides* Woodland (CEGL007070)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled at Gooney Manor and Gooney Run in Shenandoah National Park in Virginia.
Global Range: This association is restricted to two subsections of four states (Maryland, Pennsylvania, Virginia, West Virginia) of the Central Appalachians.
Nations: US
States/Provinces: MD, PA, VA, WV
TNC Ecoregions: 51:C, 59:C
USFS Ecoregions (1994/95): 221D:CP, M221Aa:CCC, M221Ab:CCC, M221B:C?, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal, Harpers Ferry, Shenandoah); USFS (George Washington, Jefferson, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HCAB
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 plots; 1 accuracy assessment point):APPA.0244, APPA.0245, APPA_AA_0934.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and S.C. Gawler
References: CAP pers. comm. 1998, Eastern Ecology Working Group n.d.*, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2007a, Harrison 2004, Harrison 2011, Lea 2003, VDNH unpubl. data, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL006002] *Juniperus virginiana - Fraxinus americana / Danthonia spicata - Poa compressa* Woodland

Translated Name: **Eastern Red-cedar - White Ash / Poverty Oatgrass - Canada Bluegrass Woodland**
Common Name: **Traprock Ridge**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Northeastern Chinquapin Oak - Red-cedar Alkaline Forest & Woodland (G016)
Alliance	*Juniperus virginiana - Fraxinus americana - Carya* spp. Woodland Alliance (A3107)

ELEMENT CONCEPT

Global Summary: This traprock ridge open woodland is known from mountainous sites in New England, New Jersey, and Pennsylvania, and may occur in southeastern New York. The vegetation occurs primarily on exposed outcrops of basaltic rock in the Connecticut Valley of New England and the Piedmont physiographic province in New Jersey. While most sites are on igneous rock, along the Kittatinny Ridge in Pennsylvania and New Jersey, it occurs on conglomerates of the Shawangunk Formation. Sites supporting this community are upper slopes of basalt, diorite, or conglomerate ridges from 365-1050 m elevation, characteristically south- or west-facing and range in slope from 5-30°. Most sites have minimal soil development. Tree cover is sparse, ranging from 5-30% cover (average 20%) with *Juniperus virginiana* being the most constant canopy tree. Other woody species sometimes present include *Fraxinus americana, Quercus rubra, Quercus prinus, Ostrya virginiana*, and *Carya glabra*. The actual canopy composition reflects, to some extent, the surrounding forest. The scattered shrub layer often includes

Rosa carolina, Quercus prinus, Quercus ilicifolia, Rhus typhina (= Rhus hirta), Vaccinium pallidum, Vaccinium angustifolium, Viburnum rafinesquianum, and *Prunus virginiana*. The herbaceous layer usually covers 12-50% of the ground and is dominated by *Schizachyrium scoparium, Deschampsia flexuosa*, and *Danthonia spicata*, with their relative abundance varying from site to site. Numerous other herbaceous species occur in this community type, including *Carex pensylvanica, Anthoxanthum odoratum, Hypericum gentianoides, Antennaria plantaginifolia, Corydalis sempervirens, Solidago nemoralis, Poa compressa, Maianthemum racemosum, Uvularia perfoliata, Aquilegia canadensis, Asclepias verticillata, Polygonum scandens, Krigia virginica*, and *Houstonia longifolia*. No species is restricted to this community, but the assemblage listed above is very characteristic.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This red-cedar - white ash woodland occurs primarily on exposed outcrops and is known from mountainous sites in New England, New Jersey, and Pennsylvania. Sites are moderate to steep east-, south- and southeast-facing upper slopes and ridgetops. Soils are dry, rapidly drained sandy loam and silt loam. The unvegetated surface consists of leaf litter or large rocks, with lesser amounts of exposed bedrock, small rocks, bare soil and downed wood. Evidence of disturbance includes the presence of exotic plants.

Global Environment: This sparse woodland occurs primarily on exposed outcrops of basaltic rock in the Connecticut Valley of New England and the Piedmont physiographic province in New Jersey and adjacent Pennsylvania. While most sites are on igneous rock, along the Kittatinny Ridge in Pennsylvania and New Jersey, it occurs on conglomerates of the Shawangunk Formation. Sites supporting this community are upper slopes of basalt, diorite, or conglomerate ridges from 365-1050 m elevation. The ridges are characteristically south- or west-facing and range in slope from 5-30°. Most sites have minimal soil development.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Carya glabra, Carya ovata, Fraxinus americana*, and/or *Prunus serotina* are dominant in the canopy with *Juniperus virginiana*. *Quercus ilicifolia* and *Vaccinium pallidum* dominate the shrub layer. *Schizachyrium scoparium, Deschampsia flexuosa*, and/or *Danthonia spicata* are common and dominant grasses, and *Dryopteris marginalis* is a common fern.

Global Vegetation: This community occurs as exposed, mainly herbaceous openings on ridgetops of resistant mafic rock. Occurrences are generally less than 0.1 ha in size. Tree cover is sparse, ranging from 5-30% cover (average 20%) with *Juniperus virginiana* being the most constant canopy tree. Other woody species sometimes present include *Fraxinus americana, Quercus rubra, Quercus prinus, Ostrya virginiana*, and *Carya glabra*. The actual canopy composition reflects, to some extent, the surrounding forest. The scattered shrub layer often includes *Rosa carolina, Quercus prinus, Quercus ilicifolia, Rhus typhina (= Rhus hirta), Vaccinium pallidum, Vaccinium angustifolium, Viburnum rafinesquianum*, and *Prunus virginiana*. The herbaceous layer usually covers 12-50% of the ground and is dominated by *Schizachyrium scoparium, Deschampsia flexuosa*, and *Danthonia spicata*, with their relative abundance varying from site to site. Numerous other herbaceous species occur in this community type, including *Carex pensylvanica, Anthoxanthum odoratum, Hypericum gentianoides, Antennaria plantaginifolia, Corydalis sempervirens, Solidago nemoralis, Poa compressa, Maianthemum racemosum, Uvularia perfoliata, Aquilegia canadensis, Asclepias verticillata, Polygonum scandens, Krigia virginica*, and *Houstonia longifolia*. No species is restricted to this community, but the assemblage listed above is very characteristic. Several uncommon species are associated with this community, including *Houstonia longifolia, Selaginella rupestris, Arabis missouriensis, Polygonum tenue, Scutellaria parvula var. missouriensis (= Scutellaria parvula var. leonardii), Muhlenbergia capillaris, Pycnanthemum torrei*, and *Pycnanthemum clinopodioides*.

Global Dynamics: The role of fire in maintaining these sites is unclear, but several authors suspect that the open structure reflects a history of burning in addition to an edaphic restriction.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Carya glabra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Quercus ilicifolia*
Herb (field)	Graminoid	*Deschampsia flexuosa*, *Schizachyrium scoparium*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana*
Herb (field)	Graminoid	*Carex pensylvanica*, *Danthonia spicata*, *Deschampsia flexuosa*, *Schizachyrium scoparium*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Carya glabra*, *Deschampsia flexuosa*, *Dryopteris marginalis*, *Juniperus virginiana*, *Quercus ilicifolia*, *Schizachyrium scoparium*, *Vaccinium pallidum*
Global: *Danthonia spicata*, *Deschampsia flexuosa*, *Helianthemum bicknellii*, *Isanthus brachiatus*, *Poa compressa*, *Rosa carolina*, *Solidago nemoralis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Anthoxanthum odoratum*, *Hypericum perforatum* (High/Medium), *Linaria vulgaris* (High/Low), *Poa compressa* (High/Low), *Rumex acetosella* (Medium/Low), *Solanum nigrum*, *Stellaria media* (Low)
Global: Vulnerable Plants: *Pycnanthemum clinopodioides* (G1G2), *Pycnanthemum torrei* (G2); **Invasive/Exotic Plants**: *Poa compressa* (High/Low); **Other Plants**: *Arabis missouriensis* (G5), *Houstonia longifolia* (G5), *Muhlenbergia capillaris* (G5), *Polygonum tenue* (G5), *Scutellaria parvula* var. *missouriensis* (G4T4), *Selaginella rupestris* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (20-May-2011). There are probably 30-60 occurrences of this community rangewide. At least 19 occurrences have been documented from Connecticut, Massachusetts, Pennsylvania and New Jersey, with outliers in New Hampshire and southeastern New York. This community is restricted to exposed outcrops of basaltic rock in the Connecticut River valley of New England and the Piedmont and High Allegheny Plateau physiographic province of New Jersey and adjacent Pennsylvania. Most occurrences are small; total acreage is probably less than 500 acres rangewide.

RELATED CONCEPTS

Global Similar Types:
- *Juniperus virginiana - Ostrya virginiana / Carex eburnea* Woodland (CEGL006180)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community is restricted to exposed outcrops of basaltic rock in the Connecticut River valley of New England and the Piedmont and High Allegheny Plateau physiographic province of New Jersey and adjacent Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: Standing dead red-cedar trees from heat stress occur in the New Jersey Culvers Gap stand.
Global Classification Comments: In general, this community is similar to a number of other sparse woodland ridgetop communities. New Jersey occurrences are floristically related to ridgetop sparse woodlands in Virginia (e.g., greenstone glades) but appear to share more species with the northern occurrences with which they have been grouped here. However, further research may indicate that the New Jersey occurrences represent a unique vegetation assemblage. In Massachusetts, this community typically occurs as herbaceous (and probably successional) patches within a hickory-hop hornbeam forest. New York contains some examples of this community which they classify under the name "red cedar rocky summit community."

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Delaware Water Gap in Pennsylvania and New Jersey, at Culvers Gap North in New Jersey, and at Fort Defiance Hill in New York.
Global Range: This community has been described from mountainous sites in New England states: Fall Mountain in New Hampshire; Bare Mountain, East Mountain, Mount Tom and Mount Norwottuck in Massachusetts; Onion Mountain, Sugarloaf, Sleeping Giant and West Mountain in Connecticut. It has also been documented at sites in the

Watchung Mountains in New Jersey, Kittatinny Ridge in New Jersey and Pennsylvania, and in southeastern New York.
Nations: CA?, US
States/Provinces: CT, MA, NH, NJ:S1S2, NY, ON?, PA:S2, VT
TNC Ecoregions: 60:C, 61:C
USFS Ecoregions (1994/95): 212B:CC, 212Fc:CCC, 221Ae:CCC, 221Af:CCC, 221Bd:CCC, 221Dc:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap, Upper Delaware)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WTRR
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 plots; 2 observation points; 3 accuracy assessment points): APPA.0061, APPA.0073, APPA.0075, APPA.1348, APPA.1405, APPA_AA_1700, APPA_AA_1967, APPA_AA_3035.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): M. Anderson and S.C. Gawler
References: Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Fike 1999, Grossman et al. 1994, Lee 1985, Lee et al. 1998, Livingston and Lund 1982, Metzler and Barrett 1992, Metzler and Barrett 2001, Metzler and Barrett 2006, Motzkin 1993, NYNHP 2009, Nichols 1914, Perles et al. 2007, Perles et al. 2008, Rawinski 1984a, Roberts 1914, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Walz 1996

A2047 *Quercus muehlenbergii - Acer saccharum - Tilia americana* Forest Alliance

Alliance Summary Description: This alliance includes a variety of dry and dry-mesic forests characterized by *Quercus muehlenbergii* and *Acer saccharum*, with associates including *Carya ovalis, Carya ovata, Fraxinus americana, Juglans nigra, Quercus alba*, and *Tilia americana*. Common subcanopy trees include *Cercis canadensis, Cornus florida*, and *Ostrya virginiana*. The shrub layer is often sparse and may contain *Cornus alternifolia, Hamamelis virginiana, Staphylea trifolia, Viburnum prunifolium, Viburnum rafinesquianum*, and *Zanthoxylum americanum*. The herbaceous layer may contain *Arabis laevigata, Asclepias quadrifolia, Clematis occidentalis (= Clematis verticillaris), Packera obovata (= Senecio obovatus), Phryma leptostachya, Saxifraga virginiensis*, and *Triosteum aurantiacum*. This vegetation occurs on upper slopes and summits on limestone, dolomite, or marble substrates. The alliance ranges from Ontario, Canada, into the eastern United States from the Great Lakes and Northern Appalachians south along the Allegheny Plateau and Appalachian Mountains, east to the Piedmont, and west to the North Central Tillplain and Interior Low Plateau.

[CEGL006162] *Acer saccharum - Quercus muehlenbergii / Carex platyphylla* Forest

Translated Name: **Sugar Maple - Chinquapin Oak / Broadleaf Sedge Forest**
Common Name: **Sugar Maple - Chinquapin Oak / Sedge Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Northeastern Chinquapin Oak - Red-cedar Alkaline Forest & Woodland (G016)
Alliance	*Quercus muehlenbergii - Acer saccharum - Tilia americana* Forest Alliance (A2047)

ELEMENT CONCEPT

Global Summary: This dry calcareous forest occurs on upper slopes and wooded summits on limestone, dolomite or marble bedrock in the northeastern United States. The somewhat open canopy is characterized by a diversity of tree species, including *Acer saccharum, Quercus muehlenbergii, Tilia americana, Fraxinus americana*, and occasionally *Liriodendron tulipifera, Quercus alba, Quercus prinus, Juglans cinerea, Juglans nigra, Carya cordiformis, Ulmus rubra, Carya ovata*, or *Carya ovalis*. *Ostrya virginiana, Betula lenta, Carya alba (= Carya tomentosa), Celtis occidentalis*, and/or *Cornus florida* often form a subcanopy. Shrubs can include *Hamamelis virginiana, Carpinus caroliniana, Staphylea trifolia, Cornus alternifolia, Viburnum acerifolium, Ribes americanum*, and occasionally *Zanthoxylum americanum* or *Viburnum rafinesquianum*. Vines may include *Dioscorea villosa, Menispermum canadense, Parthenocissus quinquefolia*, and *Toxicodendron radicans*. The herb layer is extraordinarily diverse with *Packera obovata (= Senecio obovatus), Carex eburnea, Carex platyphylla, Polygala*

senega, Aquilegia canadensis, Aureolaria flava, Piptatherum racemosum (= Oryzopsis racemosa), Anemone virginiana, Hepatica nobilis var. obtusa (= Hepatica americana), Symphyotrichum patens (= Aster patens), Symphyotrichum undulatum (= Aster undulatus), Triosteum aurantiacum, Thalictrum dioicum, Clematis occidentalis, Asclepias quadrifolia, Arabis canadensis, Geranium maculatum, Penstemon hirsutus, Trillium grandiflorum, Osmorhiza claytonii, Actaea pachypoda, Agastache nepetoides, Allium tricoccum, Arabis lyrata, Arisaema triphyllum, Asclepias exaltata, Collinsonia canadensis, Dichanthelium boscii, Carex laxiflora, Trichophorum planifolium (= Scirpus verecundus), and many others. Bedrock outcrops and boulders are common. Southern species tend to drop out at the northern extent of this type.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This sugar maple - chinkapin oak forest is a semi-rich, dry to dry-mesic forest occurring on calcareous soils. It occurs on upper slopes and wooded summits on limestone, dolomite or marble bedrock from New Jersey north to Vermont. Sites range from gentle to steep mid and upper sideslopes and rock outcrops with mostly eastern and southern aspects. Soils range from moderately well-drained to rapidly drained and include sandy loam, clay loam and loam. The unvegetated surface consists of leaf litter, with small amounts of exposed bedrock, large rocks, bare soil, and/or downed wood. Evidence of disturbance includes trails, stone walls, deer browse, and the presence of exotic plants.
Global Environment: Dry calcareous forest occurring on upper slopes and wooded summits on limestone or marble bedrock. Bedrock outcrops and boulders are common.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy is codominated by some combination of *Quercus muehlenbergii* (MA state-imperiled), *Acer saccharum*, and/or *Fraxinus americana*, typically with *Ostrya virginiana* in the subcanopy. *Rubus occidentalis* is a common shrub. The herb layer is diverse with forbs, ferns, and graminoids, including *Amphicarpaea bracteata, Carex ebenea, Eurybia divaricata, Packera obovata*, and *Solidago flexicaulis*. A total of 12 exotic taxa were reported from the five sample plots. In addition, this community supports CT state-imperiled *Asplenium ruta-muraria* and MA state-imperiled *Asclepias verticillata*.
Global Vegetation: The somewhat open canopy is characterized by a diversity of tree species, including *Acer saccharum, Quercus muehlenbergii, Tilia americana, Fraxinus americana*, and occasionally *Liriodendron tulipifera, Quercus alba, Quercus prinus, Juglans cinerea, Juglans nigra, Carya cordiformis, Ulmus rubra, Carya ovata*, or *Carya ovalis*. *Ostrya virginiana, Betula lenta, Carya alba (= Carya tomentosa), Celtis occidentalis*, and/or *Cornus florida* often form a subcanopy. Shrubs can include *Hamamelis virginiana, Carpinus caroliniana, Staphylea trifolia, Cornus alternifolia, Viburnum acerifolium, Ribes americanum*, and occasionally *Zanthoxylum americanum* or *Viburnum rafinesquianum*. Vines may include *Dioscorea villosa, Menispermum canadense, Parthenocissus quinquefolia*, and *Toxicodendron radicans*. The herb layer is extraordinarily diverse with *Packera obovata (= Senecio obovatus), Carex eburnea, Carex platyphylla, Polygala senega, Aquilegia canadensis, Aureolaria flava, Piptatherum racemosum (= Oryzopsis racemosa), Anemone virginiana, Hepatica nobilis var. obtusa (= Hepatica americana), Symphyotrichum patens (= Aster patens), Symphyotrichum undulatum (= Aster undulatus), Triosteum aurantiacum, Thalictrum dioicum, Clematis occidentalis, Asclepias quadrifolia, Arabis canadensis, Geranium maculatum, Penstemon hirsutus, Trillium grandiflorum, Osmorhiza claytonii, Actaea pachypoda, Agastache nepetoides, Allium tricoccum, Arabis lyrata, Arisaema triphyllum, Asclepias exaltata, Collinsonia canadensis, Dichanthelium boscii, Carex laxiflora, Trichophorum planifolium (= Scirpus verecundus)*, and many others.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*, *Quercus muehlenbergii*
Tree subcanopy	Broad-leaved deciduous tree	*Ostrya virginiana*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus occidentalis*
Herb (field)	Flowering forb	*Amphicarpaea bracteata*, *Eurybia divaricata*, *Packera obovata*, *Solidago flexicaulis*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*, *Quercus muehlenbergii*, *Tilia americana*
Tree subcanopy	Broad-leaved deciduous tree	*Betula lenta*, *Carya alba*, *Celtis occidentalis*, *Cornus florida*, *Ostrya virginiana*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus occidentalis*
Herb (field)	Flowering forb	*Packera obovata*
Herb (field)	Graminoid	*Carex platyphylla*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer saccharum*, *Amphicarpaea bracteata*, *Fraxinus americana*, *Quercus muehlenbergii*, *Rubus occidentalis*
Global: *Acer saccharum*, *Carex platyphylla*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Asclepias verticillata* (G5, MA state-imperiled), *Asplenium ruta-muraria* (G5, CT state-imperiled), *Quercus muehlenbergii* (G5, MA state-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Duchesnea indica* (Low/Insignificant), *Frangula alnus* (High/Medium), *Lonicera morrowii* (High/Medium), *Poa compressa* (High/Low), *Rhamnus cathartica* (High/Medium), *Rosa multiflora* (Medium/Low), *Rubus phoenicolasius* (Medium), *Verbascum thapsus* (Medium), *Vinca major* (Medium)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharum - Fraxinus americana - Juglans cinerea / Staphylea trifolia / Adlumia fungosa* Forest (CEGL006577)
- *Acer saccharum - Quercus muehlenbergii / Cercis canadensis* Forest (CEGL006017) mostly south of the glacial boundary.
- *Acer saccharum - Quercus muehlenbergii* Forest (CEGL005010) more midwestern.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Dry calcareous forest occurring on upper slopes and wooded summits on limestone or marble bedrock.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Litchfield County and at Great Falls in Connecticut, at Vossburg Hills Natural Heritage Site in Massachusetts, and near Pochuck Creek in Sussex County, New Jersey.
Global Range: This association occurs in the northeastern United States, from Vermont to New Jersey.
Nations: US
States/Provinces: CT, MA:S2, NJ, NY, VT:S3
TNC Ecoregions: 61:C, 63:P, 64:C
USFS Ecoregions (1994/95): 212E:CP, 221Ae:CCC, 221B:CC, 221D:CC, M212B:CC, M212Cb:CCC, M212Cc:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FSMC
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 plots; 1 observation point; 2 accuracy assessment points): APPA.0011, APPA.0039, APPA.0919, APPA.1446, APPA_AA_1846, APPA_AA_2178.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid and L.A. Sneddon
References: Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Metzler and Barrett 2001, Metzler and Barrett 2006, Rawinski 1984a, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006017] *Acer saccharum - Quercus muehlenbergii / Cercis canadensis* Forest

Translated Name: **Sugar Maple - Chinquapin Oak / Eastern Redbud Forest**
Common Name: **Appalachian Sugar Maple - Chinquapin Oak Limestone Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Northeastern Chinquapin Oak - Red-cedar Alkaline Forest & Woodland (G016)
Alliance	*Quercus muehlenbergii - Acer saccharum - Tilia americana* Forest Alliance (A2047)

ELEMENT CONCEPT

Global Summary: This calciphilic maple-oak forest is found in the Central Appalachians and adjacent regions of the eastern United States, ranging south and west to the Interior Low Plateau of Tennessee and the Cumberlands of Alabama. Stands occur in thin soils over calcareous substrates, sometimes in association with limestone glades. These are typically closed-canopy, rich, dry to dry-mesic forests; in some stands the canopy may vary from closed to somewhat open, particularly in Pennsylvania at the northern edge of the range. In the Mid-Atlantic region, stands occupying the driest sites are commonly open and somewhat intermediate in physiognomy between forest and woodland. The stands are primarily composed of *Acer saccharum* or occasionally *Acer nigrum, Quercus muehlenbergii, Fraxinus americana*, and *Ostrya virginiana*. Associates include *Quercus alba, Tilia americana, Acer nigrum, Ulmus rubra, Celtis occidentalis, Carya ovalis*, and *Carya ovata*. *Quercus prinus* may also be present in some examples. A variable subcanopy and shrub layer contains *Cornus florida, Cercis canadensis, Hamamelis virginiana, Rosa carolina, Rhus aromatica, Viburnum prunifolium, Viburnum rafinesquianum, Viburnum rufidulum*, and *Zanthoxylum americanum*. The sparse to well-developed herb layer may contain *Danthonia spicata, Elymus hystrix, Bouteloua curtipendula, Ageratina altissima (= Eupatorium rugosum), Antennaria plantaginifolia, Aquilegia canadensis, Arabis laevigata, Asclepias quadrifolia, Clematis occidentalis* (to the north), *Houstonia longifolia (= Houstonia tenuifolia), Polygonum scandens, Sanicula canadensis, Saxifraga virginiensis*, and *Packera obovata (= Senecio obovatus)*. Some other herbs recorded in Virginia examples include *Agrimonia rostellata, Anemone virginiana var. virginiana, Symphyotrichum patens var. patens (= Aster patens var. patens), Bromus pubescens, Dichanthelium boscii, Erigeron pulchellus var. pulchellus, Galium circaezans, Sanicula canadensis, Scutellaria elliptica*, and *Solidago ulmifolia var. ulmifolia*. Some stands attributed to this type are mesic forests of steep slopes in the Southern Ridge and Valley which are dominated by *Acer saccharum* and some combination of *Quercus alba* and/or *Quercus muehlenbergii* with *Liriodendron tulipifera, Carya* spp., and *Aesculus flava* in either the canopy or subcanopy. The same, or related forests, are reported from limestones of the lower Cumberland Plateau escarpment of Tennessee and possibly Alabama.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This sugar maple - chinkapin oak forest occurs on middle slopes or summits of limestone ridges and sideslopes with dry, rocky soils at 550 m elevation. It was sampled on a rocky, upper slope of a calcareous ridge in Giles County, Virginia, in the Central Appalachian project area on a middle slope. Soils are dry-mesic over calcareous substrates with high levels of magnesium and calcium. The unvegetated surface is dominated by leaf litter with some downed wood, large rocks and bare soil. Evidence of disturbance includes past logging and the presence of exotic plant species.
Global Environment: This association is typically found on upper sideslopes or summits of limestone, dolomite, or marble ridges with dry soils. Along the New River in West Virginia, it is found in small patches on lower to middle gorge slopes eroded from calcareous geologic formations. These are alkaline forests associated with calcareous

soils, often surrounding, or in association with, limestone or dolomite glades. The soils are well-drained, dry, and shallow with outcrops or boulders often present. In the Ridge and Valley and Central Appalachians of Virginia (Fleming 1999), stands of this type are evidently confined to substrates weathered from limestone and dolomite, most frequently occupying submesic to subxeric, southeast- to west-facing slopes at relatively low elevations (mean = 569 m [1867 feet]). These habitats usually appear to be quite dry, rocky, and at least somewhat exposed. The stands are most often situated on middle slopes but range into both lower and upper slope topographic positions. The slope shape is typically convex in at least one direction. Soils are yellow-brown to reddish-brown clay loams and silty clay loams; soil reaction ranges from strongly acidic (pH 5.3) to mildly alkaline (pH 7.4), with mean calcium (Ca) levels of 2474 ppm. In soils weathered from dolomite, magnesium (Mg) levels may exceed 1000 ppm (Fleming 1999). Soil chemistry analyzed from the one WV plot at New River Gorge had high pH (6.8) and high levels of total cation-exchange capacity, calcium (4180 ppm), potassium (121 ppm), and magnesium (424 ppm) compared to most other soils nearby.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The variable mixed overstory of this dry, species-rich, calcareous forest is composed of *Quercus alba, Quercus rubra*, and *Quercus muehlenbergii*, while *Acer saccharum* overwhelmingly dominates the understory, accounting for almost half the total density of stems (>2.5 cm dbh) in the plot. *Fraxinus americana* is also common. *Cercis canadensis* is characteristic in the subcanopy. The shrub layer is rather sparse, while the herb layer is low and fairly dense, featuring patch-dominance by *Packera obovata, Erigeron pulchellus, Hepatica nobilis var. acuta*, and *Thalictrum dioicum*. *Ageratina altissima var. altissima, Agrimonia rostellata, Muhlenbergia sobolifera*, and *Solidago ulmifolia* are also present at low cover. The stand is fairly typical of dry calcareous forests on carbonate substrates of the Virginia Ridge and Valley province.

Global Vegetation: The tall, closed-canopy stands are primarily composed of *Acer saccharum, Quercus muehlenbergii, Fraxinus americana*, and *Ostrya virginiana*. Associates include *Quercus alba, Tilia americana, Acer nigrum, Ulmus rubra, Aesculus flava, Celtis occidentalis, Carya ovalis, Carya cordiformis*, and *Carya ovata*. *Quercus prinus* may also be present in some examples. Throughout the Central Appalachians, stands occupying the driest sites are commonly open and somewhat intermediate in physiognomy between forest and woodland. A variable subcanopy and shrub layer contains *Cornus florida, Cercis canadensis, Carpinus caroliniana, Lindera benzoin, Hamamelis virginiana, Rosa carolina, Rhus aromatica, Viburnum prunifolium, Viburnum rafinesquianum, Viburnum rufidulum*, and *Zanthoxylum americanum*. The sparse to well-developed herb layer is usually species-rich and may contain *Danthonia spicata, Elymus hystrix, Bouteloua curtipendula, Ageratina altissima (= Eupatorium rugosum), Antennaria plantaginifolia, Aquilegia canadensis, Arabis laevigata, Asclepias quadrifolia, Clematis occidentalis* (to the north), *Houstonia longifolia (= Houstonia tenuifolia), Polygonum scandens, Sanicula canadensis, Saxifraga virginiensis*, and *Packera obovata (= Senecio obovatus)*. Some other herbs recorded in Virginia examples include *Agrimonia rostellata, Anemone virginiana var. virginiana, Symphyotrichum patens var. patens (= Aster patens var. patens), Bromus pubescens, Dichanthelium boscii, Erigeron pulchellus var. pulchellus, Galium circaezans, Sanicula canadensis, Scutellaria elliptica*, and *Solidago ulmifolia var. ulmifolia*. Some additional taxa that are relatively constant in the broad type are *Asplenium platyneuron, Botrychium virginianum, Carex blanda, Actaea racemosa (= Cimicifuga racemosa), Galium triflorum, Hybanthus concolor, Maianthemum racemosum, Polygonatum biflorum, Polymnia canadensis, Ranunculus recurvatus*, and *Sanguinaria canadensis*. In addition, *Muhlenbergia sobolifera* may dominate the herbaceous stratum of some stands.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Quercus alba*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved deciduous tree	*Cercis canadensis*
Herb (field)	Flowering forb	*Erigeron pulchellus*, *Hepatica nobilis* var. *acuta*, *Thalictrum dioicum*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved deciduous tree	*Cercis canadensis*
Herb (field)	Flowering forb	*Erigeron pulchellus*, *Hepatica nobilis* var. *acuta*, *Packera obovata*, *Solidago ulmifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer nigrum*, *Acer saccharum*, *Ageratina altissima* var. *altissima*, *Agrimonia rostellata*, *Fraxinus americana*, *Packera obovata*, *Quercus alba*, *Quercus muehlenbergii*, *Quercus rubra*
Global: *Acer nigrum*, *Bromus pubescens*, *Erigeron pulchellus*, *Hybanthus concolor*, *Muhlenbergia tenuiflora*, *Packera obovata*, *Quercus muehlenbergii*, *Solidago ulmifolia*, *Thalictrum dioicum*, *Ulmus rubra*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Poa compressa* (High/Low)
Global: Vulnerable Plants: *Arabis patens* (G3), *Berberis canadensis* (G3), *Carex purpurifera* (G4?, VA state-rare), *Delphinium exaltatum* (G3), *Desmodium cuspidatum* (G5, VA state-rare), *Lithospermum latifolium* (G4, VA state-rare), *Melica nitens* (G5, VA state-rare), *Monarda fistulosa* ssp. *brevis* (G5T1T2, (= ssp. brevis) (unpubl.))

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (19-Oct-2000). This forest is widely but somewhat locally distributed throughout its range in suitable calcareous habitats. It often occurs in relatively small, sometimes linear, patches except where carbonate substrates are more continuously exposed, for example on low hills and knobs (Fleming 1999). It also occurs in large patches on dry limestone knobs in the southwestern Virginia Ridge and Valley. There is very little requisite habitat for this vegetation in the George Washington and Jefferson national forests of Virginia; hence the type can be considered rare there. The largest occurrences on these national forests are probably in the Clinch Ranger District.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Carya ovata - Juglans nigra / Symphoricarpos orbiculatus / Galium circaezans* Forest (CEGL004741) related forest of the Tennessee Nashville Basin.
- *Acer saccharum - Quercus muehlenbergii / Carex platyphylla* Forest (CEGL006162) a northern variant in southern New England, northern New Jersey, and eastern New York.
- *Acer saccharum - Quercus muehlenbergii* Forest (CEGL005010) more northwesterly.
- *Fraxinus americana - Carya ovata / Frangula caroliniana / Helianthus hirsutus* Woodland (CEGL008458)
- *Quercus alba - Quercus rubra - Carya ovalis / Acer saccharum / Polystichum acrostichoides* Forest (CEGL007233) a more mesic forest found to the south and west.
- *Quercus muehlenbergii - Carya* spp. / *Ostrya virginiana* Upper East Gulf Coastal Plain Forest (CEGL003903)
- *Quercus muehlenbergii - Quercus (alba, rubra) - Carya cordiformis / Viburnum prunifolium* Forest (CEGL004793) clearly related.
- *Quercus muehlenbergii - Quercus (shumardii, stellata) / Cercis canadensis / Viburnum rufidulum* Forest (CEGL007699) more oak-dominated.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This is a dry calcareous forest of limestone and dolomitic (and rarely other sedimentary) substrates. It is rare along the AT. *Quercus muehlenbergii* is the most diagnostic tree. The herbaceous flora is patchy but species-rich, prominently featuring dry-site species such as *Packera obovata, Erigeron pulchellus, Muhlenbergia sobolifera*, and *Solidago ulmifolia*.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: The range of this type, which was initially described from "the High Alleghenies," has gradually extended south to at least the Interior Low Plateau. It may require subdivision. (This

type was formerly attributed questionably to the Upper East Gulf Coastal Plain.) Some stands attributed to this type are mesic forests of steep slopes in the Southern Ridge and Valley which are dominated by *Acer saccharum* and some combination of *Quercus alba* and/or *Quercus muehlenbergii* with *Liriodendron tulipifera, Carya* spp., and *Aesculus flava* in either the canopy or subcanopy (Andreu and Tukman 1995). The same, or related forests, are reported from limestones of the lower Cumberland Plateau escarpment of Tennessee and possibly Alabama (Bowen et al. 1995). There has been discussion of the merits of subdividing this type, in effect re-splitting former *Acer saccharum - Quercus (alba, muehlenbergii) / Aesculus flava* Forest (CEGL006136) (or an equivalent) out of it again.

In a regional analysis of 1134 plots (Georgia, North Carolina, Tennessee, Virginia) for the Southern Appalachian portion of the Appalachian Trail (Fleming and Patterson 2009a), only 14 plots from southwestern Virginia were classified as this type. In a 1300-plot analysis of all Virginia montane upland forest and woodland data (Fleming and Patterson 2009b), 23 plots from across western Virginia are classified as this type. The species that have the highest diagnostic values for the latter group (compared to other calcareous forests) are *Muhlenbergia sobolifera, Erigeron pulchellus var. pulchellus, Bromus pubescens, Solidago ulmifolia var. ulmifolia, Brachyelytrum erectum, Ulmus rubra, Packera obovata, Viburnum prunifolium, Parthenocissus quinquefolia, Quercus rubra, Ostrya virginiana, Thalictrum dioicum, Fraxinus americana*, and *Quercus muehlenbergii*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is extremely uncommon along the AT because of its confinement to limestone. It is limited to valleys of the Ridge and Valley divergence area between I-81 and Roanoke, Virginia. It was sampled at Bluff City South in Virginia.
Global Range: This maple - oak forest is found in the Central Appalachians and adjacent regions of the eastern United States, including the Ridge and Valley and Western Allegheny Plateau regions, ranging from Pennsylvania southward to the Interior Low Plateau of Tennessee and the Ridge and Valley of Virginia.
Nations: US
States/Provinces: AL?, GA, KY, MD:S3S4, OH, PA, TN, VA:S4?, WV
TNC Ecoregions: 44:C, 49:C, 50:C, 51:C, 59:C, 60:?, 61:?
USFS Ecoregions (1994/95): 212Fa:???, 212Ga:???, 212Gb:???, 221A:C?, 221D:C?, 221Ea:CCC, 221Hc:CCC, 221Ja:CCC, 221Jb:CCC, 222Ej:CPP, 222Fd:CCC, 231B:P?, 231Cc:PPP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Bd:CP?, M221Be:CPP, M221Ca:CC?, M221Cb:CCC, M221Cc:CC?, M221Ce:CCC, M221Da:CCC, M221Db:CC?, M221Dc:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal, Chickamauga-Chattanooga); TVA (Tellico); USFS (Cherokee?, Daniel Boone, George Washington, Jefferson, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FMCO
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 1 accuracy assessment point): APPA.0483, APPA_AA_1316.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): G. Fleming and M. Russo, mod. E. Largay
Global Description Author(s): L.A. Sneddon, M. Pyne, after Fleming (1999), G.P. Fleming and S.C. Gawler
References: Andreu and Tukman 1995, Bartgis 1985a, Bartgis 1993, Bowen et al. 1995, CAP pers. comm. 1998, Eastern Ecology Working Group n.d., Fike 1999, Fleming 1999, Fleming 1999*, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2006, Harrison 2004, Harrison 2011, ONHD unpubl. data, Rawinski et al. 1996, Schotz pers. comm., TDNH unpubl. data, VDNH 2003, Vanderhorst et al. 2007, Walton et al. 1997

G650. NORTHEASTERN OAK - HICKORY FOREST & WOODLAND

Group Summary Description: This group is found throughout the northeastern United States, south to Georgia. It is distinguished from other forested groups within the region by a dry-mesic to dry edaphic condition that is transitional between dry barrens and mesic hardwood forests. Forest cover can range from a dense to moderately open canopy of deciduous broadleaf trees (conifers never exceed 25%), and there is commonly a dense shrub layer. In most examples, this vegetation is overwhelmingly deciduous, and characterized by *Quercus alba, Quercus falcata, Quercus prinus, Quercus rubra, Quercus velutina, Fagus grandifolia, Carya glabra, Carya ovata, Carya cordiformis, Carya alba, Fraxinus americana*, and in the southern part of the range, *Liriodendron tulipifera*. One alliance of this group encompasses coastal plain oak-hickory forests of ancient inland dune ridges that are the

remnants of former river terraces; these forests are dry, oak-dominated, and characterized by *Carya pallida*. Pines such as *Pinus rigida, Pinus echinata, Pinus virginiana* can contribute significant canopy cover in these settings.

A2053 *Quercus alba - Carya* spp. - *Fraxinus americana* Forest Alliance

Alliance Summary Description: Associations of this alliance include dry, relatively "rich" forests and open woodlands of the northeastern United States and southern Canada dominated by *Quercus* species and include *Carya* species as a prominent (rarely codominant) feature. *Fraxinus americana*, although sometimes a sporadic member, is generally characteristic of these forests. Associated canopy species include *Quercus alba, Quercus rubra, Quercus velutina, Carya ovalis, Carya glabra*, as well as other oaks and hickories. This vegetation mainly occurs on dry upper slopes or ridgetops; one association is on a bedrock floodplain terrace. Soils are usually fertile, but often very rocky, on well-drained loams or sandy loams, predominantly on southern or eastern exposures. *Ostrya virginiana* is a common understory tree. The shrub layer is usually interrupted to absent. When present, it includes *Viburnum rafinesquianum* and *Cercis canadensis* (at the southern edge of the range). Although ericaceous species may be present and occasionally locally abundant, they are not characteristic. The herbaceous layer is characterized by forbs and may be quite diverse. Common graminoid species include *Carex pensylvanica, Carex lucorum* (at the northern range limit), *Muhlenbergia sobolifera, Elymus hystrix*, and *Danthonia spicata*. Other forbs found in these communities include *Asplenium platyneuron, Solidago caesia, Amphicarpaea bracteata, Woodsia obtusa, Selaginella rupestris, Galium circaezans*, and *Arabis laevigata*. The relatively open canopy, sparse shrub layer, and dense herbaceous layer impart a parklike appearance to many of these forests.

[CEGL003683] *Fraxinus americana - Carya glabra / Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland

Translated Name: **White Ash - Pignut Hickory / Rock Muhly - Woodland Sunflower - Elmleaf Goldenrod Woodland**

Common Name: **Central Appalachian Basic Woodland**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Northeastern Oak - Hickory Forest & Woodland (G650)
Alliance	*Quercus alba - Carya* spp. - *Fraxinus americana* Forest Alliance (A2053)

Element Concept

Global Summary: This association is a woodland dominated by *Fraxinus americana* and *Carya glabra*, occurring in dry, rocky, fertile soils derived from mafic igneous and metamorphic rocks and, less frequently, granitic rocks and calcareous sedimentary and metasedimentary formations. Stands are found from 60 to 1000 m (240-3300 feet) in elevation in the Blue Ridge and upper Piedmont of Virginia, Maryland, and West Virginia. Less constant and important canopy species include *Carya ovalis, Quercus prinus, Quercus rubra var. rubra, Juniperus virginiana*, and *Pinus virginiana*. Subcanopy species include *Celtis tenuifolia, Celtis occidentalis, Cercis canadensis var. canadensis, Ostrya virginiana*, and *Ulmus rubra*. The shrub stratum includes *Rhus aromatica var. aromatica, Ptelea trifoliata, Viburnum rafinesquianum (= var. rafinesquianum), Rhus typhina, Toxicodendron radicans*, and *Vaccinium pallidum*. Typical species of the herb stratum include *Muhlenbergia sobolifera, Helianthus divaricatus, Pycnanthemum incanum, Elymus hystrix, Carex pensylvanica, Polygonum tenue, Woodsia ilvensis, Woodsia obtusa, Phacelia dubia, Symphyotrichum oblongifolium (= Aster oblongifolius), Solidago arguta var. harrisii (= Solidago harrisii), Selaginella rupestris, Cheilanthes lanosa, Danthonia spicata, Cardamine parviflora var. arenicola, Draba ramosissima, Sedum glaucophyllum*, and others.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This Central Appalachian basic woodland occurs on steep rocky slopes from 60 to 1,000 m (240-3,300 feet) elevation with metabasalt outcrops in the Blue Ridge and upper Piedmont. It was sampled at four locations in the park. Sites are moderate to steep mid and upper slopes with mostly southern aspects. Soils are rapidly to well-drained loamy sand and silt loam. The unvegetated surface is dominated by leaf litter with a mix of exposed bedrock, large and small rocks, downed wood and bare soil. Evidence of disturbance includes past fire, deer trails and browse, and the presence of exotic plant species.

Global Environment: Stands occupy dry, rocky, thin-soiled slopes over mafic igneous and metamorphic rocks (metabasalt, diabase, actinolite schist, layered pyroxene granulite) of the Blue Ridge and upper Piedmont, and less frequently on pyroxene- or hornblende-bearing granites of the Blue Ridge, and calcareous sedimentary and metasedimentary rocks (sandstone, siltstone, metasiltstone, phyllite) of the Blue Ridge and Ridge and Valley provinces. Elevations of 38 plot samples and other observed stands range from 60 to 1012 m (240-3300 feet), with a mean of about 550 m (1800 feet). Habitats are usually situated on steep (up to 37°) middle slopes, often on or around large bedrock exposures. Mean surface cover of outcrops and loose rocks is about 40%. Aspect is variable, but the majority of sites have south to southwest aspects. Somewhat unusual and more mesic sites for this community occur on very steep, east- to northeast-facing, almost cliff-like exposures of pyroxene-bearing granites of the Virginia central Blue Ridge, with 50-70% of surface substrate of exposed bedrock and loose stones. Soils are mostly very stony clay loams that are strongly acidic (mean pH = 5.1) but have relatively high calcium (ca. 1800 ppm) and magnesium (ca. 400 ppm) levels.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Carya glabra* and *Fraxinus americana* are codominant in the open woodland canopy. *Quercus prinus* and *Quercus rubra* are also common. *Celtis occidentalis* is common in the subcanopy. Herbs include *Asplenium platyneuron, Bidens bipinnata, Carex pensylvanica, Danthonia spicata, Carex muehlenbergii, Muhlenbergia sobolifera, Paronychia canadensis, Phytolacca americana, Pycnanthemum incanum, Verbascum thapsus*, and *Solidago ulmifolia*.

Global Vegetation: Vegetation consists of open to very open woodlands with stunted canopies of 6- to 15-m tall trees. *Fraxinus americana* is the characteristic, consistently dominant or codominant canopy species, usually contributing at least 25% cover. *Carya glabra* and, less frequently, *Carya ovata* and *Carya ovalis* are common codominant overstory associates. *Quercus prinus, Quercus rubra, Juniperus virginiana, Pinus virginiana*, and *Juglans nigra* are minor canopy trees. Understory and shrub layers vary in density, with *Ulmus rubra, Celtis occidentalis, Ostrya virginiana, Cercis canadensis*, and *Rosa carolina* the most typical species. The herb layer varies from moderately open to dense and contains a diversity of xerophytic grasses and forbs. Dominant herbs are *Muhlenbergia sobolifera, Helianthus divaricatus, Solidago ulmifolia, Carex pensylvanica, Elymus hystrix*, and *Phacelia dubia*. Unusual stands that occur on concave slopes at two Virginia sites have herb layers dominated by *Chasmanthium latifolium*. Less abundant but relatively constant (50%) herbs include *Acalypha virginica, Ambrosia artemisiifolia, Antennaria plantaginifolia, Arabis laevigata, Danthonia spicata, Dichanthelium boscii, Dichanthelium linearifolium, Eupatorium sessilifolium, Geum virginianum, Heuchera americana, Lespedeza frutescens (= Lespedeza intermedia), Polygonum scandens var. cristatum, Pycnanthemum incanum, Saxifraga virginiensis*, and *Woodsia obtusa*. Less frequent but locally abundant or important herbaceous species include *Schizachyrium scoparium, Senna marilandica, Symphyotrichum laeve var. concinnum (= Aster laevis var. concinnum), Symphyotrichum oblongifolium*, and *Tradescantia ohiensis*; the last species is prominent at, but confined to, the southernmost sites for this community in Giles and Grayson counties. *Solidago juncea, Carex muehlenbergii var. enervis, Lespedeza virginica*, and *Dichanthelium depauperatum* are important species of a variant of this community type occurring on metasedimentary rocks in Maryland, near Harpers Ferry, West Virginia.

An unusual variant of the type, occurring on east- to northeast-facing cliff-like exposures of pyroxene-bearing granites, is somewhat more mesic in character. *Fraxinus americana* is the sole canopy dominant of this variant, with minor associates of *Quercus prinus, Tilia americana, Ulmus rubra*, and *Carya ovata*. The shrub layer contains young reproduction of the canopy species, as well as *Celtis occidentalis, Ostrya virginiana, Rosa carolina*, and *Crataegus pruinosa*. Scrambling vines of *Parthenocissus quinquefolia, Vitis aestivalis*, and *Toxicodendron radicans* are abundant. The herb layer is moderately dense to dense (>60% cover) despite the abundant rock cover. The lithophytes *Dryopteris marginalis, Sedum glaucophyllum, Carex communis*, and *Saxifraga virginiensis* contribute the greatest herbaceous cover. Species richness of plot-sampled stands ranges from 46 to 103 taxa per 400 square meters (mean = 66).

Global Dynamics: This community is associated with outcrops and thin-soil areas over mafic rocks and, less frequently, granitic, sedimentary, and metasedimentary rocks with high base status. Stands are mostly edaphically maintained but may occasionally be impacted by fires. The exotic herb *Commelina communis* and the shrub *Symphoricarpos orbiculatus*, introduced from farther west, are problematic invasives at some sites. *Symphoricarpos orbiculatus* is particularly aggressive and is capable of covering large areas with dense colonies in a matter of years, once established.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya glabra*, *Fraxinus americana*, *Quercus prinus*
Herb (field)	Flowering forb	*Pycnanthemum incanum*
Herb (field)	Graminoid	*Carex pensylvanica*, *Muhlenbergia sobolifera*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya glabra*, *Quercus prinus*
Herb (field)	Graminoid	*Carex pensylvanica*, *Muhlenbergia sobolifera*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Carex pensylvanica*, *Carya glabra*, *Danthonia spicata*, *Fraxinus americana*, *Muhlenbergia sobolifera*, *Pycnanthemum incanum*, *Quercus prinus*
Global: *Carex pensylvanica*, *Carya glabra*, *Dichanthelium linearifolium*, *Elymus hystrix*, *Fraxinus americana*, *Helianthus divaricatus*, *Muhlenbergia sobolifera*, *Phacelia dubia*, *Pycnanthemum incanum*, *Solidago ulmifolia*, *Woodsia obtusa*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Artemisia vulgaris*, *Bromus sterilis* (Medium/Low), *Commelina communis*, *Humulus japonicus* (Medium/Low), *Hypericum perforatum* (High/Medium), *Lonicera japonica* (High/Medium), *Lonicera morrowii* (High/Medium), *Microstegium vimineum* (High/Medium), *Nepeta cataria*, *Poa compressa* (High/Low), *Polygonum perfoliatum* (Medium), *Rubus phoenicolasius* (Medium), *Verbascum thapsus* (Medium)
Global: Vulnerable Plants: *Cuscuta coryli* (G5?, VA state-rare), *Potentilla arguta* (G5, VA state-rare), *Pycnanthemum clinopodioides* (G1G2), *Sporobolus compositus* (G5, VA state-rare), *Taenidia montana* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (24-Feb-2010). This community is naturally rare, geographically restricted, and confined to special edaphic habitats, primarily over mafic rocks in the Blue Ridge and upper Piedmont of Virginia and Maryland, but also on Blue Ridge granite and calcareous sedimentary and metasedimentary rocks in the Ridge and Valley. There are few threats to occurrences of this community. Where trails transect or approach these communities, they receive minor trampling damage and introduction of alien species.

RELATED CONCEPTS

Global Similar Types:

- *Carya (glabra, alba) - Fraxinus americana - (Juniperus virginiana var. virginiana)* Woodland (CEGL003752) is a closely related woodland of the Southern Blue Ridge; the southernmost stands of CEGL003683 in Virginia are transitional to this.
- *Carya glabra - Fraxinus americana / Acer leucoderme / Piptochaetium avenaceum* Woodland (CEGL008489)
- *Fraxinus americana / Physocarpus opulifolius / Carex pensylvanica - Allium cernuum - (Phacelia dubia)* Wooded Grassland (CEGL008529) is more open, wooded herbaceous vegetation of middle elevations on the Northern Blue Ridge.
- *Juniperus virginiana - Fraxinus americana / Carex pensylvanica - Cheilanthes lanosa* Open Woodland (CEGL006037)
- *Juniperus virginiana var. virginiana - Celtis tenuifolia - Cercis canadensis / Sporobolus clandestinus - Danthonia sericea* Woodland (CEGL008499)
- *Quercus alba - Carya glabra - Fraxinus americana / Muhlenbergia sobolifera - Elymus hystrix* Forest (CEGL006216) is an oak-hickory forest occurring on montmorillonite clays of the Piedmont and Blue Ridge foothills.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community also occurs near the AT corridor in Virginia near Narrows in Giles County, at Striped Rock in Grayson County, and at Bald Knob in Franklin County.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: The AT passes through a polygon of this type (CEGL003683) in Harpers Ferry.
Global Classification Comments: As currently circumscribed, this community type does not include related (and often spatially associated) wooded herbaceous vegetation occurring on massive, exposed outcrops, e.g., *Fraxinus americana / Physocarpus opulifolius / Carex pensylvanica - Allium cernuum - (Phacelia dubia)* Wooded Grassland (CEGL008529). In an 1134-plot regional analysis for the Southern Appalachian portion of the Appalachian Trail, only four southwestern Virginia plots were classified as this type (Fleming and Patterson 2009a), but proved distinct from several other Southern Appalachian woodlands. In a subsequent 1300-plot analysis of all Virginia upland forests and woodlands (Fleming and Patterson 2009b), plots from the southernmost parts of this association did not separate from more northern plots in quantitative analyses. See comments on similar associations.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs in the Blue Ridge and upper Piedmont of Virginia, Maryland, and West Virginia. It was sampled in Maryland (including Maryland Heights) and in Virginia.
Global Range: This community is mostly restricted to areas underlain by mafic metamorphic rocks (metabasalt, actinolite schist, layered pyroxene granulite) in the Blue Ridge and adjacent Piedmont foothills of northern Virginia and Maryland. However, scattered outliers have been documented on diabase of the northern Piedmont Triassic Basin; on calcareous sedimentary and metasedimentary substrates (sandstone, shale, metasiltstone, and phyllite) of the Blue Ridge and Ridge and Valley provinces; and on granitic terrain of the Blue Ridge. This vegetation type is rare in the George Washington National Forest, where the only known examples are located at the northern end of the Pedlar Ranger District. Excellent Blue Ridge and Piedmont examples of the type are protected in Shenandoah National Park and The Nature Conservancy's Wildcat Mountain Natural Area, respectively.
Nations: US
States/Provinces: MD, VA:S2, WV?
TNC Ecoregions: 51:C, 52:C, 59:C, 61:?
USFS Ecoregions (1994/95): 231Ae:CCC, 231Ak:CCC, 231Al:CCC, 231Ap:CCP, M221Aa:CCC, M221Ab:CC?, M221Da:CCC, M221Db:CC?, M221Dc:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, C&O Canal, Catoctin Mountain, Harpers Ferry, Shenandoah); USFS (George Washington)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 plots; 1 observation point; 5 accuracy assessment points): APPA.0452, APPA.0453, APPA.0530, APPA.1236, APPA_AA_0150, APPA_AA_0503, APPA_AA_1028, APPA_AA_1445, APPA_AA_1604.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming and P. Coulling
References: CAP pers. comm. 1998, Coulling and Rawinski 1999, Fleming 1993, Fleming 2002b, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Fleming et al. 2007a, Fleming pers. comm., Harrison 2004, Lea 2004, Rawinski et al. 1996, Southeastern Ecology Working Group n.d., Young et al. 2006, Young et al. 2009

[CEGL006336] *Quercus (alba, rubra, velutina) - Carya* spp. / *Viburnum acerifolium* Forest

Translated Name: **(White Oak, Northern Red Oak, Black Oak) / Hickory species / Mapleleaf Viburnum Forest**
Common Name: **Northeastern Dry Oak - Hickory Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Northeastern Oak - Hickory Forest & Woodland (G650)
Alliance	*Quercus alba* - *Carya* spp. - *Fraxinus americana* Forest Alliance (A2053)

ELEMENT CONCEPT

Global Summary: This oak-hickory forest occurs on well-drained loamy sand of midslopes in the northeastern United States. This vegetation is ecologically transitional between dry-rich oak-hickory forests of relatively high diversity and dry, acidic oak species-poor forests. *Quercus rubra, Quercus alba*, and *Quercus velutina* are prominent in the canopy. *Quercus prinus* and *Quercus coccinea* are canopy associates in the southern portion of the range. Typical hickory species include *Carya glabra, Carya ovata, Carya alba (= Carya tomentosa)*, and *Carya ovalis*. Other canopy associates may include *Acer rubrum, Sassafras albidum*, and *Amelanchier arborea*. At the northern range limit of this type, *Pinus strobus* and *Betula lenta* also occur as minor associates. *Cornus florida* is a characteristic understory tree in portions of the range. The shrub layer is characterized by *Viburnum acerifolium*, with other frequent associates including *Hamamelis virginiana, Vaccinium corymbosum, Corylus cornuta*, and *Corylus americana*. A short-shrub layer may be common, but is generally not abundant, and is characterized by *Vaccinium pallidum* and *Gaylussacia baccata*, with *Vaccinium angustifolium* occurring more frequently to the north. The herbaceous layer is characterized by *Carex pensylvanica, Carex rosea, Maianthemum racemosum (= Smilacina racemosa), Aralia nudicaulis, Hieracium venosum, Solidago bicolor, Desmodium glutinosum, Desmodium paniculatum, Melampyrum lineare, Chimaphila maculata, Eurybia divaricata (= Aster divaricatus), Danthonia spicata, Aureolaria* spp., *Pteridium aquilinum, Dennstaedtia punctilobula*, and *Helianthemum canadense*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This acidic, dry oak-hickory forest of the Northeast occurs on well-drained loamy sand of midslopes. It was sampled at five locations in the Central Appalachian project area. Sites range from gentle to moderate mid and lower slopes of any aspect. Soils are dry, well-drained sandy loam and clay loam. The unvegetated surface is dominated by leaf litter with small amounts of downed wood and occasional large/small rocks or bare soil. Evidence of disturbance includes the presence of exotic plant species.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This is an acidic, dry oak-hickory forest of the Northeast (from Maine to Maryland) that occurs on well-drained loamy sand of midslopes. Sampled sites range from 190-463 m (623-1,519 feet) elevation and from gentle to somewhat steep slopes and summits with all aspects. Soils are dry to dry-mesic, moderately well- to well-drained sandy loam, silt loam and loam. The unvegetated surface consists of leaf litter, with lesser amounts of exposed bedrock, large/small rocks, bare soil, and/or downed wood. Evidence of disturbance includes clearing and alterations to hydrology (ditching) at one site, and the presence of exotic plants.

Global Environment: This forest type occurs on well-drained loamy sand of midslopes and other dry-mesic sites.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus rubra, Quercus alba*, and *Quercus velutina* are prominent in the canopy. *Quercus prinus* and *Quercus coccinea* are canopy associates in the southern portion of the range. Typical hickory species include *Carya glabra, Carya ovata, Carya alba*, and *Carya ovalis*. *Nyssa sylvatica* may be common. *Cornus florida* is a characteristic understory tree. The shrub layer is characterized by *Viburnum acerifolium*; *Rubus allegheniensis* and *Hamamelis virginiana* may also be present. A patchy low-shrub layer of *Vaccinium angustifolium, Vaccinium pallidum*, and/or *Gaylussacia baccata* is typical. A patchy herb layer may include *Aralia nudicaulis, Dennstaedtia punctilobula*, and *Dryopteris marginalis*.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Quercus rubra, Quercus alba*, and *Quercus velutina* are prominent in the canopy; *Quercus prinus* and *Quercus coccinea* are canopy associates in the southern portion of the range. Typical hickory species include *Carya glabra, Carya ovata, Carya alba*, and *Carya ovalis*. *Acer saccharum, Betula lenta*, and *Nyssa sylvatica* may be common. *Carpinus caroliniana, Ostrya virginiana*, and *Cornus florida* are common understory trees. The shrub layer is characterized by *Viburnum acerifolium*. *Kalmia latifolia* is common in some stands. A dwarf-shrub layer may be common but generally not abundant with *Vaccinium angustifolium, Vaccinium pallidum*, and/or *Gaylussacia baccata* and a patchy herb layer with *Solidago caesia, Eurybia divaricata, Aralia nudicaulis*, and *Dryopteris marginalis*. In addition, this community supports NJ state-critically imperiled *Diplazium pycnocarpon*.

Global Vegetation: This vegetation is ecologically transitional between dry-rich oak-hickory forests of relatively high diversity and dry, acidic oak-species-poor forests. *Quercus rubra, Quercus alba*, and *Quercus velutina* are prominent in the canopy. Typical hickory species include *Carya glabra, Carya ovata, Carya alba (= Carya tomentosa)*, and *Carya ovalis*. Other canopy associates may include *Acer rubrum, Quercus prinus, Sassafras albidum*, and *Amelanchier arborea*. *Pinus strobus, Tsuga canadensis*, and *Betula lenta* may also occur as minor associates. *Cornus florida* is a characteristic understory tree in portions of the range. The shrub layer is typically rather sparse and characterized by *Viburnum acerifolium*, with other frequent associates including *Hamamelis virginiana, Vaccinium corymbosum, Kalmia latifolia, Corylus cornuta*, and *Corylus americana*. A short-shrub layer may be common but generally not abundant, characterized by *Vaccinium pallidum* and *Gaylussacia baccata*, with *Vaccinium angustifolium* occurring more frequently to the north. The herbaceous layer is characterized by *Carex pensylvanica, Maianthemum racemosum (= Smilacina racemosa), Dryopteris marginalis, Aralia nudicaulis, Hieracium venosum, Solidago bicolor, Desmodium glutinosum, Desmodium paniculatum, Melampyrum lineare, Chimaphila maculata, Eurybia divaricata (= Aster divaricatus), Danthonia spicata, Deschampsia flexuosa, Dennstaedtia punctilobula, Aureolaria* spp., *Pteridium aquilinum, Dennstaedtia punctilobula*, and *Helianthemum canadense*. The invasive species *Microstegium vimineum* and *Berberis thunbergii* may also be present in this forest type.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum acerifolium*
Short shrub/sapling	Dwarf-shrub	*Rubus allegheniensis*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula lenta*, *Carya glabra*
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Cornus florida*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum acerifolium*
Herb (field)	Flowering forb	*Solidago caesia*
Herb (field)	Graminoid	*Carex pensylvanica*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus prinus*, *Quercus rubra*, *Quercus velutina*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Cornus florida*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum acerifolium*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*
Herb (field)	Graminoid	*Carex pensylvanica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Aralia nudicaulis*, *Carya glabra*, *Carya ovata*, *Cornus florida*, *Quercus alba*, *Quercus prinus*, *Quercus rubra*, *Rubus allegheniensis*, *Viburnum acerifolium*
Appalachian National Scenic Trail (Lower New England Project Area): *Aralia nudicaulis*, *Carex pensylvanica*, *Carya glabra*, *Quercus prinus*, *Quercus rubra*, *Vaccinium pallidum*, *Viburnum acerifolium*
Global: *Aralia nudicaulis*, *Carex pensylvanica*, *Carya alba*, *Carya glabra*, *Carya ovalis*, *Cornus florida*, *Gaylussacia baccata*, *Maianthemum racemosum*, *Quercus prinus*, *Vaccinium pallidum*, *Viburnum acerifolium*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Microstegium vimineum* (High/Medium)
Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Diplazium pycnocarpon* (G5, NJ state-critically imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Berberis vulgaris* (Medium/Low), *Verbascum thapsus* (Medium); **Other Plants**: *Eurybia divaricata* (G5)

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (24-Jan-2005). This type is not naturally rare and has a wide geographic distribution. Mature stands, however, are uncommon and most stands are subject to logging disturbances or even complete destruction if located in rapidly developing suburban areas.

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharum - Betula alleghaniensis - Quercus rubra / Viburnum acerifolium* Forest (CEGL006943)
- *Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest (CEGL006293) can intergrade with this type in New England but is characterized by *Fagus grandifolia* (more or less absent in CEGL006336), a greater amount of *Pinus strobus* in the canopy (usually >20%), and little or no *Carya*.
- *Quercus alba - Quercus rubra - Carya alba / Cornus florida* Acidic Forest (CEGL002067) also contains *Actaea racemosa* and can occur on cherty limestone, and *Quercus velutina* is not characteristic.
- *Quercus alba - Quercus rubra - Carya alba / Vaccinium stamineum / Desmodium nudiflorum* Piedmont Forest (CEGL008475) southern analogue of CEGL006336; is more diverse and occupies soils with slightly higher base status. *Quercus velutina* is not as characteristic of this type. A number of southern herbs such as *Aristolochia serpentaria* are not found in CEGL006336; northern species such as *Corylus cornuta, Vaccinium angustifolium*, and *Aralia nudicaulis* are not found in CEGL008475.
- *Quercus coccinea - Quercus velutina / Sassafras albidum / Vaccinium pallidum* Forest (CEGL006375) lacks *Viburnum acerifolium* and *Cornus florida* and in general is less diverse and occurring on relatively more nutrient-poor soils.
- *Quercus prinus - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum*) Forest (CEGL006282)
- *Quercus velutina - Quercus alba - Carya (glabra, ovata)* Forest (CEGL002076) also contains *Quercus ellipsoidalis* or *Quercus macrocarpa* and is of shorter stature and more open canopy.
- *Quercus velutina / Carex pensylvanica* Forest (CEGL002078) is drier and more infertile, and lacks *Viburnum acerifolium, Hamamelis virginiana* and other shrubs.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: A wide range of heath shrub cover was observed in this association throughout the Lower New England project area. While *Carya* spp. are present in most examples of this association, the stand on the north end of Sharon Mountain in Connecticut lacks hickories. *Cornus florida* is characteristic whether there are heath shrubs or not. *Hamamelis virginiana* is also common. Lower New England High Slope Chestnut Oak Forest (CEGL006282) is more depauperate.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: The stand on Mt. Prospect in Connecticut has an unusual abundance of *Tsuga canadensis* in the subcanopy.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from Maryland to Maine. It was sampled in Cumberland and Perry counties, Pennsylvania, in the Central Appalachian project area. It does not occur in Virginia.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut (including at Housatonic Valley - Buck Hill, Mt. Prospect, Sharon Mountain - North End), New Jersey (Culvers Gap North, High Point South, Unionville East), New York (Corbin Hill, Nuclear Lake, Bellvale Mountain South), and at Delaware Water Gap in Pennsylvania.
Global Range: This association occurs from Maine to Maryland.
Nations: US
States/Provinces: CT, DE:S1, MA, MD, ME, NH:S2S3, NJ:S4S5, NY, PA, RI, VT
TNC Ecoregions: 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fb:CC?, 212Fc:CCC, 212Fd:CC?, 212Ga:CC?, 212Gb:CC?, 221Aa:CCP, 221Ab:CCC, 221Ad:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC,

221Dc:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCP, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CC?, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CC?, M212Eb:CC?, M221Ac:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Boston Harbor Islands, Cape Cod, Delaware Water Gap, Fort Necessity, Gettysburg, Minute Man, Morristown, Sagamore Hill, Saratoga, Upper Delaware, Weir Farm); USFWS (Assabet River, Cape May, Great Meadows)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCNO
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 4 observation points; 1 accuracy assessment point): APPA.0670, APPA.1211, APPA.1217, APPA.1242, APPA.1243, APPA_AA_1228.

Appalachian National Scenic Trail (Lower New England Project Area) Plots: (5 plots; 8 observation points; 6 accuracy assessment points): APPA.0003, APPA.0006, APPA.0074, APPA.0676, APPA.0680, APPA.1349, APPA.1356, APPA.1364, APPA.1381, APPA.1387, APPA.1425, APPA.1439, APPA.1440, APPA_AA_1705, APPA_AA_1807, APPA_AA_1844, APPA_AA_1941, APPA_AA_1972, APPA_AA_3041.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid, L.A. Sneddon, S.C. Gawler
References: Bartgis 1986, Berdine 1998, Breden 1989, Breden et al. 2001, Clancy 1996, Coxe 2009, Damman 1977, Eastern Ecology Working Group n.d., Edinger et al. 2002, Edinger et al. 2007, Edinger et al. 2008b, Enser 1999, Enser and Lundgren 2006, Fike 1999, Fleming pers. comm., Gawler 2002, Gawler and Cutko 2010, Gawler et al. 2005, Harrison 2004, Harrison 2011, Hunt 1997a, Largay and Sneddon 2010, MNAP 1991, McCoy and Fleming 2000, Metzler and Barrett 2001, Metzler and Barrett 2006, Metzler et al. 2009, NRCS 2004a, Patterson pers. comm., Perles et al. 2006a, Perles et al. 2006c, Perles et al. 2007, Perles et al. 2008, Rawinski 1984a, Sneddon et al. 2008, Sneddon et al. 2010, Soil Conservation Service 1987, Sperduto 1997b, Sperduto and Nichols 2004, Swain and Kearsley 2001, Swain and Kearsley 2001*, Thompson and Sorenson 2000, Windisch 2014a

[CEGL008515] *Quercus alba - Quercus prinus - Carya glabra / Cornus florida / Vaccinium pallidum* Forest

Translated Name: **White Oak - Chestnut Oak - Pignut Hickory / Flowering Dogwood / Blue Ridge Blueberry Forest**
Common Name: **Central Appalachian Acidic Oak - Hickory Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Northeastern Oak - Hickory Forest & Woodland (G650)
Alliance	*Quercus alba* - *Carya* spp. - *Fraxinus americana* Forest Alliance (A2053)

ELEMENT CONCEPT

Global Summary: This community is associated with substrates weathered from shale, sandstone, and other sedimentary and metasedimentary rocks in the Central Appalachian region. It appears to be widespread at low elevations of the Ridge and Valley province in Virginia and more local on the western flank of the Northern Blue Ridge, the northern edge of the Southern Blue Ridge, and extending into the Ridge and Valley of West Virginia and Maryland. It is rare on monadnocks of the extreme western Piedmont in southwestern Virginia. Extensive sites for this community in the Ridge and Valley occur on low shale knobs and ridges, or at the base of higher sandstone ridges, where local shale strata have been exposed by stream incision. On the Blue Ridge, stands are confined to a belt of metasedimentary rocks that overlie the plutonic basement complex on the western side of the anticlinorium. Habitats encompass dry, mostly southeast- to west-facing slopes, hollows, broad sub-level ridge crests, and occasionally dry valley bottoms at low elevations (mostly <610 m [2000 feet]). Slope shape is generally convex in at least one direction. The characteristic vegetation of this type is an open oak-hickory or oak-hickory-pine forest dominated by oaks (particularly *Quercus prinus* and *Quercus alba*), with high cover of *Carya* spp., especially *Carya glabra*. *Quercus velutina, Quercus rubra, Carya alba, Pinus virginiana*, and *Pinus strobus* are also important, sometimes codominant trees. Stands in which *Quercus alba* greatly dominates are also common. Total canopy cover is usually in the range of 60-80%, and dominant canopy trees typically do not much exceed, and in some situations

do not reach, 20 m in height. Minor canopy associates include *Carya ovalis, Pinus echinata, Quercus coccinea*, and *Quercus stellata*. Young representatives of most canopy species are common in the understory, along with *Cornus florida* and *Amelanchier arborea*. Generally, there is only a moderate to sparse representation of ericaceous (heath family) shrubs in this community type. However, on gentle ridge crests, where litter and humus tend to accumulate, *Vaccinium pallidum* may dominate the shrub layer in low colonies. On the more extensive steep, convex slopes, where litter accumulations are thin and patchy, ericads are sparse and herbaceous richness tends to be moderately high, although total herb cover can be quite sparse.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This low-elevation (mostly <762 m [2,500 feet]) dry but diverse oak-hickory forest occurs on southeast - to west-facing slopes, hollows, broad sub-level ridge crests, and occasionally dry valley bottoms, with substrates weathered from shale, sandstone, and other sedimentary rocks. It was sampled at 11 locations in the park. Sites include gentle to steep slopes and summits with mostly southerly aspects. Soils are dry to dry-mesic, rapidly to well-drained silt loam, loam and clay loam. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. Evidence of disturbance includes grazing/browsing, oak decline, and the presence of exotic plant species.
Global Environment: This community is associated with submesic to subxeric sites on shale, siltstone, metasiltstone, phyllite, sandstone, and deep alluvial fan material washed from these substrates. Extensive sites in the Ridge and Valley occur on low shale knobs and ridges, or at the base of higher sandstone ridges, where local shale strata have been exposed by stream incision. On the Blue Ridge, stands are confined to a belt of metasedimentary rocks that overlie the plutonic basement complex on the western side of the anticlinorium. Habitats encompass dry and dry-mesic, mostly southeast- to west-facing slopes, hollows, broad sublevel ridge crests, and occasionally dry valley bottoms at low elevations (mostly <610 m [2000 feet]). Slope shape is generally convex in at least one direction. The prevalent soils are loams of the Weikert-Berks-Rough complex. Although ranging from strongly to extremely acidic, soil samples collected from plots have slightly higher mean pH, calcium, and magnesium levels, and much lower iron and aluminum than those of more xerophytic oak/heath types. Occasional sites on the Martinsburg shale formation may be moderately calcareous. On steep slopes, the surface cover of mineral soil may be significant (up to 57% in plots) due to erosional processes.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus prinus, Quercus alba*, and/or *Quercus velutina* are codominant in the canopy along with high cover of *Carya glabra* and/or *Carya alba*. *Prunus serotina, Fraxinus americana, Acer rubrum*, and *Sassafras albidum* are common. Common shrubs include *Amelanchier arborea, Rosa carolina var. carolina, Vaccinium stamineum*, and *Vaccinium pallidum*. Common herbs include *Carex pensylvanica, Chimaphila maculata, Dichanthelium boscii, Danthonia spicata, Houstonia longifolia, Polygonatum biflorum, Potentilla canadensis*, and *Symphyotrichum undulatum*. *Smilax rotundifolia* is a common vine. In addition, this community supports VA-state critically imperiled *Heuchera caroliniana* and *Pycnanthemum clinopodioides* (also considered globally imperiled).
Global Vegetation: The characteristic vegetation of this type is an open oak-hickory or oak-hickory-pine forest dominated by oaks (particularly *Quercus prinus* and *Quercus alba*), with high cover of *Carya* spp., especially *Carya glabra*. *Quercus velutina, Quercus rubra, Carya alba, Pinus virginiana*, and *Pinus strobus* are also important, sometimes codominant trees. Stands in which *Quercus alba* greatly dominates are also common. Total canopy cover is usually in the range or 60-80%, and dominant canopy trees typically do not much exceed, and in some situations do not reach, 20 m in height. Minor canopy associates include *Carya ovalis, Pinus echinata, Quercus coccinea*, and *Quercus stellata*. Young representatives of most canopy species are common in the understory, along with *Acer rubrum, Cornus florida*, and *Amelanchier arborea*. At the richer end of the soil spectrum, nutrient-demanding species such as *Cercis canadensis, Acer saccharum, Ostrya virginiana, Fraxinus americana*, and *Ulmus rubra* may be present in the understory but rarely have more than 5% cover in a 400-square-meter plot. Generally, there is only a moderate to sparse representation of ericaceous (heath family) shrubs in this community. However, on gentle ridge crests, where litter and humus tend to accumulate, *Vaccinium pallidum* may dominate the shrub layer in low colonies. Frequent, non-ericaceous low shrubs include *Viburnum acerifolium* and *Rosa carolina*. On the more extensive steep, convex slopes, where litter accumulations are thin and patchy, ericads are sparse and herbaceous richness tends to be moderately high, although total herbaceous cover can be quite sparse. The most constant and characteristic graminoids are *Carex pensylvanica, Danthonia spicata, Dichanthelium boscii*, and *Deschampsia flexuosa*. Characteristic forbs are *Antennaria plantaginifolia, Chimaphila maculata, Desmodium rotundifolium, Galium circaezans, Houstonia longifolia, Maianthemum racemosum ssp. racemosum, Polygonatum biflorum, Potentilla canadensis, Scutellaria elliptica, Symphyotrichum undulatum, Vicia caroliniana*, and several *Lespedeza*

spp. Species richness of 35 plot-sampled stands used in the NCR Parks analysis ranges from 27 to 73 taxa per 400 square meters (mean = 46). Species richness of 49 Virginia plots ranges from 29 to 105 taxa per 400 square meters (mean = 63).

Global Dynamics: Increment cores taken from old trees in the Peters Mountain area of Alleghany County (James River Ranger District) (e.g., a 44-cm (17-inch) dbh *Quercus alba* about 225 years old, a 49-cm (19-inch) dbh *Quercus alba* about 155 years old, and a 46-cm (18-inch) dbh coppice sprout of *Quercus prinus* about 175 years old) indicate slow growth rates in stands of this type (Fleming and Moorhead 2000). Data collected from throughout the Peters Mountain study area also indicate that *Castanea dentata* was much less important in pre-blight forests on shale compared to those on the area's sandstone ridges (Fleming and Moorhead 2000). Periodic drought stress and frequent low-intensity fires are natural disturbances that regenerate the oak component of this community. Due to the contemporary reduction or exclusion of fire from most sites, stands of this association exhibit poor oak recruitment and have become susceptible to invasion by *Acer rubrum, Pinus strobus*, and other shade-tolerant mesophytic trees.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya alba*, *Quercus alba*, *Quercus prinus*, *Quercus velutina*
Tree subcanopy	Broad-leaved deciduous tree	*Amelanchier arborea*
Herb (field)	Graminoid	*Carex pensylvanica*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya alba*, *Quercus alba*, *Quercus velutina*
Tree subcanopy	Broad-leaved deciduous tree	*Amelanchier arborea*
Herb (field)	Graminoid	*Carex pensylvanica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Amelanchier arborea*, *Carex pensylvanica*, *Carya alba*, *Danthonia spicata*, *Houstonia longifolia*, *Quercus alba*, *Quercus prinus*, *Quercus velutina*, *Vaccinium pallidum*, *Vaccinium stamineum*

Global: *Antennaria plantaginifolia*, *Carex pensylvanica*, *Carya glabra*, *Cornus florida*, *Danthonia spicata*, *Dichanthelium boscii*, *Houstonia longifolia*, *Lespedeza hirta*, *Lespedeza procumbens*, *Lespedeza repens*, *Lespedeza violacea*, *Lespedeza virginica*, *Pinus virginiana*, *Potentilla canadensis*, *Quercus alba*, *Quercus prinus*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Heuchera caroliniana* (G3, globally vulnerable & VA state-critically imperiled), *Pycnanthemum clinopodioides* (G1G2, globally imperiled & VA state-critically imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (High/Medium), *Elaeagnus umbellata* var. *parvifolia*, *Lonicera japonica* (High/Medium), *Lonicera maackii* (High), *Rosa multiflora* (Medium/Low), *Taraxacum officinale*

Global: Vulnerable Plants: *Berberis canadensis* (G3), *Clematis coactilis* (G3), *Heuchera caroliniana* (G3), *Onosmodium virginianum* (G4, VA state-rare), *Pycnanthemum clinopodioides* (G1G2)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (2-Oct-2006). Although currently known from a relatively small geographic range, this community type covers extensive areas at low elevations in the Central Appalachians of Virginia and Maryland. It is very likely that this vegetation is more widely distributed in the Central Appalachians.

RELATED CONCEPTS

Global Similar Types:

- *Quercus alba - Quercus rubra - Carya alba / Vaccinium stamineum / Desmodium nudiflorum* Piedmont Forest (CEGL008475) analogue of CEGL008515 occurring in the southeastern Piedmont from southern Maryland to Georgia.
- *Quercus alba - Quercus rubra - Carya ovalis / Acer saccharum / Polystichum acrostichoides* Forest (CEGL007233)

- *Quercus prinus - Quercus rubra - Carya ovalis / Carex pensylvanica - (Calamagrostis porteri)* Forest (CEGL008516) restricted to more fertile phyllite/metasiltstone ridges at higher elevations of the same region.
- *Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum* Forest (CEGL006301) occurs at high elevations in the Ridge and Valley and lacks *Quercus prinus* and other lower-elevation species.
- *Quercus rubra - Quercus prinus - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (CEGL008514) more diverse oak-hickory forest of the Piedmont and lower Blue Ridge occurring on mafic and granitic substrates.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This type is a Central Appalachian oak-hickory forest that occurs extensively on low-elevation sedimentary and metasedimentary substrates, especially shale and siltstone. It is an extensive (locally matrix-forming) type in the Ridge and Valley province but also occurs on the Northern Blue Ridge. Plots that fell into the AT study area represent the southern end of the range, but are generally characteristic. The type has been repeatedly circumscribed in regional analyses of Central Appalachian data (e.g., George Washington/Jefferson National Forests, Shenandoah National Park, National Capital Region parks) and is robust. This community may be distinguished from Low-Elevation Mixed Oak / Heath Forest (CEGL008521) by the higher cover of *Carya*. It can be distinguished from Central Appalachian Montane Oak - Hickory Forest (Acidic Type) (CEGL008516) by elevation. CEGL008516 is a high-elevation, dry but diverse oak-hickory forest ranging from 550-1270 m (1,800-4,160 feet).
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: The southernmost known stand is a little north of I-81, in the extreme southwestern end of Bland County, Virginia, near Lick Creek. It is not common until you get to Craig County and the ridges west of Roanoke. The most constant species in the Virginia plots are *Amelanchier arborea, Quercus alba, Acer rubrum, Cornus florida, Quercus prinus, Vaccinium stamineum, Vaccinium pallidum, Chimaphila maculata, Quercus velutina*, and *Carya glabra*.
Global Classification Comments: The global range and status of this community type need further investigation. It may occur on a wider variety of substrates, and cover a much larger geographic area, than current documentation indicates. Twenty-one plots from the southern part of the Central Appalachians were classified as this association in the Appalachian Trail classification project (Fleming and Patterson 2009a). In a recent analysis of more than 1300 Virginia montane upland forest and woodland plots (Fleming and Patterson 2009b), this association was represented by 49 plots. The most constant species in these 49 plots are *Amelanchier arborea, Quercus alba, Acer rubrum, Cornus florida, Quercus prinus, Vaccinium stamineum, Vaccinium pallidum, Chimaphila maculata, Quercus velutina*, and *Carya glabra*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This low-elevation oak-hickory forest was sampled along the AT from Bland County in the Cumberlands and Southern Ridge and Valley in southwestern Virginia north through the Central Appalachians to Shenandoah National Park, but it ranges off the trail north into Maryland. It was sampled in Virginia at Bluff City North, Brushy Mountain/Dismal Creek, Catawba Mountain, Jennings Creek, McAfee Knob, Trout Creek East, and Turk Gap.
Global Range: This community type is associated with substrates weathered from shale, sandstone, and similar sedimentary and metasedimentary rocks (e.g., siltstone, metasiltstone, phyllite) in the Central Appalachians. It appears to be widespread at low elevations of the Ridge and Valley province in Maryland and Virginia, and more local on the western flank of the Northern Blue Ridge and the northern edge of the Southern Blue Ridge. It is rare on monadnocks of the extreme western Piedmont in southwestern Virginia. Within its known distribution, this is a matrix community type in localities of optimal habitat.
Nations: US
States/Provinces: MD:S4, VA:S4, WV
TNC Ecoregions: 50:C, 51:C, 52:C, 59:C
USFS Ecoregions (1994/95): 231Ak:CCC, M221Aa:CCC, M221Ab:CCC, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, C&O Canal, Harpers Ferry, Shenandoah); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAOH
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: This community is documented from Blue Ridge Parkway, C&O Canal, Harpers Ferry, and Shenandoah National Park; however, it was only sampled in Shenandoah in the AT corridor. This is likely due to the occurrence of this community at lower elevations off of the trail.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (8 plots; 3 observation points; 6 accuracy assessment points): APPA.0097, APPA.0241, APPA.0343, APPA.0401, APPA.0402, APPA.0405, APPA.0998, APPA.1000, APPA.1146, APPA.1149, APPA.1332, APPA_AA_0195, APPA_AA_0591, APPA_AA_0679, APPA_AA_1044, APPA_AA_1106, APPA_AA_1516.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and P.P. Coulling
References: Eastern Ecology Working Group n.d., Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 2000, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Harrison 2004, Harrison 2011, Rawinski et al. 1996, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL008516] *Quercus prinus - Quercus rubra - Carya ovalis / Carex pensylvanica - (Calamagrostis porteri)* Forest

Translated Name: **Chestnut Oak - Northern Red Oak - Red Hickory / Pennsylvania Sedge - (Porter's Reedgrass) Forest**
Common Name: **Central Appalachian Montane Oak - Hickory Forest (Acidic Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Northeastern Oak - Hickory Forest & Woodland (G650)
Alliance	*Quercus alba* - *Carya* spp. - *Fraxinus americana* Forest Alliance (A2053)

ELEMENT CONCEPT

Global Summary: This community is currently known from the southern part of the Central Appalachians, on the northern Virginia Blue Ridge and higher ridges of the Ridge and Valley in western Virginia and adjacent West Virginia. Occurrences in western Maryland and central and western Pennsylvania should be sought. This association usually occupies middle to upper slopes and narrow ridge crests underlain by various sedimentary and metamorphic rocks, including sandstone, quartzite, siltstone, metasiltstone, phyllite, acidic shale, and rarely amphibolite. Among 53 Virginia plot samples, elevation ranges from 550-1270 m (2000-4160 feet), but the type is most common between 760 and 1100 m (2500-3600 feet). The moisture potential of plot-sampling sites was assessed as submesic or subxeric. Slopes vary from steep to sublevel, with aspects ranging from northeast to west. This association has an open, mixed canopy dominated by several oaks and hickories. Trees tend to be slightly stunted (often <20 m tall) on the drier and more exposed sites. *Quercus rubra, Quercus prinus*, and *Carya ovalis* are the most abundant canopy species, but *Quercus alba* is a constant minor associate that becomes more abundant and replaces *Quercus prinus* at the highest elevations. *Carya ovata, Carya glabra, Fraxinus americana*, and *Quercus velutina* are minor overstory associates. The subcanopy tends to be strongly dominated by *Carya ovalis*. Lower understory layers tend to be open or sparse with scattered *Ostrya virginiana, Crataegus macrosperma, Amelanchier arborea, Acer pensylvanicum*, and tree saplings. *Vaccinium stamineum, Vaccinium pallidum, Rosa carolina*, and *Spiraea betulifolia var. corymbosa* commonly form a patchy low-shrub layer. The herb layer is open but moderately diverse with drought-tolerant graminoids and forbs.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This high-elevation dry but diverse oak-hickory forest occurs on mid to upper slopes and narrow ridge crests at 625-1270 m (2,000-4,160 feet) elevation that are underlain by various sedimentary and metamorphic rocks, including sandstone, quartzite, siltstone, metasiltstone, phyllite, and acidic shale. It was sampled at six locations in the Central Appalachian project area. Sites are gentle to steep mid and upper slopes and ridges with mostly southern and eastern aspects. Soils are

well-drained silt loam and loam. The unvegetated surface may be dominated by leaf litter, often with some exposed bedrock, large and small rocks, downed wood, and/or bare soil. Evidence of disturbance includes past fire, trails, wind/ice damage, grazing/browsing, and the presence of exotic plant species.

Global Environment: Occurrences are strongly associated with middle- to higher-elevation upper slopes and ridge crests underlain by various sedimentary and metamorphic rocks, including sandstone, quartzite, siltstone, metasiltstone, phyllite, acidic shale, and rarely amphibolite. Among 54 Virginia plot samples, elevation ranges from 550-1270 m (1800-4160 feet), but the type is most common between 760 and 1100 m (2500-3600 feet). The type usually occupies middle to upper slopes and narrow ridge crests. The moisture potential of plot-sampling sites was assessed as submesic or subxeric. Slopes tend to be convex and vary from steep to sublevel (mean = 16°), with aspects ranging from northeast to west. Surface cover of outcrops and boulders averages about 5%, and loose channery is abundant at sites underlain by siltstone, metasiltstone, and shale. Substantial areas of exposed mineral soil are often present. Soil samples collected from plots are strongly to extremely acidic, with moderately low base cation levels, except manganese.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The open canopy and subcanopy are made up of combinations of *Quercus rubra, Quercus prinus, Quercus alba, Carya glabra, Carya ovata*, and/or *Carya ovalis*. *Prunus serotina, Sassafras albidum*, and Acer rubrum are also common in some stands. *Acer pensylvanicum* and *Vaccinium* spp. (mostly *Vaccinium pallidum* and *Vaccinium stamineum*) dominate the patchy shrub layer. Other common shrubs may include *Castanea dentata, Rosa carolina var. carolina, Rubus flagellaris*, and *Rubus occidentalis*. *Galium latifolium, Amphicarpaea bracteata, Dioscorea quaternata, Stellaria pubera*, and *Polygonatum biflorum* characterize the patchy herb layer. Additional common herbs include *Solidago arguta, Carex pensylvanica, Calamagrostis porteri, Dichanthelium boscii, Festuca subverticillata, Deschampsia flexuosa, Carex digitalis, Geranium maculatum, Helianthus divaricatus, Maianthemum racemosum ssp. racemosum, Polygonum scandens var. cristatum, Silene stellata, Symphyotrichum cordifolium*, and *Uvularia perfoliata*. This community also supports VA-state critically imperiled *Heuchera caroliniana*.

Global Vegetation: This association has an open, mixed canopy dominated by several oaks and hickories. Trees tend to be slightly stunted (often <20 m tall) on the drier and more exposed sites. *Quercus rubra, Quercus prinus*, and *Carya ovalis* are the most abundant canopy species, but *Quercus alba* is a constant minor associate that becomes more abundant and replaces *Quercus prinus* at the highest elevations. *Carya ovata, Carya glabra, Fraxinus americana*, and *Quercus velutina* are minor overstory associates. The subcanopy tends to be strongly dominated by *Carya ovalis*. Lower understory layers tend to be open or sparse with scattered *Ostrya virginiana, Crataegus macrosperma, Amelanchier arborea, Acer pensylvanicum*, and tree saplings. *Vaccinium stamineum, Vaccinium pallidum, Rosa carolina*, and *Spiraea betulifolia var. corymbosa* commonly form a patchy low-shrub layer. The herb layer is open but moderately diverse with drought-tolerant graminoids and forbs. Many stands have strong patch-dominance by sedges and grasses, among which the most important species are *Carex pensylvanica, Calamagrostis porteri, Dichanthelium boscii, Festuca subverticillata*, and *Deschampsia flexuosa*. Among the most abundant forbs are *Ageratina altissima var. altissima, Solidago ulmifolia, Solidago arguta var. arguta, Houstonia longifolia, Uvularia perfoliata, Amphicarpaea bracteata, Paronychia canadensis*, and *Galium latifolium*. Forbs tend to be patchy or scattered but may dominate on straight or concave slopes. Additional herbs occurring more-or-less frequently include *Symphyotrichum undulatum (= Aster undulatus), Eurybia macrophylla (= Aster macrophyllus), Agrostis perennans, Helianthus divaricatus, Heuchera americana, Scrophularia lanceolata, Doellingeria infirma (= Aster infirmus), Eupatorium sessilifolium, Asclepias quadrifolia, Penstemon canescens, Arabis laevigata, Cunila origanoides, Carex virescens, Silene stellata, Carex laxiflora, Pycnanthemum incanum, Potentilla canadensis, Polygonum scandens var. cristatum, Vicia caroliniana, Carex cephalophora, Galium circaezans, Bromus pubescens*, and *Danthonia spicata*. Many other herbs occur at low constancy and cover. Species richness of 53 plot-sampled stands ranges from 30 to 103 taxa per 400 square meters (mean = 62).

Global Dynamics: Fire (at least historically), windthrow, ice storms, herbivory by white-tailed deer, and periodic drought stress are natural disturbances that probably influence this community type. The frequent structure exhibited by this association (open understory and dense graminoid herb layer) could possibly be an artifact of frequent historical fires and/or livestock grazing, but such disturbances ceased a considerable time ago on most sites. Oak recruitment is generally poor on most sites, but hickory recruitment is abundant. On the more mesic sites (concave slopes, etc.), the understory often contains *Acer rubrum* and other shade-tolerant mesophytic trees, which have probably invaded following a period of fire exclusion.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya ovalis*, *Carya ovata*, *Quercus alba*, *Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Acer rubrum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya ovalis*, *Carya ovata*, *Quercus alba*, *Quercus prinus*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Acer rubrum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer pensylvanicum*, *Amphicarpaea bracteata*, *Carya ovalis*, *Carya ovata*, *Dioscorea quaternata*, *Galium latifolium*, *Quercus alba*, *Quercus prinus*, *Quercus rubra*, *Vaccinium pallidum*, *Vaccinium stamineum*
Global: *Carya ovalis*, *Galium latifolium*, *Helianthus divaricatus*, *Houstonia longifolia*, *Ostrya virginiana*, *Penstemon canescens*, *Quercus prinus*, *Quercus rubra*, *Scrophularia lanceolata*, *Solidago arguta*, *Solidago ulmifolia*, *Vaccinium stamineum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Heuchera caroliniana* (G3, globally vulnerable & VA state-critically imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (High/Medium), *Barbarea vulgaris* (Low/Insignificant), *Hieracium caespitosum* (Medium/Insignificant), *Lapsana communis*, *Ligustrum obtusifolium* (Medium/Low), *Poa compressa* (High/Low), *Rosa multiflora* (Medium/Low), *Rumex obtusifolius*, *Taraxacum officinale*, *Veronica arvensis*
Global: Vulnerable Plants: *Elymus trachycaulus* (G5, VA state-rare), *Heuchera caroliniana* (G3), *Phlox buckleyi* (G2)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (23-Feb-2010). Although currently known from a relatively small geographic range, this community type covers substantial areas at low to middle elevations of both the Northern Blue Ridge and Ridge and Valley provinces.

RELATED CONCEPTS

Global Similar Types:

- *Quercus alba - Carya glabra - Fraxinus americana / Muhlenbergia sobolifera - Elymus hystrix* Forest (CEGL006216) is a drier oak-hickory forest associated with mafic hardpan soils of the Piedmont.
- *Quercus alba - Quercus prinus - Carya glabra / Cornus florida / Vaccinium pallidum* Forest (CEGL008515) occurs at lower elevations in the Central Appalachians.
- *Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum* Forest (CEGL006301)
- *Quercus rubra - Carya ovata - Fraxinus americana / Actaea racemosa - Hydrophyllum virginianum* Forest (CEGL008518) occurs in the same region, at similar elevations, and on similar topographic positions, but occurs on rich sites over calcareous and mafic rocks; composition is more mesophytic, with a lush herb layer of leafy, colonial, nutrient-demanding forbs.
- *Quercus rubra - Quercus prinus - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (CEGL008514) occurs at lower elevations on mafic and granitic substrates of the western Piedmont and lower Blue Ridge.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This type can occur on any acidic sedimentary or metasedimentary rock, not just metasiltstone and phyllite. Central Appalachian Montane Oak - Hickory Forest (Acidic Type) (CEGL008516) is a dry but very diverse oak-hickory type, while Appalachian Montane Oak - Hickory Forest (Typic Acidic Type) (CEGL007230) is a much more acidic and less floristically diverse type.

Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: This community occurs from the New River in Virginia north, although it is known from a few scattered locations south of the New River but not within the AT corridor.
Global Classification Comments: Although it has a similar canopy, this association differs significantly from *Quercus rubra - Quercus prinus - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (CEGL008514) in its understory and herbaceous composition. It occupies drier, steeper sites and lacks (or nearly so) many characteristic low-elevation and mesophytic species of CEGL008514, e.g., *Liriodendron tulipifera, Quercus alba, Cercis canadensis, Asimina triloba, Actaea racemosa (= Cimicifuga racemosa), Solidago caesia, Desmodium glutinosum*, etc. Conversely, this type contains a number of montane and xerophytic species that are absent or unimportant in CEGL008514. This type occurs in the same region, at similar elevations, and on similar topographic positions as *Quercus rubra - Carya ovata - Fraxinus americana / Actaea racemosa - Hydrophyllum virginianum* Forest (CEGL008518). The latter, however, is associated with richer, more mesic, deeper-soiled sites over calcareous and mafic rocks. Its herb layer contrasts sharply with the dry, graminoid-dominated herb layer of this association (CEGL008516) in being dominated by large, leafy, nutrient-demanding forbs.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs in the southern part of the Central Appalachians, on the northern Virginia Blue Ridge, and higher ridges of the Ridge and Valley in western Virginia and adjacent West Virginia. It was sampled in Virginia at Crimora Lake Overlook, Doyles River Overlook, Ivy Creek Overlook, Big Run Overlook, Potts Mountain, and James River Face Wilderness. Four plots are from Shenandoah National Park.
Global Range: This community is currently known from the southern part of the Central Appalachians, on the northern Virginia Blue Ridge and higher ridges of the Ridge and Valley in western Virginia and adjacent West Virginia. A few small occurrences have been documented on the northern edges of both the Southern Blue Ridge and Cumberlands and Southern Ridge and Valley ecoregions. Occurrences in western Maryland and central and western Pennsylvania should be sought. Within the known range, this unit can be a large-patch community type in localities of optimal habitat.
Nations: US
States/Provinces: MD?, VA:S3S4, WV
TNC Ecoregions: 50:C, 51:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Shenandoah); USFS (George Washington, Jefferson, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAOH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (6 plots; 1 accuracy assessment point): APPA.0207, APPA.0208, APPA.0210, APPA.0212, APPA.0352, APPA.0497, APPA_AA_0662.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d., Eyre 1980, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2007b, Fleming pers. comm., Harrison 2004, Harrison 2011, Rawinski et al. 1996, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL006301] *Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum* Forest

Translated Name: **Northern Red Oak - (Pignut Hickory, Shagbark Hickory) / Hophornbeam / Blue Ridge Sedge Forest**
Common Name: **Oak - Hickory / Hophornbeam / Sedge Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Northeastern Oak - Hickory Forest & Woodland (G650)
Alliance	*Quercus alba - Carya* spp. - *Fraxinus americana* Forest Alliance (A2053)

ELEMENT CONCEPT

Global Summary: This association is a dry, rich oak-hickory forest of the northeastern United States, occurring from Maine and Vermont to Pennsylvania and northern New Jersey. It is dominated by a mixture of hickories and oaks over a hop-hornbeam subcanopy with or without a parklike sedge lawn. The vegetation occurs on low-elevation ridgetops, upper slopes, south- or west-facing sideslopes, and is supported by well-drained loams or sandy loams, often derived from alkaline bedrock. The tree canopy, which ranges from nearly closed forest to partially open woodland, is dominated by a mixture of *Carya glabra, Carya ovata, Carya ovalis, Quercus rubra, Quercus alba, Quercus velutina*, with occasional *Ostrya virginiana* and *Acer rubrum*. Minor associates include *Acer saccharum, Pinus strobus*, and *Fraxinus americana*. A subcanopy of *Ostrya virginiana* is conspicuous in most areas. Additional species in the subcanopy or tall-shrub layer that occur in lower abundance can include *Hamamelis virginiana, Cornus florida, Amelanchier arborea, Acer pensylvanicum*, and *Viburnum acerifolium*. Low shrubs can include *Vaccinium angustifolium, Vaccinium pallidum, Rubus idaeus*, or *Viburnum rafinesquianum*. The herb layer can range from a sedge lawn of *Carex lucorum*, with some *Carex pensylvanica, Carex woodii, Carex appalachica*, or *Carex rosea*, to a more patchy herbaceous layer with sedges in addition to scattered *Elymus hystrix, Bromus pubescens, Ageratina altissima, Festuca subverticillata, Uvularia perfoliata, Aralia nudicaulis, Maianthemum racemosum (= Smilacina racemosa), Desmodium glutinosum, Desmodium paniculatum, Prenanthes alba, Solidago bicolor, Hepatica nobilis var. obtusa (= Hepatica americana), Carex* (Laxiflorae group), *Deschampsia flexuosa, Packera paupercula (= Senecio pauperculus), Packera obovata (= Senecio obovatus), Symphyotrichum undulatum (= Aster undulatus), Symphyotrichum patens (= Aster patens), Polystichum acrostichoides*, and *Dichanthelium* spp. Spring ephemerals such as *Erythronium americanum* and *Claytonia virginica* also occur in some portions of the range.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This rich oak-hickory forest occurs on low-elevation ridgetops, upper slopes, and south- or west-facing sideslopes. It extends from Maine and Vermont to Pennsylvania and northern New Jersey. Sites are gentle to steep slopes and ridgetops with mostly eastern and southern aspects. The soils are dry-mesic to dry generally well-drained sandy loam and silt loam. The unvegetated surface consists of leaf litter, with lesser amounts of large rocks (sometimes significant amounts), small rocks, bare soil and/or downed wood. Evidence of disturbance includes wind/ice damage and the presence of exotic plants.

Global Environment: This community occupies upper slopes and sideslopes at low elevations, generally with southeastern to western exposures. The low relief of southern New England limits this vegetation to small occurrences, most of which are <4 ha (10 acres). Soils are well-drained loams or sandy loams and often circumneutral. Soils are often stony, but exposed bedrock, boulders, cobbles, and mineral soil are sparse.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The tree canopy, which ranges from nearly closed forest to partially open woodland, is dominated by a mixture of *Carya glabra, Carya ovata, Carya alba, Quercus rubra, Quercus alba*, and/or *Quercus prinus* often with *Acer saccharum* and *Fraxinus americana* over a subcanopy of *Ostrya virginiana*. Tall shrubs include *Viburnum acerifolium* and *Amelanchier arborea*; *Vaccinium pallidum* is a common dwarf-shrub. The grassy herbaceous layer is dominated by *Carex pensylvanica, Danthonia spicata*, and/or *Carex lucorum* (sedge lawn may or may not be present) along with *Solidago caesia, Solidago bicolor*, and *Deschampsia flexuosa*.

Global Vegetation: This forest has a closed to open canopy dominated by a mixture of *Carya glabra, Carya ovata, Carya ovalis, Quercus rubra, Quercus alba, Quercus velutina*, with occasional *Ostrya virginiana, Quercus prinus, Carya alba*, and *Acer rubrum*. Minor associates include *Acer saccharum, Pinus strobus*, and *Fraxinus americana*. A subcanopy of *Ostrya virginiana* is conspicuous in most areas. Additional species in the subcanopy or tall-shrub layers that occur in lower abundance include *Hamamelis virginiana, Cornus florida, Amelanchier arborea, Acer pensylvanicum*, and *Viburnum acerifolium*. Low shrubs can include *Vaccinium angustifolium, Vaccinium pallidum, Gaylussacia baccata, Rubus allegheniensis, Rubus idaeus, Viburnum dentatum*, or *Viburnum rafinesquianum*. *Vaccinium stamineum* may be present in the most southerly (NJ/PA) occurrences of this association. The herb layer can range from a sedge lawn of *Carex lucorum*, with some *Carex pensylvanica, Carex woodii, Carex appalachica*, or *Carex rosea*, to a more patchy herbaceous layer with sedges in addition to scattered *Elymus hystrix, Bromus pubescens, Danthonia spicata, Anthoxanthum odoratum, Ageratina altissima, Festuca subverticillata, Uvularia perfoliata, Aralia nudicaulis, Maianthemum racemosum (= Smilacina racemosa), Desmodium glutinosum, Desmodium paniculatum, Prenanthes alba, Solidago bicolor, Solidago juncea, Hepatica nobilis var. obtusa (= Hepatica americana), Carex* spp. (Laxiflorae group), *Deschampsia flexuosa, Packera paupercula (= Senecio*

pauperculus), Packera obovata (= Senecio obovatus), Symphyotrichum undulatum (= Aster undulatus), Symphyotrichum patens (= Aster patens), Veronica officinalis, Polystichum acrostichoides, and *Dichanthelium* spp. Spring ephemerals such as *Erythronium americanum* and *Claytonia virginica* also occur in some portions of the range.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Carya glabra*, *Quercus rubra*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Carya glabra*, *Quercus rubra*
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*
Tall shrub/sapling	Broad-leaved deciduous tree	*Ostrya virginiana*
Herb (field)	Flowering forb	*Ageratina altissima* var. *altissima*
Herb (field)	Graminoid	*Carex lucorum*, *Deschampsia flexuosa*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Amelanchier arborea*, *Carex pensylvanica*, *Carya glabra*, *Carya ovata*, *Maianthemum canadense*, *Viburnum acerifolium*
Global: *Amelanchier arborea*, *Carex lucorum*, *Carex pensylvanica*, *Carex rosea*, *Carya glabra*, *Carya ovalis*, *Carya ovata*, *Deschampsia flexuosa*, *Elymus hystrix*, *Maianthemum racemosum*, *Potentilla canadensis*, *Potentilla simplex*, *Quercus alba*, *Quercus prinus*, *Quercus rubra*, *Quercus velutina*, *Solidago bicolor*, *Solidago juncea*, *Uvularia perfoliata*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Berberis vulgaris* (Medium/Low), *Calystegia sepium*, *Convolvulus arvensis* (Medium/Low), *Microstegium vimineum* (High/Medium), *Rosa multiflora* (Medium/Low)
Global: Vulnerable Plants: *Crataegus spathulata* (G5, VA state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (20-May-2011). This association is a large-patch to matrix-forming forest association of the northeastern U.S. There are likely to be over 1000 occurrences of this vegetation, with approximately half of those having good ecological integrity. The association is ranked G4 rather than G5 because it has declined up to 30% over the long term, and continues to be threatened by residential and commercial development, invasive species, and repeated gypsy moth infestations. The impact of climate change is not currently known.

RELATED CONCEPTS

Global Similar Types:
- *Quercus alba - Quercus prinus - Carya glabra / Cornus florida / Vaccinium pallidum* Forest (CEGL008515) occurs in similar, low-elevation settings in VA, WV, and MD but much more oak than hickory.
- *Quercus prinus - Quercus rubra - Carya ovalis / Carex pensylvanica - (Calamagrostis porteri)* Forest (CEGL008516) is a "southern analogue" occurring on middle- to higher-elevation upper slopes and ridge crests in the Central Appalachians; has a similar structure and composition but the floristics are somewhat different.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community grades from a forest with extensive sedge lawn to an open glade with patchy sedge cover. In New Hampshire, *Carex pensylvanica* is more of a rich-site indicator than *Carex lucorum*. In Connecticut, *Carex deweyana* and *Festuca subverticillata* are enrichment indicators. Some of the New Jersey examples lack *Ostrya virginiana*.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: As discussed at the classification meeting, some of the northeastern state ecologists would like former *Carya (glabra, ovata) - Fraxinus*

americana - *Quercus* spp. Forest (CEGL006236) split back out of this association (CEGL006301). The global description for CEGL006301 has since been broadened to better represent the merging of the two associations.
Global Classification Comments: Former *Carya (glabra, ovata) - Fraxinus americana - Quercus* spp. Forest (CEGL006236) was lumped into this community in 2009 allowing for oak-hickory without sedge lawn stands to be included in this type (CEGL006301).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut (Mt. Prospect, Sharon Mountain - North End), New Jersey (Culvers Gap North, Sunrise Mountain Southeast, Unionville West), New York (Harriman State Park), and at Delaware Water Gap in Pennsylvania.
Global Range: The principal distribution of this community type is centered in Lower New England, ranging from southern New Hampshire to New Jersey and northern Pennsylvania.
Nations: US
States/Provinces: CT, MA, ME, NH:S2, NJ:S2S3, NY, PA, RI, VT:S3
TNC Ecoregions: 49:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212E:CC, 212Fa:CCP, 212Fb:CCC, 212Fc:CCC, 212Ga:CPP, 212Gb:CPP, 221Ab:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Am:CCP, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCP, 221Dc:CCC, 221Ea:CCC, 221Fa:CCC, 222I:CC, M212Bb:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Dc:CCC, M212De:CCC, M212Eb:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap, Saratoga)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FOHG
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (6 plots; 4 observation points; 39 accuracy assessment points): APPA.0010, APPA.0065, APPA.0076, APPA.0568, APPA.0662, APPA.0905, APPA.1347, APPA.1357, APPA.1437, APPA.1452, APPA_AA_1644, APPA_AA_1687, APPA_AA_1698, APPA_AA_1731, APPA_AA_1740, APPA_AA_1792, APPA_AA_1859, APPA_AA_1869, APPA_AA_1886, APPA_AA_1908, APPA_AA_2051, APPA_AA_2177, APPA_AA_2305, APPA_AA_2376, APPA_AA_2404, APPA_AA_2406, APPA_AA_2457, APPA_AA_2494, APPA_AA_2500, APPA_AA_2528, APPA_AA_2533, APPA_AA_2576, APPA_AA_2582, APPA_AA_2766, APPA_AA_2806, APPA_AA_2813, APPA_AA_2823, APPA_AA_2851, APPA_AA_2892, APPA_AA_2953, APPA_AA_3005, APPA_AA_3037, APPA_AA_3069, APPA_AA_3075, APPA_AA_3097, APPA_AA_3098, APPA_AA_3164, APPA_AA_3277, APPA_AA_3345.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming, P. Coulling, S.L. Neid and S.C. Gawler
References: Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d., Edinger et al. 2002, Edinger et al. 2007, Enser 1999, Enser and Lundgren 2006, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming et al. 2001, Gawler 2002, Gawler and Cutko 2010, Lundgren 2001, Metzler and Barrett 2001, Metzler and Barrett 2004, Metzler and Barrett 2006, NRCS 2004a, NYNHP 2009, Perles et al. 2007, Rawinski 1984a, Rawinski et al. 1996, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Thompson and Sorenson 2000*, VDNH 2003

[CEGL008518] *Quercus rubra - Carya ovata - Fraxinus americana / Actaea racemosa - Hydrophyllum virginianum* Forest

Translated Name: **Northern Red Oak - Shagbark Hickory - White Ash / Black Baneberry - Eastern Waterleaf Forest**
Common Name: **Central Appalachian Montane Oak - Hickory Forest (Basic Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Northeastern Oak - Hickory Forest & Woodland (G650)
Alliance	*Quercus alba* - *Carya* spp. - *Fraxinus americana* Forest Alliance (A2053)

ELEMENT CONCEPT

Global Summary: This community is known from the southern part of the Central Appalachians, extending into the extreme northern portions of the Southern Blue Ridge, Southern Ridge and Valley, and Cumberland Mountains. It

occurs throughout western Virginia and adjacent eastern West Virginia, forming extensive patches on the Northern Blue Ridge and, somewhat more locally, on the higher ridges of the Ridge and Valley province. Favorable sites are upper slopes and ridge crests with deep, base-rich soils weathered from mafic and calcareous parent material, including metabasalt (greenstone), amphibolite, pyroxene-bearing granulite, charnockite, and actinolite schist. It also occurs on sites underlain by calcareous sandstone, siltstone, metasiltone, phyllite, and felsic granites with mafic clasts. Occurrences span a range of intermediate elevations, from 680-1265 m (2250-4150 feet), with a mean elevation of approximately 1000 m (3280 feet). Slopes are mostly gentle to moderate, averaging about 15°. Aspect varies considerably, but a majority of stands are located on sites with southwestern to northwestern or flat exposures. Soils are mostly dark, friable loams and silt loams with variable chemistry, but typically high in calcium, magnesium, and/or manganese. The characteristic expression of this community is that of an oak or oak-hickory forest with an herb layer that resembles that of a rich cove forest. *Quercus rubra* is the most constant member of the overstory but usually shares dominance with *Carya ovalis, Carya ovata, Fraxinus americana* or, less frequently, other mesophytic hardwoods such as *Tilia americana* (both *var. americana* and *var. heterophylla*), *Quercus alba, Carya cordiformis, Prunus serotina*, and *Betula lenta*. Both *Liriodendron tulipifera* and *Quercus prinus*, which are ubiquitous in much of the Central Appalachians, are uncommon to rare in this community type. The subcanopy tends to be strongly dominated by *Carya* spp. and *Fraxinus americana*, with *Acer saccharum, Acer rubrum, Acer pensylvanicum*, and *Ostrya virginiana* also important in some stands. The shrub layer is typically sparse. Most stands have a lush and generally diverse herb layer, with total cover often exceeding 80% and strong patch-dominance by leafy, colonial forbs such as *Actaea racemosa (= Cimicifuga racemosa), Ageratina altissima var. altissima, Hydrophyllum virginianum, Collinsonia canadensis, Caulophyllum thalictroides, Laportea canadensis, Impatiens pallida, Thalictrum coriaceum*, and *Asclepias exaltata*. At higher elevations, where the type is transitional to northern red oak forests, *Dennstaedtia punctilobula* often dominates the herb layer in large clones.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This basic Central Appalachian montane oak-hickory forest occurs at elevations from 297 to 1183 m in the Northern Blue Ridge and Ridge and Valley on convex upper slopes, saddles and broad ridge crests with deep, base-rich soils weathered from mafic and calcareous parent material. It was sampled at 21 locations in Central Appalachians. Sites range from gentle to somewhat steep mid and upper slopes and ridges with variable aspects. Soils are dry to mesic well-drained loam, clay loam, silt loam, sandy loam, and loamy sand. The unvegetated surface is dominated by leaf litter with some downed wood, large rocks and/or bare soil. Evidence of disturbance includes trails, heavy deer browsing, wind/ice damage, gypsy moth damage, and the presence of exotic plant species.

Global Environment: This association typically occupies convex upper slopes, saddles and broad ridge crests with deep, base-rich soils weathered from mafic and calcareous parent material. On the Blue Ridge, these include metabasalt (greenstone), amphibolite, pyroxene-bearing granulite, charnockite, actinolite schist, and calcareous metasiltstone or phyllite. In the Ridge and Valley province, the most common substrates are calcareous sandstone (of several formations) and calcareous siltstone of the Juniata Formation. The type also occurs less frequently on Blue Ridge sites underlain by felsic granite with mafic clasts. Occurrences span a range of intermediate elevations, from 680-1265 m (2250-4150 feet), but are most common above 820 m (2700 feet); mean elevation of 77 plot samples is approximately 1000 m (3280 feet). Slopes are mostly gentle to moderate, averaging about 15°. Aspect varies considerably, but a majority of stands are located on sites with southwestern to northwestern or flat exposures. Overall site moisture potential probably ranges from moderately high to high, and thus sites can generally be considered submesic to mesic. Surface substrate usually consists primarily of leaf litter, with few surface rocks present, although small areas on sharp convexities or in debris-collecting concavities may be notably rocky. Soils are dark, moist, friable loams and silt loams or, less frequently, clay loams. Samples collected from plots are moderately to strongly acidic, with varying base status (calcium concentrations range from 140-4064 ppm) but more uniformly high manganese levels (mean = 159 ppm, max = 511 ppm).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus rubra* shares dominance with *Quercus alba, Carya ovalis, Carya ovata*, and/or *Fraxinus americana* (which may surpass *Carya* spp. coverage in the canopy at higher elevations). The subcanopy is strongly dominated by *Carya* spp., *Fraxinus americana*, and *Prunus serotina*. *Ostrya virginiana* may be present, but not dominant. The shrubs layer is typically very sparse but can include *Acer pensylvanicum, Hamamelis virginiana, Hydrangea* spp., and/or *Magnolia* spp. The lush and diverse herb layer resembles that of a rich cove forest and includes *Actaea racemosa, Ageratina altissima, Asclepias exaltata, Actaea racemosa, Circaea lutetiana ssp. canadensis, Collinsonia canadensis, Dioscorea quaternata, Festuca subverticillata, Dennstaedtia punctilobula, Hydrophyllum virginianum, Monarda clinopodia,*

Sanguinaria canadensis, Stellaria pubera, Thalictrum coriaceum, Uvularia perfoliata, and/or *Viola* spp., along with many others. This community also supports VA-state critically imperiled *Heuchera caroliniana*, WV-state critically imperiled *Bromus pubescens*, VA-state imperiled *Rubus idaeus ssp. strigosus*, and WV-state imperiled *Bromus pubescens*.

Global Vegetation: The characteristic expression of this community is that of an oak or oak-hickory forest with an herb layer that resembles that of a rich cove forest. *Quercus rubra* is the most constant member of the overstory but usually shares dominance with *Carya ovalis, Carya ovata, Fraxinus americana* or, less frequently, other mesophytic hardwoods such as *Tilia americana* (both *var. americana* and *var. heterophylla*), *Quercus alba, Carya cordiformis, Prunus serotina*, and *Betula lenta*. Both *Liriodendron tulipifera* and *Quercus prinus*, which are ubiquitous in much of the Central Appalachians, are uncommon to rare in this community type. The subcanopy tends to be strongly dominated by *Carya* spp. and *Fraxinus americana*, with *Acer saccharum, Acer rubrum, Acer pensylvanicum*, and *Ostrya virginiana* also important in some stands. The shrub layer is typically sparse. Most stands have a lush and generally diverse herb layer, with total cover often exceeding 80% and strong patch-dominance by leafy, colonial forbs, especially *Actaea racemosa (= Cimicifuga racemosa), Ageratina altissima var. altissima, Hydrophyllum virginianum, Collinsonia canadensis, Caulophyllum thalictroides, Laportea canadensis, Impatiens pallida, Thalictrum coriaceum*, and *Asclepias exaltata*. Dominance patterns in the ground layer vary considerably both within and among stands, and at least 22 herbaceous species are known to attain at least 10% cover in one or more stands of this type. Other characteristic herbs that usually occur at lower cover include *Solidago curtisii, Dioscorea quaternata, Amphicarpaea bracteata, Geranium maculatum, Uvularia perfoliata, Monarda clinopodia, Circaea lutetiana ssp. canadensis, Arisaema triphyllum, Eupatorium purpureum var. purpureum, Stellaria pubera, Festuca subverticillata, Sanguinaria canadensis, Silene stellata, Osmorhiza claytonii, Prenanthes altissima, Trillium grandiflorum, Scrophularia lanceolata, Osmunda claytoniana, Helianthus decapetalus, Stachys nuttallii (= Stachys subcordata), Thelypteris noveboracensis*, and *Viola pubescens*. A noteworthy variant of the type features overwhelming herb-layer dominance by *Osmunda claytoniana* on sites with slightly concave microtopography that may sustain higher soil moisture. Another distinctive variant occurs at higher elevations (>1128m [3700 feet]) on granitic terrain of the Northern Blue Ridge and occasionally elsewhere, where this type is somewhat transitional to high-elevation forests strongly dominated by *Quercus rubra* and acidophilic shrubs and herbs. This variant consistently features an open, stunted canopy of gnarled *Quercus rubra* and *Carya ovata* over a fern-rich herb layer dominated by *Dennstaedtia punctilobula*, with the more characteristic nutrient-demanding forbs still present but occurring at lower cover. Mean species richness of 77 plot samples was 57 taxa per 400 square meters.

Global Dynamics: All stands have likely experienced a long history of disturbance, including the loss of *Castanea dentata* as an overstory constituent in the early 20th century, logging, occasional low-intensity fires, and wind and ice storms. Many occurrences also experienced moderate to severe defoliation by gypsy moth (*Lymantria dispar*) during the last several decades. Severe wind and ice storms are common disturbances at higher elevations and more exposed locations, resulting in stunted and gnarled tree stature. Several stands of this type, particularly those in northern Shenandoah National Park, experienced severe oak mortality following sustained defoliation by gypsy moth and coincident drought in the late 1980s and early 1990s; these have regenerated in even-aged stands of *Fraxinus americana* or combinations of *Fraxinus americana* and *Carya* spp. Like most eastern oak forests, stands of this community type tend to have poor or marginal oak recruitment, and many have been invaded by shade-tolerant mesophytes such as *Acer saccharum, Acer rubrum*, and *Tilia americana* following decades of fire exclusion. However, such mesophytic trees are absent from the understories of some stands where younger tree recruitment is overwhelmingly composed of *Carya* spp. Because of the deep, fertile soils occupied by this community, invasive exotics (especially *Alliaria petiolata*) have become well-established at some sites.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Fraxinus americana*
Tree canopy	Broad-leaved deciduous tree	*Carya ovalis*, *Carya ovata*, *Quercus rubra*
Herb (field)	Flowering forb	*Actaea racemosa*, *Ageratina altissima*, *Asclepias exaltata*, *Caulophyllum thalictroides*, *Collinsonia canadensis*, *Impatiens pallida*, *Laportea canadensis*, *Thalictrum coriaceum*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Carya ovalis*, *Carya ovata*, *Fraxinus americana*
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Herb (field)	Flowering forb	*Actaea racemosa*, *Ageratina altissima*, *Asclepias exaltata*, *Caulophyllum thalictroides*, *Collinsonia canadensis*, *Hydrophyllum virginianum*, *Impatiens pallida*, *Laportea canadensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Actaea racemosa*, *Ageratina altissima*, *Carya ovalis*, *Circaea lutetiana* ssp. *canadensis*, *Dioscorea quaternata*, *Fraxinus americana*, *Hydrophyllum virginianum*, *Monarda clinopodia*, *Prunus serotina*, *Quercus alba*, *Quercus rubra*, *Thalictrum coriaceum*
Global: *Actaea racemosa*, *Ageratina altissima*, *Carya cordiformis*, *Carya ovalis*, *Carya ovata*, *Fraxinus americana*, *Hydrophyllum virginianum*, *Monarda clinopodia*, *Quercus alba*, *Quercus rubra*, *Thalictrum coriaceum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Bromus pubescens* (G5, WV state-critically imperiled), *Heuchera caroliniana* (G3, globally vulnerable & VA state-critically imperiled), *Rubus idaeus* ssp. *strigosus* (G5T5, VA state-imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Arctium minus* (Medium/Insignificant), *Calystegia sepium*, *Chenopodium album*, *Galinsoga quadriradiata*, *Hieracium caespitosum* (Medium/Insignificant), *Poa compressa* (High/Low), *Ranunculus bulbosus*, *Rosa multiflora* (Medium/Low), *Rumex acetosella* (Medium/Low), *Taraxacum officinale*
Global: Vulnerable Plants: *Arnoglossum muehlenbergii* (G4, VA state-rare), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Heuchera alba* (G2Q), *Heuchera caroliniana* (G3), *Panax quinquefolius* (G3G4, under collection pressure), *Scutellaria arguta* (G1?Q), *Scutellaria saxatilis* (G3), *Tsuga caroliniana* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (22-Feb-2010). This vegetation type appears to be largely restricted to base-rich soils on the higher ridges of the Central Appalachians, where it constitutes a large-patch community. Extensive occurrences north of Virginia and West Virginia are unlikely. Sites occupied by this community are highly favorable for timber production, and a substantial percentage of known stands occur on U.S. Forest Service lands subject to harvesting. In addition to logging, threats to this type include oak decline and invasive exotic weeds.

RELATED CONCEPTS

Global Similar Types:

- *Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest (CEGL007692) is very similar but more southern in distribution; the Southern Blue Ridge analogue of CEGL008518.
- *Quercus prinus - Quercus rubra - Carya ovalis / Carex pensylvanica - (Calamagrostis porteri)* Forest (CEGL008516) occurs in the same region, at similar elevations, and on similar topographic positions, but occurs on drier, more acidic sites over sedimentary and metasedimentary rocks; composition is much less mesophytic, with an herb layer usually patch-dominated by dry-site graminoids.
- *Quercus rubra - (Quercus alba) / Ilex montana / Dennstaedtia punctilobula - Lysimachia quadrifolia* Forest (CEGL008506) occupies higher-elevation sites with infertile soils.
- *Quercus rubra - Fraxinus americana - Acer saccharum / Actaea racemosa - Caulophyllum thalictroides* Forest (CEGL004256) is a rich, high-elevation red oak forest of the Southern Appalachians.
- *Quercus rubra - Quercus prinus - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (CEGL008514) occurs at lower elevations in the Blue Ridge and western Piedmont, on dry-mesic sites over mafic and granitic rocks.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community is uncommon south of the New River in Virginia, owing to the scarcity of suitably base-rich geologic

substrates. This type is a Central Appalachian rich montane oak-hickory forest that, as currently circumscribed, occurs on mafic and calcareous sedimentary substrates of the Northern Blue Ridge and Ridge and Valley from about 750 to 1,150 m (2,500-3,800 feet) elevation. It mostly occurs on gentle, deep-soiled upper slopes and has an extremely lush herb layer that resembles that of a rich cove forest. It is especially extensive on metabasalt ridges of the Northern Blue Ridge, which dominate Shenandoah National Park. Oak recruitment is poor, and *Acer saccharum* and other mesophytic trees are invading many stands of the type.

Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: In the Shenandoah National Park vegetation mapping project, if *Fraxinus americana* was dominant in an advanced successional stage with some *Quercus* and *Carya* present and an intact native shrub and herb layer, the stand was classified as Central Appalachian Montane Oak - Hickory Forest (Basic Type) (CEGL008518) because *Fraxinus americana* is a nominal and frequent codominant in that type.

Global Classification Comments: As currently circumscribed, this association encompasses three community types classified by Fleming and Coulling (2001) based on limited plot data from discrete portions of western Virginia. Subsequently, much more extensive plot data were collected across the area, and the compositional and geographic distinction of these "types" became less clear. Recent analysis of a Virginia statewide dataset of 255 montane oak-hickory plots (Fleming and Patterson 2009b) supported the merger of these types as a single association appropriate at the scale of the U.S. National Vegetation Classification. This unit was represented by 77 plots. It is somewhat variable in composition, but consistent in its environmental affiliations and easily recognizable in the field. To an extent, the original classified units can be recognized as "variants" of this association, varying in the relative abundances of some species, in affiliations with geologic substrates, and in soil type or chemistry. A common characteristic of all variants is relatively high concentrations of soil manganese. Several recent studies of montane forest vegetation (Newell and Peet 1996b, Newell 1997, Coulling and Rawinski 1999) have identified a strong positive relationship between manganese levels and species richness. In this community type, however, abundant manganese may explain the total cover and, in part, the composition of the herb layer, but total herb diversity may be more a function of total base saturation and the abundance of other soil cations. In addition, the abundance of both *Carya* spp. and *Fraxinus americana* in these stands is no doubt a reflection of the higher base status of soils supporting this association. An intensive study of forest vegetation in the Southern Appalachians comprising nine landscapes and >1100 plots identified no vegetation type in which either *Carya ovalis* (included in *Carya glabra*) or *Carya ovata* constitutes an important component (Newell 1997). The tendency of *Carya* spp. to occupy more fertile soils was long ago noted (Guthrie 1820), and the relative paucity of *Carya* in Central and Southern Blue Ridge forests may reflect the exceptionally high base status of many Central Appalachian soils.

Several stands of this type, particularly those in northern Shenandoah National Park, experienced severe oak mortality following sustained defoliation by gypsy moth and coincident drought in the late 1980s and early 1990s.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is found from the southern part of the Central Appalachians north along the AT into western Virginia and adjacent West Virginia and north into Maryland. It is uncommon south of the New River in Virginia and very common in Shenandoah National Park. It was sampled in Maryland at Gathland State Park; in Virginia at Bald Face Mountain, Cole Mountain, Devils Ditch, Floyd Mountain, Gravel Springs, Holston Mountain, James River Face Wilderness, Kelly Knob, Potts Mountain, Smith Roach Gap, South Marshall, Tar Jacket Ridge, and Thunder Hill; and in West Virginia at Blue Ridge.

Global Range: This community is known from the southern part of the Central Appalachians in western Virginia and adjacent West Virginia, on upper slopes and ridge crests with deep, base-rich soils weathered from mafic and calcareous parent material. It is a recurring type that forms extensive patches in suitable habitat of the Northern Blue Ridge, and somewhat more locally in the Ridge and Valley province. Outlying occurrences extend into the extreme northern portions of the Southern Blue Ridge, Southern Ridge and Valley, and Cumberland Mountains (High Knob Massif) and western Maryland. It is possible this type extends into central Pennsylvania, but low relief almost certainly limits, if not precludes, its distribution north of Virginia and West Virginia.

Nations: US

States/Provinces: MD, VA:S3S4, WV

TNC Ecoregions: 50:C, 51:C, 59:C

USFS Ecoregions (1994/95): M221Aa:CCC, M221Bd:CCC, M221Ce:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC

Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Shenandoah); USFS (George Washington, Jefferson, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAOH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (19 plots; 3 observation points; 26 accuracy assessment points): APPA.0106, APPA.0107, APPA.0109, APPA.0232, APPA.0238, APPA.0243, APPA.0246, APPA.0248, APPA.0337, APPA.0338, APPA.0339, APPA.0340, APPA.0346, APPA.0347, APPA.0348, APPA.0350, APPA.0480, APPA.0481, APPA.0669, APPA.1003, APPA.1174, APPA.1175, APPA_AA_0287, APPA_AA_0297, APPA_AA_0304, APPA_AA_0413, APPA_AA_0431, APPA_AA_0481, APPA_AA_0569, APPA_AA_0582, APPA_AA_0600, APPA_AA_0606, APPA_AA_0632, APPA_AA_0681, APPA_AA_0715, APPA_AA_0719, APPA_AA_0782, APPA_AA_0828, APPA_AA_0833, APPA_AA_0907, APPA_AA_0926, APPA_AA_1160, APPA_AA_1215, APPA_AA_1231, APPA_AA_1322, APPA_AA_1411, APPA_AA_1421, APPA_AA_1585.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and P.P. Coulling
References: Coulling and Rawinski 1999, Eyre 1980, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2007b, Guthrie 1820, Newell 1997, Newell and Peet 1996b, Rawinski et al. 1996, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL008514] *Quercus rubra - Quercus prinus - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest

Translated Name: **Northern Red Oak - Chestnut Oak - Red Hickory / (Eastern Redbud) / Wreath Goldenrod Forest**
Common Name: **Central Appalachian Basic Oak - Hickory Forest (Western Piedmont / Lower Blue Ridge Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Northeastern Oak - Hickory Forest & Woodland (G650)
Alliance	*Quercus alba* - *Carya* spp. - *Fraxinus americana* Forest Alliance (A2053)

ELEMENT CONCEPT

Global Summary: This community is currently known from a narrow range in the Northern Blue Ridge and adjacent inner Piedmont of Virginia, Maryland, and West Virginia. It is restricted to the western Piedmont foothills and lower- to middle-elevation slopes and spurs of the main Blue Ridge. Elevation ranges from 140 to 950 m (450-3100 feet). The type is generally associated with base-rich soils weathered from mafic igneous and metamorphic rocks, including metabasalt, amphibolite, pyroxene-bearing granulite, charnockite, and actinolite schist. It also occurs less frequently on granitic rocks and calcareous metasiltones and phyllites. Habitats are more-or-less rocky, gentle to steep, submesic to subxeric slopes with a wide range of aspects. Midslope topographic positions are typical, but stands occasionally occur on lower or upper slopes and crests. This association is a true oak-hickory forest with mixed canopy dominance by several *Quercus* spp. and *Carya* spp. In particular, *Carya ovalis, Quercus rubra*, and *Quercus prinus* are consistent codominants and have the highest importance values based on standard forestry statistics generated from stem-diameter measurements. *Quercus alba, Quercus velutina, Carya alba, Carya glabra, Fraxinus americana*, and *Liriodendron tulipifera* are less constant canopy species but achieve codominance in some stands. *Carya* spp., *Quercus* spp., *Acer rubrum, Nyssa sylvatica, Fraxinus americana*, and *Sassafras albidum* are well-represented in lower tree strata. *Cercis canadensis* (at lower elevations) and, to a lesser extent, *Cornus florida* dominate the shrub and lowest tree layers, while *Viburnum acerifolium* is a common low shrub. A large number of herbaceous species occur in the type.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This basic oak-hickory forest is known only from metamorphic geologic substrates and base-rich soils restricted to the Northern Blue Ridge north of Roanoke, Virginia, and adjacent inner Piedmont of Virginia, Maryland, and West Virginia. Elevation ranges from 140 to 950 m (450-3,100 feet). It was sampled at 16 locations in the Central Appalachian project area.

Sites range from gentle to somewhat steep mid to upper slopes and summits of mostly eastern or western aspects. Soils are moderately well- to well-drained silt loam, sandy loam and loam. The unvegetated surface is typically dominated by leaf litter but may also consist of some exposed bedrock, large and small rocks, downed wood and bare soil. Evidence of disturbance includes past fire, trails, wind-ice damage, grazing/browsing, chestnut blight, insect/disease damage, and the presence of exotic plant species.

Global Environment: This association is restricted to the western Piedmont foothills and lower- to middle-elevation slopes and spurs of the main Blue Ridge. Elevation ranges from 140 to 950 m (450-3100 feet). The type is generally associated with base-rich soils weathered from mafic igneous and metamorphic rocks, including metabasalt, amphibolite, pyroxene-bearing granulite, charnockite, and actinolite schist. It also less frequently occurs on granitic rocks and calcareous metasiltones and phyllites. In 75 plot-sampled stands, elevation ranges from 140 to 950 m (450-3100 feet), with a mean of 485 m (1590 feet). Occurrences above 850 m (2800 feet) are uncommon and restricted to warm, south- to west-facing slopes. Habitats are more-or-less rocky, gentle to steep (mean = 17°), submesic to subxeric slopes with a wide range of aspects. Middle-slope topographic positions are typical, but stands occasionally occur on lower or upper slopes and crests. Surficial cover of outcrops and boulders in plots averages about 10%. Soils are dark, very stony, clay, silt, or silty-clay loams. Although pH ranges from extremely acidic to circumneutral, these soils consistently have moderately high levels of calcium, magnesium, and manganese.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The mixed canopy is dominated by *Carya ovalis, Quercus rubra*, and *Quercus prinus*. *Quercus alba, Quercus velutina, Carya ovata, Carya glabra, Fraxinus americana*, and *Liriodendron tulipifera* are less constant canopy species but achieve codominance in some stands. *Fraxinus americana, Cercis canadensis* (at lower elevations), *Cornus florida, Asimina triloba, Lindera benzoin, Amelanchier arborea, Hamamelis virginiana, Ostrya virginiana*, and/or *Acer rubrum* dominate the lowest tree and shrub layers. Common herbs include *Galium circaezans, Festuca subverticillata, Maianthemum racemosum ssp. racemosum, Dioscorea quaternata, Solidago caesia, Circaea lutetiana ssp. canadensis, Desmodium nudiflorum, Podophyllum peltatum*, and/or *Sanguinaria canadensis*. This community also supports VA-state critically imperiled *Bromus ciliatus*.

Global Vegetation: This association is a true oak-hickory forest with variable mixed canopy dominance by several *Quercus* spp. and *Carya* spp. *Carya ovalis, Quercus rubra*, and *Quercus prinus* are consistent codominants and have the highest importance values (IV) based on standard forestry statistics generated from stem-diameter measurements. *Quercus alba, Quercus velutina, Carya alba, Carya glabra, Fraxinus americana*, and *Liriodendron tulipifera* are less constant canopy species but achieve codominance in some stands. *Carya* spp., *Quercus* spp., *Acer rubrum, Nyssa sylvatica, Fraxinus americana*, and *Sassafras albidum* are well-represented in lower tree strata. *Cercis canadensis* and, to a lesser extent, *Cornus florida* dominate the shrub and lowest tree layers, while *Viburnum acerifolium* is a common low shrub. *Cercis canadensis*, however, is elevation-limited in this region and is commonly absent from stands on the main Blue Ridge. Small patches of *Vaccinium pallidum* and *Vaccinium stamineum* may be present, but as a rule, ericads are sparse. Additional shrubs and small trees of irregular but local importance include *Ostrya virginiana, Asimina triloba, Ulmus rubra, Amelanchier arborea*, and *Hamamelis virginiana*. Climbing lianas of *Toxicodendron radicans, Parthenocissus quinquefolia*, and *Vitis* spp. are common. The herb layer varies from somewhat sparse to fairly dense. A large number of herbaceous species occur in the type, but *Desmodium nudiflorum, Solidago caesia, Dioscorea quaternata, Galium circaezans, Circaea lutetiana ssp. canadensis, Amphicarpaea bracteata, Botrychium virginianum, Geum virginianum, Phryma leptostachya, Actaea racemosa (= Cimicifuga racemosa), Aristolochia serpentaria*, and *Cardamine concatenata* are particularly characteristic. The latter species, *Thalictrum thalictroides*, and *Claytonia virginica* completely dominate the early spring herbaceous aspect, carpeting the ground with their small white flowers. *Solidago curtisii* usually replaces *Solidago caesia* at the higher end of the elevational range. Herbs that may be locally common or abundant include *Dryopteris marginalis, Desmodium glutinosum*, and *Aralia nudicaulis*. Species richness of plot-sampled stands ranges from 43 to 103 taxa per 400 square meters (mean = 70).

Global Dynamics: The proportion of *Liriodendron tulipifera* increases with canopy disturbance. Consequently, in many stands logged during the 20th century, *Liriodendron* is codominant with the oaks and hickories. Some stands of this association have been modified by repeated cutting and are now heavily dominated by *Liriodendron tulipifera*. *Symphoricarpos orbiculatus, Polygonum caespitosum var. longisetum*, and exotics such as *Ailanthus altissima, Rubus phoenicolasius*, and *Celastrus orbiculata* often become established in canopy gaps following timber harvests or gypsy moth damage. In recent years, the abundance of *Cornus florida* has been significantly reduced by mortality resulting from dogwood anthracnose.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya ovalis*, *Quercus alba*, *Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Fraxinus americana*, *Ostrya virginiana*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Carya ovalis*
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Ostrya virginiana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Amphicarpaea bracteata*, *Asimina triloba*, *Carya ovalis*, *Cornus florida*, *Festuca subverticillata*, *Fraxinus americana*, *Galium circaezans*, *Ostrya virginiana*, *Quercus alba*, *Quercus prinus*, *Quercus rubra*, *Solidago caesia*, *Toxicodendron radicans*
Global: *Actaea racemosa*, *Amphicarpaea bracteata*, *Aristolochia serpentaria*, *Carya alba*, *Carya glabra*, *Carya ovalis*, *Cercis canadensis*, *Cornus florida*, *Desmodium nudiflorum*, *Fraxinus americana*, *Galium circaezans*, *Liriodendron tulipifera*, *Maianthemum racemosum*, *Phryma leptostachya*, *Quercus prinus*, *Quercus rubra*, *Solidago caesia*, *Uvularia perfoliata*, *Viburnum acerifolium*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Bromus ciliatus* (G5, VA state-critically imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Ligustrum obtusifolium* (Medium/Low), *Lonicera japonica* (High/Medium), *Lonicera morrowii* (High/Medium), *Microstegium vimineum* (High/Medium), *Nepeta cataria*, *Prunus avium* (High/Low), *Rubus phoenicolasius* (Medium), *Taraxacum officinale*, *Torilis japonica*, *Verbascum thapsus* (Medium)
Global: Vulnerable Plants: *Panax quinquefolius* (G3G4, under collection pressure), *Scutellaria saxatilis* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (23-Feb-2004). Although currently known from a relatively small geographic range, this community type covers large areas at low elevations on the Northern Blue Ridge and some of its Piedmont foothills. In recent years, the abundance of *Cornus florida* has been significantly reduced by mortality resulting from dogwood anthracnose. Stands are threatened by removal of commercially valuable timber species (e.g., *Quercus rubra, Quercus prinus, Quercus alba, Carya* spp.). Some stands of this association have been modified by repeated cutting and are now heavily dominated by *Liriodendron tulipifera*. *Symphoricarpos orbiculatus, Polygonum caespitosum var. longisetum*, and exotics such as *Ailanthus altissima, Rubus phoenicolasius*, and *Celastrus orbiculata* often become established in canopy gaps following timber harvests or gypsy moth damage.

RELATED CONCEPTS

Global Similar Types:

- *Quercus alba - Carya glabra - Fraxinus americana / Muhlenbergia sobolifera - Elymus hystrix* Forest (CEGL006216) is mostly in the Piedmont in more xeric habitats with shallow or hardpan soils.
- *Quercus alba - Quercus prinus - Carya glabra / Cornus florida / Vaccinium pallidum* Forest (CEGL008515) is an acidic oak-hickory forest of sedimentary and metasedimentary substrates, particularly shale, in the Central Appalachians.
- *Quercus prinus - Quercus rubra - Carya ovalis / Carex pensylvanica - (Calamagrostis porteri)* Forest (CEGL008516) occupies drier sites at higher elevations in the Central Appalachians; usually lacks *Liriodendron tulipifera, Cercis canadensis*, and other low-elevation species.
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057)
- *Quercus prinus - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest (CEGL008523)
- *Quercus rubra - Carya ovata - Fraxinus americana / Actaea racemosa - Hydrophyllum virginianum* Forest (CEGL008518) occupies rich sites over calcareous and mafic rocks at higher elevations of the Central Appalachians; composition is more mesophytic, with a lush herb layer of leafy, colonial, nutrient-demanding forbs.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: In the AT corridor, this type occurs strictly on the Blue Ridge north of Roanoke, at low to middle elevations, on base-rich granite and metabasalt substrates (at middle to high elevations on these substrates, it is replaced by Central Appalachian Montane Oak - Hickory Forest (Basic Type) (CEGL008518)). It is known only from metamorphic geologic substrates of the Blue Ridge and western Piedmont, and is not found anywhere in the Ridge and Valley province. This is a Central Appalachian oak-hickory forest that occurs on mafic and base-rich granitic substrates of the Blue Ridge and its western Piedmont foothills. The elevational range of the type is from <300 m (<1,000 feet) to about 950 m (3,100 feet) on warm slopes (lower on sheltered slopes and in northern Virginia); plots in this analysis range from about 400 to 960 m, and mostly lack some of the lower-elevation species (e.g., *Cercis canadensis* and *Solidago caesia*) that are common in the type.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: Virginia plots earlier assigned to Northern Hardpan Basic Oak - Hickory Forest (CEGL006216) were reclassified to this type (CEGL008514). The proportion of *Liriodendron tulipifera* increases with canopy disturbance. Consequently, in many stands logged during the 20th century, *Liriodendron* is codominant with the oaks and hickories. Some stands of this association have been modified by repeated cutting and are now heavily dominated by *Liriodendron tulipifera*. *Symphoricarpos orbiculatus, Polygonum caespitosum var. longisetum*, and exotics such as *Ailanthus altissima, Rubus phoenicolasius*, and *Celastrus orbiculata* often become established in canopy gaps following timber harvests or gypsy moth damage. In recent years, the abundance of *Cornus florida* has been significantly reduced by mortality resulting from dogwood anthracnose.
Global Classification Comments: In the context of the VDNH George Washington / Jefferson National Forest dataset (VDNH unpubl. data), *Desmodium nudiflorum* has the highest unscaled adjusted Indicator Value among herbs of this community type. However, plots representing this association were also analyzed in a 477-plot dataset of Piedmont and Inner Coastal Plain vegetation, where *Desmodium nudiflorum* attained much higher indicator status in other vegetation types. Because of these results, *Solidago caesia* was chosen as a nominal herb for this community, instead of *Desmodium nudiflorum*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is restricted to the Northern Blue Ridge north of Roanoke, Virginia, and adjacent inner Piedmont of Virginia, Maryland, and West Virginia. It was sampled in Pennsylvania, Maryland (including Weverton Cliffs), West Virginia (including Harpers Ferry, Loudoun Heights, Potomac Wayside), and Virginia (including Dickey Hill, Jarman Gap, Rockfish Gap).
Global Range: This community type is currently known from a narrow range in the Northern Blue Ridge and adjacent inner Piedmont of Virginia, Maryland and West Virginia, extending into the northern periphery of the Southern Blue Ridge. The type appears to be co-extensive with several mafic, igneous and metamorphic rocks, but also occurs on granitic substrates, metasiltstone and phyllite.
Nations: US
States/Provinces: MD, VA:S3S4, WV
TNC Ecoregions: 51:C, 52:C, 59:C
USFS Ecoregions (1994/95): 231Ak:CCC, 231Al:CCC, 231Ap:CCC, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, C&O Canal, Catoctin Mountain, Harpers Ferry, Monocacy, Shenandoah); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAOH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (7 plots; 10 observation points; 12 accuracy assessment points): APPA.0200, APPA.0247, APPA.0249, APPA.0250, APPA.0449, APPA.0459, APPA.0460, APPA.0515, APPA.0517, APPA.0518, APPA.1193, APPA.1235, APPA.1237, APPA.1238, APPA.1239, APPA.1240, APPA.1330, APPA_AA_0476, APPA_AA_0667, APPA_AA_0823, APPA_AA_1056, APPA_AA_1083, APPA_AA_1092, APPA_AA_1170, APPA_AA_1186, APPA_AA_1365, APPA_AA_1366, APPA_AA_1403, APPA_AA_1434.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming

References: Eastern Ecology Working Group n.d., Eyre 1980, Fleming 2002a, Fleming 2002b, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2007b, Harrison 2004, Harrison 2011, Lea 2003, Lea 2004, Young et al. 2006, Young et al. 2007a, Young et al. 2009

G161. PITCH PINE BARRENS

Group Summary Description: This group encompasses woodlands dominated by *Pinus rigida*, or by *Pinus rigida* mixed with oak species, occurring on dry and nutrient-poor soils and mostly maintained by fire. *Quercus rubra, Pinus strobus*, and *Betula populifolia* are common associates in the north, while *Quercus stellata* is characteristic in the south. A tall-shrub layer of *Quercus ilicifolia, Quercus prinoides*, and, south of New England, *Quercus marilandica* are commonly present, although portions of some barrens (or occasionally the entire barrens) lack the scrub oak component. A well-developed low-shrub layer is typical, with lowbush *Vaccinium* spp., *Gaylussacia baccata*, and *Comptonia peregrina* characteristic. The main constituents of this group are the associations that characterize the pine barrens of sandy substrates in the northeastern United States; the group also contains associations in which *Pinus rigida* dominates thin-soiled rocky hilltops. Substrates are of two major types: (1) deep sandy soils of outwash plains, stabilized inland sand dunes, and glacial till; and (2) less commonly, thin-soiled outcrops of acidic bedrock along exposed low-elevation ridgelines and upper slopes. The soils are consequently coarse-textured, acidic, mostly well-drained to xeric, and low in nutrients. *Pinus rigida* is the usual dominant, and cover may range from closed-canopy forest to (more typically) open woodlands.

A0524 *Pinus rigida* Woodland Alliance

Alliance Summary Description: This alliance is dominated by *Pinus rigida*, usually characterized by a well-developed tall-shrub layer dominated by *Quercus ilicifolia* overtopping a low heath layer comprising *Vaccinium angustifolium, Vaccinium pallidum*, and *Gaylussacia baccata*. The herbaceous layer is usually patchy, but is better developed where the shrub layer is less dense. Characteristic herbs include *Carex pensylvanica, Cypripedium acaule, Danthonia spicata, Gaultheria procumbens, Melampyrum lineare*, and *Pteridium aquilinum*. This alliance occurs on rock outcrops, summits, exposed slopes, or sandy soils of sand plains, flat glacial outwash plains, and till.

[CEGL006116] *Pinus rigida / (Quercus ilicifolia) / Photinia melanocarpa / Deschampsia flexuosa* Woodland

Translated Name: **Pitch Pine / (Bear Oak) / Black Chokeberry / Wavy Hairgrass Woodland**
Common Name: **Pitch Pine Rocky Summit**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Pitch Pine Barrens (G161)
Alliance	*Pinus rigida* Woodland Alliance (A0524)

ELEMENT CONCEPT

Global Summary: This northeastern pitch pine community occurs on dry rocky ridges and summits of low to moderate elevations. Soils are derived from acidic bedrock and are typically shallow, well- to excessively drained, coarse sands or gravels that develop in pockets of the exposed bedrock expanses. The canopy is open and trees are often stunted, usually less than 15 m in height and may be under 10 m. Tall shrubs are scattered and not abundant. The dwarf-shrub layer is moderately to well-developed (>20% cover, often more dense). Herbs are sparse. The bryoid layer is of variable cover, with lichens prominent. The ground cover is bare rock and deciduous and coniferous litter. The canopy is dominated by *Pinus rigida* with a variable mixture of associates, such as *Betula populifolia, Quercus rubra, Quercus prinus, Carya glabra, Pinus strobus, Pinus resinosa, Betula lenta, Acer rubrum*, and *Prunus serotina*. The tall-shrub layer is composed of scattered *Quercus ilicifolia, Quercus prinoides*, or less commonly *Nemopanthus mucronatus*. The shrub layer is dominated by heaths, such as *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium myrtilloides*, and *Gaylussacia baccata*, as well as other shrubs, such as *Comptonia peregrina* and *Photinia melanocarpa (= Aronia melanocarpa)*. The herbaceous layer typically includes *Pteridium aquilinum, Schizachyrium scoparium, Deschampsia flexuosa, Danthonia spicata, Carex pensylvanica* and/or *Carex lucorum, Maianthemum canadense, Aralia nudicaulis, Melampyrum lineare, Fragaria*

virginiana, Rumex acetosella, Erechtites hieraciifolia, Corydalis sempervirens, Trientalis borealis, and *Cypripedium acaule*. In the northern Appalachian Mountains, this community generally occurs at elevations from near sea level to 520 m (1700 feet) and may include species of northern affinity, such as *Viburnum nudum, Kalmia angustifolia, Betula papyrifera, Picea rubens*, and *Rhododendron canadense*. Periodic fires are probably necessary for persistence of this type, except at the most extreme sites. This association is differentiated from *Pinus rigida / Corema conradii* Woodland (CEGL006154) by the absence of *Corema*, and from other *Pinus rigida*-dominated woodlands of rocky habitats by the absence or very low cover of the scrub oak *Quercus ilicifolia*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: These pitch pine rocky summits occur at low to moderate elevations; sampled site elevations range from 387-792 m (1,270-2,598 feet). They have shallow acidic, well-drained sandy to gravelly soils. Sites range from gentle to steep upper slopes and summits (rock outcrops) with mostly northern and southern aspects. Soils are dry to xeric rapidly to well-drained sand, sandy loam and silt loam. The unvegetated surface consists of exposed bedrock/large rocks or leaf litter, with small amounts of downed wood, bare soil and/or small rocks. Evidence of disturbance includes trails and trampling from recreational use, fire, and wind/ice damage.

Global Environment: This northeastern pitch pine community occurs on dry rocky ridges and summits of low to moderate elevations. Soils are derived from acidic bedrock and are typically shallow, well- to excessively drained, coarse sands or gravels that develop in pockets of the exposed bedrock expanses. In the northern Appalachian Mountains, this community generally occurs at elevations from near sea level to 520 m (1700 feet), while in the Central Appalachians, this community occurs at elevations up to 1340 m (4400 feet).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Pinus rigida* is the dominant (tree- or shrub-sized) with a variable mixture of canopy associates, such as *Quercus prinus, Betula populifolia, Quercus rubra, Acer rubrum, Pinus strobus*, and/or *Carya glabra*. *Quercus ilicifolia* and *Photinia melanocarpa* are characteristic in the tall-shrub layer. *Kalmia latifolia* is often present. *Gaylussacia baccata* and *Vaccinium angustifolium* are dominant dwarf-shrubs. *Deschampsia flexuosa* and *Maianthemum canadense* are common in the herb layer. High lichen cover on exposed bedrock and large rocks is characteristic.

Global Vegetation: The canopy is open and trees are often stunted, usually less than 15 m in height and may be under 10 m. Tall shrubs are scattered and not abundant. The dwarf-shrub layer is moderately to well-developed (>20% cover, often more dense). Herbs are sparse. The bryoid layer is of variable cover, with lichens prominent. The ground cover is bare rock and deciduous and coniferous litter. The canopy is dominated by *Pinus rigida* with a variable mixture of associates, such as *Betula populifolia, Quercus rubra, Quercus prinus, Carya glabra, Pinus strobus, Pinus resinosa, Betula lenta, Acer rubrum*, and *Prunus serotina*. The tall-shrub layer is composed of scattered *Quercus ilicifolia, Quercus prinoides*, or less commonly *Nemopanthus mucronatus*. The shrub layer is dominated by heaths, such as *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium myrtilloides*, and *Gaylussacia baccata*, as well as other shrubs, such as *Comptonia peregrina* and *Photinia melanocarpa (= Aronia melanocarpa)*. The herbaceous layer typically includes *Pteridium aquilinum, Schizachyrium scoparium, Deschampsia flexuosa, Danthonia spicata, Carex pensylvanica* and/or *Carex lucorum, Maianthemum canadense, Aralia nudicaulis, Melampyrum lineare, Fragaria virginiana, Rumex acetosella, Erechtites hieraciifolia, Corydalis sempervirens, Trientalis borealis*, and *Cypripedium acaule*. In the northern Appalachian Mountains, this community may include species of northern affinity, such as *Viburnum nudum, Kalmia angustifolia, Betula papyrifera, Picea rubens*, and *Rhododendron canadense*.

Global Dynamics: Periodic fires are probably necessary for persistence, except at the most extreme sites.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus rigida*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Quercus ilicifolia*
Tall shrub/sapling	Needle-leaved tree	*Pinus rigida*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Photinia melanocarpa*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium angustifolium*
Herb (field)	Graminoid	*Deschampsia flexuosa*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus rigida*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Quercus ilicifolia*
Tall shrub/sapling	Needle-leaved tree	*Pinus rigida*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Amelanchier arborea*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium angustifolium*, *Vaccinium pallidum*
Herb (field)	Flowering forb	*Corydalis sempervirens*, *Erechtites hieraciifolia*, *Rumex acetosella*
Herb (field)	Graminoid	*Deschampsia flexuosa*, *Schizachyrium scoparium*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Gaylussacia baccata*, *Photinia melanocarpa*, *Pinus rigida*, *Quercus ilicifolia*, *Quercus prinus*, *Vaccinium angustifolium*
Global: *Betula lenta*, *Betula populifolia*, *Gaylussacia baccata*, *Pinus rigida*, *Quercus ilicifolia*, *Quercus prinus*, *Vaccinium angustifolium*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Rumex acetosella* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (20-May-2011). There are many occurrences of this association over a large range, including many examples with good ecological integrity. Major threats include loss to cell phone towers, wind turbines, and utility lines, trampling by visitors on hiking trails, and fire suppression.

RELATED CONCEPTS

Global Similar Types:
- *Pinus (pungens, rigida) - Quercus prinus / (Quercus ilicifolia) / Gaylussacia baccata* Woodland (CEGL004996)
- *Pinus rigida - Quercus prinus / Gaylussacia baccata / Carex pensylvanica* Woodland (CEGL004821)
- *Pinus rigida / Corema conradii* Woodland (CEGL006154)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: One example of this community at Culvers Gap in New Jersey has high tree cover (59%) and the trees are not stunted or gnarly. New York recognizes *Quercus prinus* as *Quercus montana*.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut, Massachusetts (Mt. Everett, Pine Cobble, Race Mountain Summit), New Jersey (Culvers Gap North), and New York (Bearfort Mountain, Bellvale Mountain South, Minnewaska Region Plots).
Global Range: This association occurs in the northeastern United States from central New England south to Maryland.
Nations: CA, US
States/Provinces: CT, MA, MD, ME, NH, NJ:S1, NY, PA, QC, RI, VT:S1
TNC Ecoregions: 49:P, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Ca:CCP, 212Cb:CCC, 212Da:CCP, 212Dc:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCC, 221Al:CCP, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Ea:CPP, M212A:CC, M212Bb:CCC, M212Bd:CCC, M212Cb:CCC, M212De:CCP, M212Ea:CCC, M212Eb:CCP, M221Aa:CCC, M221Ac:CCC, M221B:CC, M221Da:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Delaware Water Gap, Upper Delaware)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WPPS

Appalachian National Scenic Trail (Lower New England Project Area) Plots: (6 plots; 4 observation points; 21 accuracy assessment points): APPA.0037, APPA.0038, APPA.0042, APPA.0068, APPA.0531, APPA.0925, APPA.1350, APPA.1377, APPA.1538, APPA.1540, APPA_AA_1636, APPA_AA_1726, APPA_AA_1763, APPA_AA_1765, APPA_AA_1882, APPA_AA_2232, APPA_AA_2235, APPA_AA_2359, APPA_AA_2599, APPA_AA_2767, APPA_AA_2865, APPA_AA_2897, APPA_AA_2948, APPA_AA_2978, APPA_AA_3112, APPA_AA_3148, APPA_AA_3205, APPA_AA_3212, APPA_AA_3218, APPA_AA_3219, APPA_AA_3316.

Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay

Global Description Author(s): S.C. Gawler

References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Harrison 2004, Harrison 2011, Hunt 1999, Küchler 1956, Lubinski et al. 2003, Lundgren 1999a, Metzler and Barrett 2001, Metzler and Barrett 2006, Moore and Taylor 1927, NYNHP 2009, Perles et al. 2007, Perles et al. 2008, Rawinski 1984a, Sperduto 1997a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

G162. VIRGINIA PINE - TABLE MOUNTAIN PINE WOODLAND & BARRENS

Group Summary Description: Vegetation of this group encompasses predominantly evergreen woodlands and forests occupying very exposed, convex, often rocky south- and west-facing slopes, ridge spurs, crests, and clifftops in the Central Appalachians, Southern Ridge and Valley and Southern Blue Ridge, as well as distinctive shale barrens of low to mid elevations in the Central and Southern Appalachians. They typically occur at moderate to upper elevations (450-1200 m [1500-4000 feet]), with the more southerly examples at the higher elevations. In the Southern Blue Ridge, this group is best developed above 700 m (2300 feet) in elevation, but some examples may be found at lower elevations. The underlying rock is acidic and sedimentary or metasedimentary (e.g., quartzites, sandstones and shales). The soils are very infertile, shallow and droughty. A thick, poorly decomposed duff layer, along with dead wood and highly volatile ericaceous shrubs, creates a strongly fire-prone habitat. Most examples are dominated by *Pinus pungens*, often with *Pinus rigida* and/or *Pinus virginiana*, and occasionally *Tsuga caroliniana*. The canopy is usually patchy to open, but areas of closed canopy may be present, especially where *Tsuga caroliniana* is prominent, or where fire has been absent. The shrub layer may be well-developed, with *Gaylussacia baccata, Vaccinium pallidum*, or other acid-tolerant species most characteristic. Herbs are usually sparse but may include *Pityopsis graminifolia* and *Tephrosia virginiana*. Fire is a very important ecological process in this group. Frequent, low-intensity fires coupled with periodic severe fires is one factor that determines the occurrence of this vegetation rather than hardwood forests under natural conditions. The pines may be able to maintain dominance due to edaphic conditions, such as very shallow soil or extreme exposure in some areas, which can produce sustained drought conditions, but most sites appear eventually to succeed to oak dominance in the absence of fire. Fire is also presumably a strong influence on vegetation structure, producing a more open woodland canopy structure and more herbaceous ground cover.

In floristically distinctive shale barrens examples, the exposed aspects, parent material with high levels of toxic metals, and lack of soil create extreme conditions for plant growth. Vegetation is mostly of a woodland physiognomy, but may include large open areas of sparse vegetation. The dominant trees are primarily *Quercus prinus* and *Pinus virginiana*. On higher-pH shale barrens, which are less common, the primary trees include *Juniperus virginiana* and *Fraxinus americana*, but these are placed in a different group. Shale barrens endemics are diagnostic in the herb layer. The substrate includes areas of solid rock as well as unstable areas of shale scree, usually steeply sloped. The fully exposed areas are extremely dry. These barrens are high in endemic species.

A0677 *Pinus pungens - Pinus rigida - Quercus prinus* Woodland Alliance

Alliance Summary Description: This alliance encompasses woodlands dominated by some combination of *Pinus pungens, Pinus rigida*, and *Pinus virginiana*, often with *Quercus prinus*. Common canopy and subcanopy associates include *Acer rubrum, Castanea dentata, Nyssa sylvatica, Oxydendrum arboreum*, and *Quercus coccinea*. Typical shrubs include *Fothergilla major, Gaylussacia baccata, Gaylussacia ursina, Kalmia latifolia, Leiophyllum buxifolium, Leucothoe recurva, Quercus ilicifolia, Rhododendron catawbiense, Rhododendron carolinianum, Rhododendron maximum, Vaccinium angustifolium, Vaccinium corymbosum, Vaccinium pallidum, Vaccinium simulatum*, and *Vaccinium stamineum*. Understory species composition will vary within the range of this alliance,

but commonly found forb and subshrub species in this usually sparse stratum include *Carex pensylvanica, Comptonia peregrina, Epigaea repens, Galax urceolata, Gaultheria procumbens, Pteridium aquilinum var. latiusculum*, and *Xerophyllum asphodeloides*. These woodlands may be found from Pennsylvania, Maryland and West Virginia south and west to Tennessee, Georgia, and South Carolina in the Central and Southern Appalachians, Ridge and Valley, and southern Piedmont. This vegetation tends to occur under extreme conditions, including rock outcrops, summits, and exposed slopes, including steep, shaley slopes that maintain the open structure of the vegetation. Fire plays a role in the maintenance of the structure and composition of this vegetation, and without periodic fire, these woodlands may gradually transition into forests dominated by *Quercus prinus* and *Quercus coccinea*, except on the most extreme sites, where this vegetation is more self-perpetuating.

[CEGL004996] *Pinus (pungens, rigida) - Quercus prinus / (Quercus ilicifolia) / Gaylussacia baccata* Woodland

Translated Name: **(Table Mountain Pine, Pitch Pine) - Chestnut Oak / (Bear Oak) / Black Huckleberry Woodland**

Common Name: **Central Appalachian Pine - Oak / Heath Woodland**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Virginia Pine - Table Mountain Pine Woodland & Barrens (G162)
Alliance	*Pinus pungens - Pinus rigida - Quercus prinus* Woodland Alliance (A0677)

Element Concept

Global Summary: This association represents mixed woodlands occupying xeric, convex, often rocky south- and west-facing slopes, ridge spurs, crests, and clifftops in the Central Appalachians and peripherally in the Piedmont and Southern Blue Ridge. Stands occur at elevations from 275 to 1200 m (900-4000 feet) on various substrates but most commonly on acidic, sedimentary and metasedimentary substrates (e.g., quartzites, sandstones, and shales). Soils are very infertile, shallow, and droughty. A thick, poorly decomposed duff layer, along with dead wood and highly volatile ericaceous shrubs, create a strongly fire-prone habitat. *Pinus pungens* and *Pinus rigida*, individually or together, codominate the canopy with *Quercus prinus*. The physiognomy of this community can approach that of a closed-canopy forest in some situations as a result of fire exclusion. Scattered canopy and subcanopy associates may include *Quercus coccinea, Quercus rubra, Quercus marilandica, Pinus virginiana, Castanea dentata, Acer rubrum, Sassafras albidum, Nyssa sylvatica*, and *Amelanchier arborea*. *Quercus ilicifolia* often dominates a moderately open to very dense tall-shrub layer, while variable combinations of *Kalmia latifolia, Gaylussacia baccata, Vaccinium pallidum, Vaccinium angustifolium, Vaccinium stamineum, Pieris floribunda, Rhododendron catawbiense*, and other ericads form a generally dense low-shrub layer. *Smilax rotundifolia* and *Smilax glauca* may be prominent climbers among the shrubs. Herbaceous species, often very sparse, are rooted in small openings among the shrubs, on rocks, and in disturbed areas where mineral soil is exposed. Typical herbs and subshrubs include *Epigaea repens, Gaultheria procumbens, Xerophyllum asphodeloides, Iris verna, Pteridium aquilinum var. latiusculum, Melampyrum lineare var. latifolium, Stenanthium gramineum var. micranthum, Uvularia puberula, Lycopodium tristachyum, Aralia hispida* (usually on outcrops), and *Carex tonsa*. Periodic fire is an important ecological process that provides opportunities for the regeneration of both canopy pines and less competitive herbaceous species, while setting back successional encroachment of xeric oaks. On many sites (e.g., clifftops, quartzite ledges), the vegetation is self-perpetuating due to extreme edaphic conditions.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This pine - oak / heath woodland occurs on xeric, convex, often rocky south- and west-facing slopes, ridge spurs, crests, and clifftops at elevations from 275 to 1,200 m (900-4,000 feet). It was sampled at 12 locations in the Central Appalachian project area. Sites range from somewhat to very steep, upper slopes and summits with mostly western aspects. Soils are dry to xeric, rapidly to well-drained sandy loam, silt loam and sand. The unvegetated surface is dominated by leaf litter with some downed wood and large/small rocks; one site is dominated by exposed bedrock. Evidence of disturbance includes trails, wind/ice damage, impacts from recreational climbing and camping, oak decline, and gypsy moth and pine bark beetle damage.

Global Environment: These mixed woodlands occupy xeric, convex, often rocky south- and west-facing slopes, ridge spurs, crests, and clifftops in the Central Appalachians and peripherally in the Piedmont and Southern Blue Ridge. Stands occur at elevations from 275 to 1200 m (900-4000 feet) on various substrates but most commonly on

acidic, sedimentary and metasedimentary substrates (e.g., quartzites, sandstones, and shales). Soils are very infertile, shallow, and droughty. A thick, poorly decomposed duff layer, along with dead wood and highly volatile ericaceous shrubs, create a strongly fire-prone habitat. On many sites (e.g., clifftops, quartzite ledges), the vegetation is self-perpetuating due to extreme edaphic conditions. There are significant differences in site conditions associated with variations in this community type. One major variant, often associated with *Pinus pungens* abundance, occurs at low to middle elevations and tends to occupy cliffs and steep sideslopes with significant rock cover. Another variant, often associated with high *Pinus rigida* cover, occurs at middle to high elevations and tends to occupy moderately steep to sublevel upper slopes and crests with little rock cover and very dense duff. Although strongly fire-prone habitats influence vegetation structure and composition of both subtypes, the rock outcrop variant tends to be more influenced by edaphic stresses because of its frequent association with cliffs and outcrop areas.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Pinus rigida* and/or *Pinus pungens* share canopy dominance with *Quercus prinus* and/or *Quercus coccinea*. *Acer rubrum* and *Nyssa sylvatica* are common in the subcanopy. *Pinus virginiana* is absent to minor. The shrub layer includes *Kalmia latifolia, Quercus ilicifolia, Amelanchier arborea, Gaylussacia baccata*, and *Vaccinium pallidum*. Herbs are variable and sparse, although *Pteridium aquilinum var. latiusculum, Schizachyrium scoparium, Epigaea repens*, and *Gaultheria procumbens* are common. This community also supports VA-state imperiled *Buckleya distichophylla*.
Global Vegetation: The canopies of stands of this type are codominated by *Pinus pungens* and *Pinus rigida*, either individually or together, with *Quercus prinus*. Scattered canopy and subcanopy associates may include *Quercus coccinea, Quercus rubra, Quercus marilandica, Pinus virginiana, Castanea dentata, Acer rubrum, Sassafras albidum, Nyssa sylvatica*, and *Amelanchier arborea*. *Quercus ilicifolia* often dominates a moderately open to very dense tall-shrub layer, while variable combinations of *Kalmia latifolia, Gaylussacia baccata, Vaccinium pallidum, Vaccinium angustifolium, Vaccinium stamineum, Pieris floribunda, Rhododendron catawbiense*, and other ericads form a generally dense low-shrub layer. *Smilax rotundifolia* and *Smilax glauca* may be prominent climbers among the shrubs. Herbaceous species, often very sparse, are rooted in small openings among the shrubs, on rocks, and in disturbed areas where mineral soil is exposed. Typical herbs and subshrubs include *Epigaea repens, Gaultheria procumbens, Xerophyllum asphodeloides, Iris verna, Pteridium aquilinum var. latiusculum, Melampyrum lineare var. latifolium, Stenanthium gramineum var. micranthum, Uvularia puberula, Lycopodium tristachyum, Aralia hispida* (usually on outcrops), and *Carex tonsa*. Although fully intergradational, two variants recognized in Virginia are very distinct in their typical expressions. Both share *Quercus prinus* as a codominant canopy tree and have a similar ericaceous shrub layer composed largely of *Kalmia latifolia, Gaylussacia baccata*, and *Vaccinium pallidum*. However, in the first variant, which is usually associated with cliffs and rocky slopes, *Pinus pungens* is the most constant and abundant pine. In the second variant, most often associated with xeric upper slopes and crests, *Pinus rigida* is the most constant and abundant pine. Recognition of these variants as formal types or subtypes has proven problematic due to intergradation of both habitats and floristic composition. Piedmont stands of this community (e.g., on Bull Run Mountain, Virginia, and Sugarloaf Mountain, Maryland) are similar to montane stands but lack *Quercus ilicifolia* and other species characteristic of higher elevations. In 57 plot samples classified as this association from Virginia, mean species richness was 19 species per 400 m2, ranging from 9-27 species per 400 m2.
Global Dynamics: The canopy closure can approach forest physiognomy in some situations as a result of fire exclusion. Periodic fire is an important ecological process which provides opportunities for the regeneration of both canopy pines and less competitive herbaceous species, while setting back successional encroachment of xeric oaks. On many sites (e.g., clifftops, quartzite ledges), the vegetation is self-perpetuating due to extreme edaphic conditions. Much of this vegetation in Virginia has been devastated in the 1990s by infestations of southern pine beetle (*Dendroctonus frontalis*). These outbreaks have resulted in extensive mortality of the dominant pines and changed physiognomies, at least temporarily, to a shrubland condition.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus pungens*, *Pinus rigida*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Short shrub/sapling	Dwarf-shrub	*Gaultheria procumbens*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus pungens*, *Pinus rigida*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium pallidum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Gaultheria procumbens*, *Gaylussacia baccata*, *Kalmia latifolia*, *Nyssa sylvatica*, *Pinus pungens*, *Pinus rigida*, *Quercus ilicifolia*, *Quercus prinus*, *Vaccinium pallidum*
Global: *Buckleya distichophylla*, *Carex polymorpha*, *Galax urceolata*, *Gaultheria procumbens*, *Gaylussacia baccata*, *Iris verna*, *Kalmia latifolia*, *Lycopodium tristachyum*, *Melampyrum lineare* var. *latifolium*, *Nyssa sylvatica*, *Pinus pungens*, *Pinus rigida*, *Quercus coccinea*, *Quercus ilicifolia*, *Quercus prinus*, *Sassafras albidum*, *Vaccinium pallidum*, *Xerophyllum asphodeloides*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Buckleya distichophylla* (G3, globally vulnerable & VA state-imperiled)
Global: Vulnerable Plants: *Buckleya distichophylla* (G3, Subtype 1), *Carex polymorpha* (G3, Subtype 2), *Tsuga caroliniana* (G3), *Vaccinium myrtilloides* (G5, VA state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Oct-2001). This community is widely but locally distributed in the Central Appalachians, forming large patches at some sites. It is apparently secure, although fire suppression and insect pathogens represent ongoing stand-altering disturbances.

RELATED CONCEPTS

Global Similar Types:
- *Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland (CEGL007097)
- *Pinus rigida - (Pinus pungens) / Rhododendron catawbiense - Kalmia latifolia / Galax urceolata* Woodland (CEGL004985)
- *Pinus rigida - Quercus prinus / Gaylussacia baccata / Carex pensylvanica* Woodland (CEGL004821)
- *Pinus rigida / (Quercus ilicifolia) / Photinia melanocarpa / Deschampsia flexuosa* Woodland (CEGL006116)
- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This is the Central Appalachian analogue of Blue Ridge Table Mountain Pine - Pitch Pine Woodland (Typic Type) (CEGL007097). It scarcely differs except for the absence of *Gaylussacia ursina* and *Vaccinium hirsutum* and the presence of *Quercus ilicifolia* in the shrub layer of some stands. The latter has high constancy in the plots used for this analysis (all from south of the James River), but over the whole region, it is somewhat inconstant (thus its parenthetical status). It can intergrade with both major xeric oak / heath forests, i.e., Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299) and Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271).
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: This community type is closely related to other xeric pine and pine-oak associations. It is thought to differ in the frequent shrub layer dominance of *Quercus ilicifolia*, a northern species which is absent in similar communities south of Virginia, as well as the absence of a number of uncommon but characteristic southern species such as *Gaylussacia ursina, Rhododendron carolinianum, Rhododendron minus, Leiophyllum buxifolium*, and *Fothergilla major*. In 68 plots from Virginia, the most constant (≥62%) species, in order of descending constancy, are *Kalmia latifolia, Vaccinium pallidum, Quercus prinus (= Quercus montana), Gaylussacia baccata, Quercus ilicifolia, Sassafras albidum, Nyssa sylvatica, Pinus rigida, Acer rubrum*, and *Amelanchier arborea*. Other less constant species from this community with more northern affinities, which are absent or infrequent south of Virginia, are *Pieris floribunda* and *Vaccinium angustifolium*. Long-term, widespread

fire exclusion is an ongoing problem which may be causing some stands to succeed to closed, mixed oak-pine forest. However, on many sites occupied by this community, edaphic conditions are so stressful that tree oaks are marginally competitive, and even long fire-return intervals (e.g., >25 years) are sufficient to maintain pine codominance. Within the past ten years, much of this vegetation in Virginia has been devastated by infestations of southern pine beetle (*Dendroctonus frontalis*). These outbreaks have resulted in extensive mortality of the dominant pines and changed physiognomies, at least temporarily, to a shrubland condition. Two subtypes formerly recognized in Virginia have proven problematic in recent analyses and are better regarded as intergrading variants.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs in the Central Appalachians from Lehigh County, Pennsylvania, south to Bland County, Virginia. It was sampled in Maryland, Pennsylvania, and Virginia at Brushy Mountain, Dragons Tooth, James River Face Wilderness, Peters Mountain, Sawmill Run Overlook, Trout Creek West, and Turk Run Overlook.
Global Range: This community occurs in the Central Appalachian region of Virginia, West Virginia, Maryland, and Pennsylvania, with very local outliers in the western Piedmont of Virginia and Maryland (e.g., Sugarloaf Mountain). In Virginia, the type as a whole ranges through the Blue Ridge and Ridge and Valley provinces north of the New River. Outliers occur on Bull Run Mountain (Fauquier County), Willis Mountain (Buckingham County), and other Virginia Piedmont foothills.
Nations: US
States/Provinces: MD:S4, PA, VA:S4, WV
TNC Ecoregions: 51:C, 52:C, 59:C, 61:?
USFS Ecoregions (1994/95): 231Ak:CCC, 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Bb:CCC, M221Ce:C??, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, C&O Canal, Catoctin Mountain, Shenandoah); USFS (George Washington, Jefferson, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WMDP
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (6 plots; 7 observation points; 24 accuracy assessment points): APPA.0240, APPA.0349, APPA.0408, APPA.0409, APPA.0513, APPA.0520, APPA.1021, APPA.1151, APPA.1189, APPA.1214, APPA.1215, APPA.1220, APPA.1221, APPA_AA_0026, APPA_AA_0111, APPA_AA_0132, APPA_AA_0191, APPA_AA_0350, APPA_AA_0438, APPA_AA_0547, APPA_AA_0618, APPA_AA_0622, APPA_AA_0631, APPA_AA_0692, APPA_AA_0785, APPA_AA_0855, APPA_AA_0912, APPA_AA_0937, APPA_AA_1102, APPA_AA_1238, APPA_AA_1330, APPA_AA_1400, APPA_AA_1426, APPA_AA_1427, APPA_AA_1485, APPA_AA_1488, APPA_AA_1557.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and P.P. Coulling
References: Eyre 1980, Fike 1999, Fleming 1985, Fleming 2002a, Fleming 2002b, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2006, Fleming et al. 2007b, Fleming pers. comm., Harrison 2004, Harrison 2011, Rawinski et al. 1994, Rawinski et al. 1996, Southeastern Ecology Working Group n.d.*, WVNHP unpubl. data b, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL007097] *Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland

Translated Name: **Table Mountain Pine - Pitch Pine - (Chestnut Oak) / Mountain Laurel - Blue Ridge Blueberry Woodland**
Common Name: **Blue Ridge Table Mountain Pine - Pitch Pine Woodland (Typic Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Virginia Pine - Table Mountain Pine Woodland & Barrens (G162)
Alliance	*Pinus pungens - Pinus rigida - Quercus prinus* Woodland Alliance (A0677)

ELEMENT CONCEPT

Global Summary: This association includes mostly evergreen woodlands dominated by *Pinus pungens* and/or *Pinus rigida*, occurring over a dense ericaceous shrub stratum, on sharp ridges, mostly above 610 m (2000 feet) elevation in the Southern Blue Ridge. This type is also found in limited areas of the inner Piedmont and Cumberland Mountains. This woodland occurs across a wide elevational range (485-1220 m [1600-4000 feet]), on exposed ridges and upper slopes with southerly and westerly exposures, over thin, excessively drained, nutrient-poor soils, and can be associated with rock outcroppings. Canopy coverage can often approach that of a forest, especially in areas where fire has been excluded and deciduous species have significant coverage. Deciduous species that can be important, particularly in the subcanopy, include *Quercus prinus, Quercus coccinea, Quercus stellata, Nyssa sylvatica, Acer rubrum*, and *Oxydendrum arboreum*. *Pinus virginiana, Pinus echinata*, and *Pinus strobus* can have high coverage and even codominate on some sites. The shrub stratum is dominated by ericaceous species, typically *Kalmia latifolia* and *Leucothoe recurva* in the tall-shrub stratum and *Vaccinium pallidum* as a low shrub. Other shrub species vary with location but include *Vaccinium stamineum, Vaccinium simulatum, Vaccinium pallidum, Vaccinium hirsutum, Vaccinium corymbosum, Rhododendron maximum, Rhododendron minus, Gaylussacia ursina, Gaylussacia baccata, Buckleya distichophylla, Pyrularia pubera*, and *Fothergilla major*. Species commonly found in the sparse herb stratum include *Chimaphila maculata, Galax urceolata, Pteridium aquilinum var. latiusculum, Xerophyllum asphodeloides, Chamaelirium luteum, Comptonia peregrina, Leiophyllum buxifolium, Gaultheria procumbens, Iris verna, Dichanthelium* spp., and *Epigaea repens*, although herbaceous species composition will vary within the range of this community. *Smilax glauca* is a common vine. Without periodic fire, this community will gradually succeed into forests dominated by *Acer rubrum* or *Quercus prinus* and *Quercus coccinea*, except on the most extreme sites, where this vegetation is self-perpetuating. It is thought that woodlands dominated by *Pinus pungens* are associated with more xeric conditions than woodlands dominated by *Pinus pungens* in combination with other tree species.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: Southern Appalachian examples of this pine woodland are generally found above 610 m (2,000 feet) elevation. Sites range from moderate to steep mid and upper slopes and ridgetops with mostly southern aspects. Soils are mesic to xeric, moderately well- to rapidly drained loam, clay loam, and sandy loam. The unvegetated surface is dominated by leaf litter with some downed wood and occasional large/small rocks and bare soil. Evidence of disturbance includes fire and fire suppression (thick duff layer), trails, hemlock/fir adelgid and pine bark beetle damage, chestnut blight, and wind/ice damage.

Global Environment: This association is typically found on sharp ridges mostly above 610 m (2000 feet) elevation in the Southern Blue Ridge. This woodland occurs across a wide elevation range from 488 to 1220 m (1600-4000 feet) in the Southern Appalachians, on exposed ridges and upper slopes with southerly and westerly exposures, over thin, excessively drained, nutrient-poor soils, and can be associated with rock outcroppings. It is thought that woodlands dominated by *Pinus pungens* are associated with more xeric conditions than woodlands dominated by *Pinus pungens* in combination with other tree species (Zobel 1969, Barden 1977).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: In the Southern Blue Ridge, stands include *Pinus pungens* and/or *Pinus rigida*, without *Quercus ilicifolia* present. The canopy is dominated by *Pinus pungens* and/or *Pinus rigida*, possibly with *Pinus virginiana*, but this not dominant. Additional tree species include *Acer rubrum, Oxydendrum arboreum, Pinus strobus, Quercus coccinea, Quercus prinus*, and *Sassafras albidum*. Characteristic shrubs include *Kalmia latifolia, Vaccinium pallidum, Gaylussacia baccata, Lyonia ligustrina var. ligustrina*, and *Vaccinium stamineum*. Herbs are sparse but *Epigaea repens* is a common herb; *Smilax glauca* is a common vine. This community also supports TN-state imperiled *Buckleya distichophylla*.

Global Vegetation: These mostly evergreen woodlands are characteristically dominated by *Pinus pungens* and/or *Pinus rigida*, occurring over a dense ericaceous shrub stratum. Deciduous species that can be important, particularly in the subcanopy, include *Quercus prinus, Quercus coccinea, Quercus stellata* (in lower elevation occurrences), *Nyssa sylvatica, Acer rubrum*, and *Oxydendrum arboreum*. *Pinus virginiana, Pinus echinata*, and *Pinus strobus* can have high coverage and even codominate on some sites. The shrub stratum is dominated by ericaceous species, typically *Kalmia latifolia* and *Leucothoe recurva* in the tall-shrub stratum and *Vaccinium pallidum* as a low shrub. Other shrub species vary with location, but include *Vaccinium stamineum, Vaccinium simulatum, Vaccinium pallidum, Vaccinium hirsutum, Vaccinium corymbosum, Rhododendron maximum, Rhododendron minus, Gaylussacia ursina, Gaylussacia baccata, Buckleya distichophylla, Pyrularia pubera, Castanea dentata, Castanea pumila*, and *Fothergilla major*. Species commonly found in the sparse herb stratum include *Chimaphila maculata,*

Galax urceolata, Pteridium aquilinum var. latiusculum, Xerophyllum asphodeloides, Chamaelirium luteum, Comptonia peregrina, Leiophyllum buxifolium, Gaultheria procumbens, Iris verna, Melampyrum lineare, Dichanthelium spp., and *Epigaea repens*, although herbaceous species composition will vary within the range of this community. *Smilax glauca* is a common vine. Species in this community which have the bulk of their worldwide range in the Southern Blue Ridge include *Leiophyllum buxifolium, Pieris floribunda, Pinus pungens*, and *Xerophyllum asphodeloides*. Other rare species include *Fothergilla major, Robinia hispida var. fertilis, Robinia hispida var. rosea*, and *Robinia viscosa var. viscosa*.

Global Dynamics: Fire contributes to the maintenance of this community by destroying the litter layer, opening the canopy, releasing seed from the serotinous cones, and killing competing vegetation. Red squirrels are known to cut branches to remove the *Pinus pungens* cones. It is thought this "squirrel grazing" may decrease the growth and vigor of trees (Zobel 1969). Canopy removal by icestorms stimulate oak sprouting and release advanced regeneration (Williams and Johnson 1992). Canopy coverage in stands of this association can often approach that of a forest, especially in areas where fire has been excluded and deciduous species have significant coverage. Without periodic fire, this community will gradually succeed into forests dominated by *Quercus prinus* and *Quercus coccinea*, except on the most extreme sites, where this vegetation is self-perpetuating (Newell and Peet 1994). However, recent regional pine beetle kills throughout large areas of the Southeast have accelerated the rate of succession in most of these stands. This acceleration of succession may lead to conversion of these forests to hardwoods in the long term (M. Jenkins pers. comm.).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus pungens*, *Pinus rigida*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Tree subcanopy	Broad-leaved deciduous tree	*Oxydendrum arboreum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus pungens*, *Pinus rigida*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Quercus prinus*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Herb (field)	Flowering forb	*Galax urceolata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Epigaea repens*, *Pinus pungens*
Global: *Comptonia peregrina*, *Epigaea repens*, *Fothergilla major*, *Galax urceolata*, *Gaultheria procumbens*, *Leiophyllum buxifolium*, *Pinus pungens*, *Xerophyllum asphodeloides*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Buckleya distichophylla* (G3, globally imperiled), *Castanea dentata* (G4, TN state-imperiled), *Rhododendron minus* (G4, TN state-imperiled)
Global: Vulnerable Plants: *Buckleya distichophylla* (G3), *Canoparmelia amabilis* (G1), *Fothergilla major* (G3, Southern Appalachian endemic), *Robinia hispida* var. *fertilis* (G4T1Q), *Robinia hispida* var. *kelseyi* (G4T1), *Robinia hispida* var. *rosea* (G4T3?), *Robinia viscosa* var. *viscosa* (G3T3), *Tsuga caroliniana* (G3), *Vaccinium hirsutum* (G3); **Other Plants**: *Pieris floribunda* (G4, Southern Blue Ridge endemic)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (30-Apr-1998). This community is endemic to the southern Appalachian Mountains where it is maintained by periodic fire or extreme site conditions. Recent studies show that acreage of this community has decreased due to fire suppression (Turrill and Buckner 1995) and that many remaining examples have substantial hardwood invasion. Lightning-set and high-intensity controlled burns are necessary to maintain and re-establish this community type. In addition, recent pine beetle outbreaks have killed off large areas of this

community type in the past five years (1998-2003) in the Southeast. Due to this, the global rank may soon need to be adjusted to G2.

Related Concepts

Global Similar Types:

- *Pinus (pungens, rigida) - Quercus prinus / (Quercus ilicifolia) / Gaylussacia baccata* Woodland (CEGL004996) is more northern and with *Quercus ilicifolia*.
- *Pinus rigida - (Pinus pungens) / Rhododendron catawbiense - Kalmia latifolia / Galax urceolata* Woodland (CEGL004985) occurs at higher elevations (1220-1555 m [4000-5100 feet) and usually includes *Rhododendron catawbiense*.
- *Pinus rigida - Quercus prinus / Gaylussacia baccata / Carex pensylvanica* Woodland (CEGL004821)
- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119)

Classification

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Southern Appalachian pine-oak/heath vegetation. Most stands were dominated by one or the other pine in the name. This woodland can intergrade with xeric oak/heath forests (i.e., Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271)).
Global Classification Comments: Other communities with *Pinus pungens* occur in central Pennsylvania and in Virginia. These northern types are thought to have a different species composition and geology than the forests described here. Species associated with *Pinus pungens* in the northern part of its range that do not occur in this community include *Quercus ilicifolia, Viburnum acerifolium*, and *Vaccinium angustifolium*. [See *Pinus (pungens, rigida) - Quercus prinus / (Quercus ilicifolia) / Gaylussacia baccata* Woodland (CEGL004996).] Examples of this association studied on lands of the Eastern Band of the Cherokee Indians in Cherokee County, North Carolina, include a substantial amount of *Pinus echinata* and lack *Pinus pungens*. These stands occur on low ridges (520-670 m [1700-2200 feet]) and otherwise, floristically, are a good match for this forest type. It is believed that they are transitional to low-elevation stands dominated by *Pinus echinata* in the Cumberlands and Southern Ridge and Valley. In the Appalachian Trail classification study, 22 plots from Georgia, North Carolina, Tennessee, and Virginia were classified as this association with a homoteneity of 68% (Fleming and Patterson 2009a). The most constant species (≥64%), in order of descending constancy, are *Kalmia latifolia, Acer rubrum, Quercus prinus, Quercus coccinea, Pinus rigida, Pinus pungens, Gaylussacia baccata, Gaylussacia ursina, Oxydendrum arboreum, Vaccinium pallidum, Nyssa sylvatica, Galax urceolata*, and *Gaultheria procumbens*. Less constant species with high mean cover values (≥5 cover class) in these plots are *Pinus pungens, Pinus rigida, Gaylussacia baccata, Gaylussacia ursina*, and *Vaccinium hirsutum*.

Element Distribution

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This woodland is scattered in and near the AT corridor in the southern two-thirds of the Southern Blue Ridge. It just ranges into southwestern Virginia at Feathercamp Ridge West and Holston Mountain. It was also sampled in Georgia, North Carolina, at Cliff Ridge and elsewhere in Tennessee.
Global Range: This community ranges throughout the Southern Blue Ridge and Cumberland Mountains, from southwestern Virginia and southeastern Kentucky, south through western North Carolina and eastern Tennessee, into northeastern Georgia and northwestern South Carolina.
Nations: US
States/Provinces: GA, KY, NC, SC, TN, VA:S3?
TNC Ecoregions: 50:P, 51:C, 52:C, 59:?
USFS Ecoregions (1994/95): M221Aa:CCP, M221Ab:CCP, M221Ac:CCC, M221Ce:CCC, M221Da:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains))

Element Sources

Appalachian National Scenic Trail Map-Class Code: WDMP
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (6 plots; 6 observation points; 24 accuracy assessment points): APPA.0088, APPA.0550, APPA.0579, APPA.0608, APPA.0621, APPA.0625,

APPA.1088, APPA.1092, APPA.1163, APPA.1166, APPA.1168, APPA.1171, APPA_AA_0166, APPA_AA_0168, APPA_AA_0192, APPA_AA_0319, APPA_AA_0322, APPA_AA_0374, APPA_AA_0401, APPA_AA_0427, APPA_AA_0491, APPA_AA_0749, APPA_AA_0757, APPA_AA_0780, APPA_AA_0809, APPA_AA_0866, APPA_AA_0882, APPA_AA_0981, APPA_AA_1009, APPA_AA_1134, APPA_AA_1249, APPA_AA_1368, APPA_AA_1423, APPA_AA_1448, APPA_AA_1534, APPA_AA_1595.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay

Global Description Author(s): M.P. Schafale and A.S. Weakley

References: Allard 1990, Barden 1977, Eyre 1980, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Golden 1974, Golden 1981, Hedlin et al. 1981, McLeod 1988, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Newell and Peet 1995, Peet et al. unpubl. data, Pyne 1994, Racine 1966, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Turrill and Buckner 1995, Wharton 1978, White 2003, White 2006, Whittaker 1956, Williams 1991, Williams and Johnson 1990, Williams and Johnson 1992, Williams et al. 1990a, Zobel 1969

A3312 *Pinus virginiana - Quercus prinus* Acidic Shale Woodland Alliance

Alliance Summary Description: These mixed evergreen-deciduous woodlands and sparse woodlands are dominated by some combination of *Juniperus virginiana var. virginiana, Pinus virginiana, Pinus rigida*, and *Quercus prinus*. Hardwood associates include *Carya glabra, Carya ovalis, Carya ovata, Fraxinus americana, Quercus rubra, Quercus stellata*, and *Quercus velutina*. The shrub layer includes *Amelanchier arborea, Gaylussacia baccata, Quercus ilicifolia, Vaccinium pallidum*, and *Vaccinium stamineum*. The herbaceous layer is generally sparse; grass and other graminoid species include *Carex pensylvanica, Danthonia spicata, Deschampsia flexuosa, Dichanthelium linearifolium*, and *Schizachyrium scoparium*. Forbs include *Cunila origanoides, Heuchera americana, Hieracium venosum, Penstemon hirsutus, Phlox subulata, Symphyotrichum cordifolium*, and *Viola pedata*. Lichens such as *Cladonia* spp. and *Cladina* spp. are abundant in some areas. These woods are found on acidic shale substrates from Maryland, Pennsylvania, Virginia and West Virginia.

[CEGL008525] *Pinus virginiana - Quercus prinus / Quercus ilicifolia / (Hieracium greenii, Viola pedata)* Woodland

Translated Name: **Virginia Pine - Chestnut Oak / Bear Oak / (Maryland Hawkweed, Bird's-foot Violet) Woodland**

Common Name: **Central Appalachian Xeric Shale Woodland (Virginia Pine / Sparse Herbs Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Virginia Pine - Table Mountain Pine Woodland & Barrens (G162)
Alliance	*Pinus virginiana* - *Quercus prinus* Acidic Shale Woodland Alliance (A3312)

ELEMENT CONCEPT

Global Summary: This shale barren mixed woodland is endemic to the Central Appalachian region of west-central Virginia and eastern West Virginia and the Ridge and Valley physiographic province in Maryland. There it is widely but locally distributed in shale districts of the Ridge and Valley on strongly convex, mostly southeast- to west-facing slopes and adjacent divide crests. It is very locally represented in similar Blue Ridge landscapes underlain by shale-like metamorphic rocks. Stands range in elevation from about 300-730 m (1000-2400 feet) on moderate to steep slopes. These environments are xeric and drought-prone, with high soil temperatures and evaporation rates during the summer months. Substrates appear to be relatively stable and lack the ongoing erosional processes of the larger, steeper shale barrens. Vegetation is an open woodland dominated by *Pinus virginiana* and *Quercus prinus*, usually as a mixture but occasionally with one strongly dominant. *Pinus pungens* and *Quercus rubra* are occasional canopy associates. Mean canopy cover is usually <50%, and dominant pines are <15 m tall. A sparse understory of younger *Pinus virginiana* and *Quercus prinus* 6-10 m tall is usually present, often with *Amelanchier arborea*. The sparse shrub layer is characterized by patchy *Quercus ilicifolia* and tree saplings. Low-growing *Vaccinium pallidum* is the most abundant component of the short-shrub layer, sometimes occurring with *Vaccinium stamineum*. The herbaceous flora of this vegetation is depauperate. *Carex pensylvanica* and *Danthonia spicata* are typical, although at low cover. Forbs tend to be variable among sites; the most typical are *Hieracium greenei, Viola pedata,*

Houstonia longifolia, and *Solidago bicolor*. Scattered individuals of the shale-barren endemics *Antennaria virginica, Packera antennariifolia (= Senecio antennariifolius), Paronychia montana*, and *Eriogonum allenii* occasionally occur in this community, particularly where stands border well-developed shale barrens. A characteristic feature of some examples of this type is ground-level dominance of *Cladina* spp. lichens. This association differs from related shale-barren associations in its extremely depauperate flora, absence of *Juniperus virginiana*, and presence of *Hieracium greenei* and *Quercus ilicifolia*. *Pinus pungens* may occur in this type and is very rarely found in other shale barren types.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This xeric Virginia pine shale woodland occurs on moderate to steep slopes from 300-730 m (1,000-2,400 feet) elevation. It is endemic to the Central Appalachian region of west-central Virginia and eastern West Virginia, possibly reaching into Maryland, as well as in the Ridge and Valley of Virginia. It was sampled at two locations in the AT corridor. One site is a steep, south-facing midslope, the other a somewhat steep, southeast-facing bedrock outcrop. Soils are rapidly drained. The unvegetated surface at both sites is dominated by rocks with some leaf litter, downed wood and bare soil. Disturbance includes trampling, damage from pine bark beetle and past fire events.

Global Environment: This association is widely but locally distributed in shale districts of the central Ridge and Valley on strongly convex, mostly southeast- to west-facing slopes and adjacent divide crests. It is very locally represented in similar Blue Ridge landscapes underlain by shale-like metamorphic rocks. Plot-sampled stands range in elevation from about 300 to 730 m (1000-2400 feet) and have slopes varying from 11-33° (mean = 25°). These environments are xeric and drought-prone, with high soil temperatures and evaporation rates during the summer months. Substrates appear to be relatively stable and lack the ongoing erosional processes of the larger, steeper shale barrens. Surface cover of channery and mineral soil is high, but shale outcrops occupy only a minor portion of the surface substrate. Very little litter or duff accumulates on the slopes, preventing or discouraging fires from burning through these habitats. Low pH, base cation, and micronutrient values in soil samples collected from plots indicate an oligotrophic nutrient regime that contrasts sharply with the higher fertility of shale barren soils.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This xeric shale woodland is dominated by *Pinus virginiana*. *Pinus pungens* and *Quercus prinus* can codominate in the canopy. *Quercus ilicifolia* and *Vaccinium pallidum* form a sparse shrub layer. Other shrubs may include *Amelanchier arborea, Kalmia latifolia*, and *Vaccinium stamineum*. Herbs are sparse but can include *Carex pensylvanica, Carex umbellata, Schizachyrium scoparium, Dichanthelium depauperatum, Paronychia argyrocoma, Dicentra eximia*, and *Solidago bicolor*.

Global Vegetation: Vegetation is an open woodland dominated by *Pinus virginiana* and *Quercus prinus*, usually as a mixture but occasionally with one strongly dominant. *Pinus pungens* and *Quercus rubra* are occasional canopy associates. Mean canopy cover is usually <50% and dominant pines are <15 m tall. A sparse understory of younger *Pinus virginiana* and *Quercus prinus* 6-10 m tall is usually present, often with *Amelanchier arborea*. The sparse shrub layer is characterized by patchy *Quercus ilicifolia* and tree saplings. Low-growing *Vaccinium pallidum* is the most abundant component of the short-shrub layer, sometimes occurring with *Vaccinium stamineum*. The herbaceous flora of this vegetation is depauperate. *Carex pensylvanica* and *Danthonia spicata* are typical, although at low cover. Forbs tend to be variable among sites; the most typical are *Hieracium greenei, Viola pedata, Houstonia longifolia*, and *Solidago bicolor*. Scattered individuals of the shale-barren endemics *Antennaria virginica, Packera antennariifolia (= Senecio antennariifolius), Paronychia montana*, and *Eriogonum allenii* occasionally occur in this community, particularly where stands border well-developed shale barrens. A characteristic feature of some examples of this type is ground-level dominance of *Cladina* spp. lichens. Several mosses, including *Leucobryum glaucum, Polytrichum* sp., and *Dicranum* sp., were also present in plots. This association has extraordinarily low species richness (range in Virginia plots = 9-20 taxa per 400 square meters; mean = 15).

Global Dynamics: Edaphic conditions appear to be the controlling factor that maintains pine dominance in this association. Plot-sampled stands at Peters Mountain in Alleghany County, Virginia, have numerous long-dead standing and fallen logs and no evidence of fire (Fleming and Moorhead 2000). Normally a fast-growing, short-lived, shade-intolerant invader of abandoned fields, *Pinus virginiana* is very tolerant of dry soils but is easily killed by intense fires (Fowells 1965). Under the harsh, open-canopy environment of the shale slopes, this pine is able to reproduce well and succeed itself, while severe drought and perhaps low nutrient availability stunt potential hardwood successors such as *Quercus prinus, Quercus alba*, and *Carya* spp. The lack of fire allows the dominant pines to reach relatively old ages and probably contributes to high ground cover of lichens and low cover of herbs. Increment cores taken from representative dominant pines in Peters Mountain plots indicated ages of approximately

95, 113, and 118 years despite relatively small sizes (22, 31, and 26 cm dbh [9,12, and 10 inches], respectively), reflecting slow growth rates (Fleming and Moorhead 2000).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus pungens*, *Pinus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Quercus ilicifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus pungens*, *Pinus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Pinus pungens*, *Pinus virginiana*, *Quercus ilicifolia*, *Quercus prinus*, *Vaccinium pallidum*
Global: *Antennaria virginica*, *Hieracium greenii*, *Pinus pungens*, *Pinus virginiana*, *Quercus ilicifolia*, *Viola pedata*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (24-Feb-2010). This association appears to be restricted to a small (approximately 10-county) area in the Ridge and Valley region of west-central Virginia and eastern West Virginia. However, there are probably at least 100 and possibly several hundred occurrences of this community type in Virginia alone.

RELATED CONCEPTS

Global Similar Types:

- *Pinus rigida - Quercus prinus / Gaylussacia baccata / Carex pensylvanica* Woodland (CEGL004821)
- *Pinus virginiana - Juniperus virginiana - Quercus rubra / Solidago arguta var. harrisii - Opuntia humifusa* Woodland (CEGL006288)
- *Quercus prinus / Quercus ilicifolia / Danthonia spicata* Woodland (CEGL008526) is a deciduous or mixed shale woodland with higher shrub and herb cover and overall species richness.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This type is characterized by open *Pinus virginiana* or mixed woodlands with very depauperate lower strata and heavy ground cover of *Cladonia* species. It is one of the most barren of the Central Appalachian shale barrens.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Plot samples from Virginia classified as this association (n=13) have a homoteneity of 64%. The most constant (≥62%) species, in order of descending constancy, are *Pinus virginiana, Quercus ilicifolia, Quercus prinus (= Quercus montana), Vaccinium pallidum, Amelanchier arborea, Quercus rubra*, and *Danthonia spicata*. Species richness in these very depauperate shale woodlands ranges from 9-20 species per 400-m2 sample, averaging 15 species per 400-m2 sample. Fieldwork in 2011 on Dan's Mountain WMA in Maryland confirmed this type on southwest-facing exposures over the Jennings Shale Formation. More inventory work is needed to confirm number of occurrences in Maryland.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is endemic to the Central Appalachian region of west-central Virginia and eastern West Virginia, possibly reaching into Maryland, and is also found in the Ridge and Valley of Virginia. It was sampled at James River Face Wilderness in Bedford County, Virginia.
Global Range: This community is endemic to the Central Appalachian region of west-central Virginia and eastern West Virginia, and the Ridge and Valley physiographic province in Maryland. In Virginia, it is mostly confined to

Ordovician, Silurian, and Devonian shales of the Ridge and Valley province. There are a few very localized occurrences on Cambrian (Harpers Formation) metasiltstone and phyllite of the Northern Blue Ridge. The principal range in West Virginia includes Pendleton, Greenbriar, and Monroe counties.
Nations: US
States/Provinces: MD, VA:S3, WV
TNC Ecoregions: 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ab:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WPOS
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 plots): APPA.0359, APPA.0360.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming, P.P. Coulling, S.C. Gawler
References: Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Fowells 1965, Lea 2003

[CEGL003624] *Pinus virginiana / Vaccinium pallidum / Schizachyrium scoparium - Carex pensylvanica* Woodland

Translated Name: **Virginia Pine / Blue Ridge Blueberry / Little Bluestem - Pennsylvania Sedge Woodland**
Common Name: **Blue Ridge Acidic Shale Woodland**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Virginia Pine - Table Mountain Pine Woodland & Barrens (G162)
Alliance	*Pinus virginiana* - *Quercus prinus* Acidic Shale Woodland Alliance (A3312)

ELEMENT CONCEPT

Global Summary: This community occurs on steep, shaley slopes in the Southern Appalachians and has an open to closed, stunted canopy and sparse herb and shrub strata characterized by species able to grow in loose shale fragments. It is known from the Hot Springs Window, in the Blue Ridge Mountains, and occurs elsewhere in the Southern Appalachians, such as the Chauga Basin, South Carolina, and from Chilhowee Mountain, Tennessee. The canopy (5-25 m tall, 25-75% cover) is dominated by *Pinus virginiana*, with *Quercus prinus* and *Quercus rubra* sometimes present in substantial numbers in less extreme habitats. The shrub layer is very sparse, and may include scattered individuals of *Kalmia latifolia, Vaccinium stamineum*, and *Vaccinium pallidum*. The herb layer is very sparse to patchy, and is dominated by *Schizachyrium scoparium, Carex pensylvanica, Danthonia spicata, Dichanthelium linearifolium*, with scattered individuals of *Coreopsis major, Houstonia longifolia (= Houstonia tenuifolia), Hieracium venosum*, and *Euphorbia corollata*. Lichens are frequent, particularly on in-place outcrops, and include *Cladina rangiferina* and *Cladonia* spp. Loose shale fragments cover 50-90% of the ground surface. It is apparently a long-lived community, maintained by harsh edaphic conditions of steep slopes and shifting shale substrate. The community can vary quite widely from a very open canopy to one that is almost closed in cases where the slope is less steep and/or the rock underlying the stand is more stable.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This acidic shale woodland is found below 610 m (2,000 feet) elevation. The sampled stand is on a steep, west-facing lower slope.
Global Environment: This community occurs on steep, shaley slopes in the Southern Appalachians and has a sparse herb and shrub strata characterized by species able to grow in loose shale fragments. Loose shale fragments cover 50-90% of the ground surface. It is apparently a long-lived community, maintained by harsh edaphic conditions of steep slopes and shifting shale substrate. The community can vary quite widely from a very open canopy to one that is almost closed in cases where the slope is less steep and/or the rock underlying the stand is more stable.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is primarily dominated by *Pinus virginiana*, with *Quercus prinus* and *Quercus rubra* sometimes present in substantial numbers in less extreme habitats. The shrub layer is very sparse and may include scattered individuals of *Kalmia latifolia, Vaccinium stamineum*, and *Vaccinium pallidum*. Herbs are diverse but sparse.
Global Vegetation: The stunted open to closed canopy (5-25 m tall, 25-75% cover) of stands of this type is dominated by *Pinus virginiana*, with *Quercus prinus* and *Quercus rubra* sometimes present in substantial numbers in less extreme versions of this habitat. The shrub layer is very sparse, and may include scattered individuals of *Kalmia latifolia, Vaccinium stamineum*, and *Vaccinium pallidum*. The herb layer is very sparse to patchy, and is dominated by *Schizachyrium scoparium, Carex pensylvanica, Danthonia spicata, Dichanthelium linearifolium*, with scattered individuals of *Coreopsis major, Houstonia longifolia (= Houstonia tenuifolia), Hieracium venosum*, and *Euphorbia corollata*. Lichens are frequent, particularly on in-place outcrops, and include *Cladina rangiferina* and *Cladonia* spp.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*, *Quercus rubra*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Pinus virginiana*, *Vaccinium stamineum*
Global: *Carex pensylvanica*, *Pinus virginiana*, *Schizachyrium scoparium*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Philadelphus hirsutus* (G5, NC state-imperiled), *Symphyotrichum oblongifolium* (G5, NC state-critically imperiled)
Global: Vulnerable Plants: *Heuchera caroliniana* (G3), *Vaccinium hirsutum* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (19-Feb-2004). As defined, this community is limited to the rare outcrops of shale in the Blue Ridge and in the transition between the Blue Ridge and Ridge and Valley physiographic provinces in extreme western North Carolina and eastern Tennessee. There is some possibility that this type may be somewhat more widespread in the Ridge and Valley of Tennessee, southwestern Virginia, and northern Alabama, although no new locations have been found to date (Feb 2004). It is distinguished from the various shale barren types of western Virginia, eastern West Virginia, western Maryland, and south-central Pennsylvania by the complete absence of the distinctive endemic flora of that region. Most examples are not highly threatened by development or timber harvesting because of their occurrence on steep slopes and the low value/poor quality timber present. This community type is threatened by the invasive exotic *Paulownia tomentosa*, which can colonize this community type where it is near a seed source. Although the current condition of the examples of this type are good, the fact that there are only three known Element Occurrences requires us to give this a high priority Global Rank.

RELATED CONCEPTS

Global Similar Types:

- *Quercus prinus - Juniperus virginiana - (Pinus virginiana) / Philadelphus hirsutus - Celtis occidentalis* Woodland (CEGL007720) on steep, rocky, riverine bluffs in the Southern Blue Ridge with exposed and eroding shale.
- *Quercus prinus - Pinus virginiana - (Pinus pungens) / Schizachyrium scoparium - Dichanthelium depauperatum* Woodland (CEGL008540) of Virginia, Maryland and West Virginia, is strictly a woodland of non-shale substrates.
- *Quercus prinus / Quercus ilicifolia / Danthonia spicata* Woodland (CEGL008526) on dry shale slopes of the Central Appalachians.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This is a distinctive type on a distinctive substrate, with a stunted canopy and sparse herb and shrub strata characterized by species able to grow in loose shale fragments.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: This is a woodland of erosive shale substrates. Compositionally, this type is very similar to Central Appalachian Chestnut Oak - Virginia Pine Woodland (CEGL008540) of the Central Appalachians which is strictly a woodland of non-shale substrates.
Global Classification Comments: Five plots from the area of Hot Springs, North Carolina, are classified as this association in the Appalachian Trail classification study (Fleming and Patterson 2009a). These plots have 27 species with ≥60% constancy. Species with ≥80% constancy include, in order of descending constancy, *Pinus virginiana, Quercus prinus, Quercus rubra, Vaccinium stamineum, Campanula divaricata, Coreopsis major, Andropogon virginicus var. virginicus, Hieracium venosum, Juniperus virginiana var. virginiana, Danthonia spicata*, and *Acer rubrum*. This type is distinguished from the various shale barren types of western Virginia, eastern West Virginia, western Maryland, and south-central Pennsylvania by the complete absence of the distinctive endemic flora of that region. L.L. Gaddy (pers. comm.) reports this association from the Chauga Basin, South Carolina, and it is known from Chilhowee Mountain, Tennessee.

This association shares many floristic elements with *Quercus prinus - Pinus virginiana - (Pinus pungens) / Schizachyrium scoparium - Dichanthelium depauperatum* Woodland (CEGL008540), a Central Appalachian acidic woodland of various substrates other than shale, occurring in Virginia, Maryland and West Virginia. The two associations emerged as distinct in cluster analysis (Fleming and Patterson 2009a); however, when comparing the constant species (≥60%) of the two groups, only three species, *Andropogon virginicus var. virginicus, Carya pallida*, and *Ulmus alata*, were present in samples of this association (CEGL003624) (n=5) and not in those of CEGL008540 (n=28). In this comparison, less constant species which are unique to CEGL008540 are *Chionanthus virginicus, Cornus florida, Gaylussacia baccata, Quercus ilicifolia*, and *Quercus stellata*, but with a larger sample of CEGL003624, those differences may not hold.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community occurs at Hot Springs Window, in Pisgah National Forest (Lovers Leap) in Madison County, North Carolina, on steep slopes above the French Broad River.
Global Range: This forest is found in the Southern Appalachians of the Carolinas and Tennessee. It is reported from somewhat calcareous shales in the Hot Springs Window, in the Blue Ridge of North Carolina and Tennessee, from the Chauga Basin, South Carolina, and from Chilhowee Mountain, Tennessee.
Nations: US
States/Provinces: NC, SC?, TN
TNC Ecoregions: 50:P, 51:C
USFS Ecoregions (1994/95): 221Jb:PPP, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains?); USFS (Cherokee, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WDMP
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 2 accuracy assessment points): APPA.0164, APPA_AA_0189, APPA_AA_0659.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): R. White
References: Allard 1990, Fleming and Patterson 2009a, Peet et al. unpubl. data, Schafale 1998b, Schafale 2002, Schafale 2012, Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

[CEGL008540] ***Quercus prinus - Pinus virginiana - (Pinus pungens) / Schizachyrium scoparium - Dichanthelium depauperatum*** **Woodland**
Translated Name: **Chestnut Oak - Virginia Pine - (Table Mountain Pine) / Little Bluestem - Starved Witchgrass Woodland**
Common Name: **Central Appalachian Chestnut Oak - Virginia Pine Woodland**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Virginia Pine - Table Mountain Pine Woodland & Barrens (G162)
Alliance	*Pinus virginiana* - *Quercus prinus* Acidic Shale Woodland Alliance (A3312)

ELEMENT CONCEPT

Global Summary: This community is a mixed oak-pine woodland with a canopy of stunted, often gnarled trees, varying from semi-open to very open. It occurs on steep convex slopes, ridge spurs, and clifftops which have high solar exposure. Most are on moderate to steep slopes with much exposed mineral soil. Sites are confined to lower elevations (<770 m [2500 feet]), are distinctly xeric, and usually have southeast to southwest aspects. Underlying bedrock includes quartzite, metasandstone and sandstone, granite, shale, and other acidic rocks. Surface cover of outcrops and loose stones is relatively high. Soils are extremely acidic. The canopy is typically codominated by *Quercus prinus* and *Pinus virginiana* in variable proportions; in some slightly more mesic occurrences, *Quercus rubra* may occur with or in place of *Quercus prinus*. *Pinus pungens* is an important, even dominant, associate in a minority of stands. Minor but relatively constant tree associates include *Carya glabra, Amelanchier arborea*, and *Sassafras albidum*. Minor, inconstant tree associates include *Quercus coccinea, Quercus velutina, Quercus stellata, Quercus marilandica, Quercus alba, Carya alba, Carya ovata, Juniperus virginiana, Pinus strobus*, and *Fraxinus americana*. The shrub layer varies from moderately dense to sparse, with *Vaccinium pallidum* and *Vaccinium stamineum* the most constant and abundant species. *Quercus ilicifolia, Kalmia latifolia, Rhus copallinum, Rhus aromatica, Rosa carolina, Castanea pumila, Viburnum acerifolium*, and *Toxicodendron pubescens* are inconstant, but occasionally common, in the type. Herbaceous composition and density vary with shrub density. Graminoid-rich openings dominated by *Schizachyrium scoparium, Dichanthelium depauperatum, Carex pensylvanica, Danthonia spicata*, and *Dichanthelium commutatum* are frequent. Also present is a surprising variety of low-cover forbs, among the most characteristic of which are *Hieracium venosum, Solidago erecta, Potentilla canadensis, Campanula divaricata, Viola sagittata, Houstonia longifolia, Antennaria plantaginifolia, Aureolaria laevigata, Helianthus divaricatus, Cunila origanoides, Symphyotrichum undulatum (= Aster undulatus), Coreopsis verticillata, Tephrosia virginiana, Lespedeza frutescens, Polygonatum biflorum var. biflorum, Taenidia integerrima, Asplenium platyneuron*, and *Clitoria mariana*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This xeric chestnut oak - Virginia pine woodland is confined to lower elevations (<770 m [2,500 feet]) in habitats usually with abundant outcrops with southeast to southwest aspects on steep convex slopes, ridge spurs, and clifftops. It was sampled at three locations in the Central Appalachian project area. Sites are somewhat steep to steep, south- and southeast-facing, upper-slope cliffs (sandstone outcrops) with xeric sandy loam and clay loam soils. The unvegetated surface is dominated by either leaf litter or exposed bedrock with some downed wood, large rocks and bare soil. Evidence of disturbance includes the presence of exotic plant species.
Global Environment: This association occurs on steep convex slopes, ridge spurs, and clifftops which have high solar exposure. Most habitats are characterized by moderate to steep (mean = 24°) slopes with much exposed mineral soil. Sites are confined to lower elevations (<770 m [2500 feet]), are distinctly xeric, and usually have southeast to southwest aspects. Underlying bedrock at plot-sampling sites in VA, MD, and WV includes Antietam quartzite, ferruginous metasandstone of the Harper's Formation, acidic granites, acidic phases of Catoctin metabasalt, schistose metasedimentary rocks of the Mather Gorge Formation, shales and sandstones of the Hinton formation in the Mauch Chunk group, and ancient alluvium composed of quartzitic cobbles. Surface cover of outcrops and loose stones is relatively high (mean = 38% in MD and VA plots). Soils are extremely acidic (mean pH = 4.4) and very low in base status, except for high aluminum levels and sometimes relatively high potassium levels. One somewhat anomalous site is located on massive alluvial fans that overlie the floor of the Great Valley of Virginia along the foot of the Blue Ridge in Augusta County. Here, stands occupy barren, elevated cobble terraces bordering a stream and representing the floodplain level of an earlier erosional cycle.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Pinus virginiana* and *Quercus prinus* codominate the canopy. *Carya glabra, Fraxinus americana, Quercus stellata, Quercus marilandica*, and/or *Pinus pungens* may also be present. *Amelanchier arborea, Vaccinium pallidum*, and *Vaccinium stamineum* are common shrubs. *Quercus ilicifolia* is absent. *Schizachyrium scoparium, Carex pensylvanica, Danthonia spicata, Antennaria plantaginifolia, Hypericum punctatum, Dichanthelium commutatum, Asplenium platyneuron, Potentilla canadensis*, and *Houstonia longifolia* are common herbs.

Global Vegetation: The canopy cover of stunted, often gnarled trees varies from semi-open to very open. *Quercus prinus* and *Pinus virginiana* are usually codominant in variable proportions; in some slightly more mesic occurrences, *Quercus rubra* may occur with or in place of *Quercus prinus*. *Pinus pungens* is an important, even dominant, associate in a minority of stands. Minor but relatively constant tree associates include *Carya glabra, Amelanchier arborea*, and *Sassafras albidum*. Minor, inconstant tree associates include *Quercus coccinea, Quercus velutina, Quercus stellata, Quercus marilandica, Quercus alba, Carya alba, Carya ovata, Juniperus virginiana, Pinus strobus*, and *Fraxinus americana*. The shrub layer varies from moderately dense to sparse, with *Vaccinium pallidum* and *Vaccinium stamineum* the most constant and abundant species. *Quercus ilicifolia, Kalmia latifolia, Rhus copallinum, Rhus aromatica, Rosa carolina, Castanea pumila, Viburnum acerifolium*, and *Toxicodendron pubescens* are inconstant, but occasionally common, in the type. Herbaceous composition and density vary with shrub density. Graminoid-rich openings dominated by *Schizachyrium scoparium, Dichanthelium depauperatum, Carex pensylvanica, Danthonia spicata*, and *Dichanthelium commutatum* are frequent. Occasional stands feature patch-dominance by *Sorghastrum nutans* or *Andropogon gerardii*. Also present is a surprising variety of low-cover forbs, among the most characteristic of which are *Hieracium venosum, Solidago erecta, Potentilla canadensis, Campanula divaricata, Viola sagittata, Houstonia longifolia, Antennaria plantaginifolia, Aureolaria laevigata, Helianthus divaricatus, Cunila origanoides, Symphyotrichum undulatum (= Aster undulatus), Coreopsis verticillata, Tephrosia virginiana, Lespedeza frutescens, Polygonatum biflorum var. biflorum, Taenidia integerrima, Asplenium platyneuron*, and *Clitoria mariana*. Additional herbs occurring less frequently include *Lespedeza hirta, Solidago odora, Deschampsia flexuosa, Coreopsis major, Solidago puberula var. puberula, Solidago bicolor, Solidago arguta var. caroliniana, Solidago sphacelata, Hypericum hypericoides ssp. multicaule (= Hypericum stragulum), Lysimachia quadrifolia, Asclepias amplexicaulis, Sericocarpus asteroides, Dicentra eximia, Paronychia fastigiata, Sericocarpus linifolius, Ionactis linariifolius, Symphyotrichum laeve, Phlox subulata, Pellaea atropurpurea, Polygonum scandens var. cristatum, Viola x palmata, Arabis laevigata*, and *Zizia trifoliata*. Vascular plant species richness of plot-sampled stands ranges from 17 to 56 taxa per 400 square meters (mean = 37). Nonvascular cover tends to be sparse and characterized by fruticose lichens, including *Cladina arbuscula (= Cladonia arbuscula)*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Amelanchier arborea*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Vaccinium pallidum*, *Vaccinium stamineum*
Herb (field)	Graminoid	*Carex pensylvanica*, *Danthonia spicata*, *Schizachyrium scoparium*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Vaccinium pallidum*, *Vaccinium stamineum*
Herb (field)	Graminoid	*Carex pensylvanica*, *Danthonia spicata*, *Dichanthelium depauperatum*, *Schizachyrium scoparium*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Amelanchier arborea*, *Carex pensylvanica*, *Danthonia spicata*, *Pinus virginiana*, *Quercus marilandica*, *Quercus prinus*, *Quercus stellata*, *Schizachyrium scoparium*, *Vaccinium pallidum*, *Vaccinium stamineum*

Global: *Carex pensylvanica*, *Carex umbellata*, *Castanea pumila*, *Danthonia spicata*, *Dichanthelium commutatum*, *Dichanthelium depauperatum*, *Hieracium venosum*, *Lespedeza hirta*, *Pinus virginiana*, *Quercus marilandica*, *Rhus*

copallinum, *Schizachyrium scoparium*, *Solidago odora*, *Tephrosia virginiana*, *Toxicodendron pubescens*, *Vaccinium pallidum*, *Vaccinium stamineum*

Other Noteworthy Species

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Ailanthus altissima* (Medium)
Global: Vulnerable Plants: *Allium oxyphilum* (G2), *Monarda fistulosa* ssp. *brevis* (G5T1T2), *Taenidia montana* (G3)

Conservation Status Rank

Global Rank & Reasons: G3? (8-Feb-2008). Although this community is likely to have a broader distribution in the Central Appalachians than present documentation suggests, it is a small-patch vegetation type restricted to special habitat conditions.

Related Concepts

Global Similar Types:
- *Pinus rigida - Quercus prinus / Gaylussacia baccata / Carex pensylvanica* Woodland (CEGL004821)
- *Pinus virginiana / Vaccinium pallidum / Schizachyrium scoparium - Carex pensylvanica* Woodland (CEGL003624) on dry shale slopes of the Southern Appalachians.
- *Quercus prinus - Juniperus virginiana - (Pinus virginiana) / Philadelphus hirsutus - Celtis occidentalis* Woodland (CEGL007720) on steep, rocky, riverine bluffs in the Southern Blue Ridge with exposed and eroding shale.
- *Quercus prinus / Quercus ilicifolia / Danthonia spicata* Woodland (CEGL008526) on dry shale slopes of the Central Appalachians.

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This is a Central Appalachian acidic woodland of various substrates other than shale. The occurrences of this type along the AT in Roanoke County, Virginia, are some of the largest and finest known.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: The classification of this type is supported by analysis of 28 Virginia, 3 Maryland, and 8 West Virginia plot samples. Additional inventory and data collection are needed to clarify the geographic range, classification, and environmental context of this type. The known range of this community is limited to the Northern Blue Ridge, Ridge and Valley, Cumberlands, and Piedmont in Virginia, West Virginia, and Maryland, but geologic substrates and site conditions similar to those supporting the known examples occur elsewhere in the Central Appalachians, and a broader geographic range seems likely. Recent data indicating possible rock chemistry and compositional gradients may result in future splitting of the type, or expansion of the concept (G. Fleming pers. comm. 2009).

Element Distribution

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is limited to the Northern Blue Ridge, Ridge and Valley, and western Piedmont in Virginia, West Virginia and Maryland. It was sampled in Virginia at McAfee Knob and Catawba Mountain.
Global Range: The known range of this community is limited to the Northern Blue Ridge, Ridge and Valley, and western Piedmont in Virginia, West Virginia and Maryland, but geologic substrates and site conditions similar to those supporting the known examples occur elsewhere in the Central Appalachians, and a broader geographic range seems likely.
Nations: US
States/Provinces: MD, VA:S3, WV
TNC Ecoregions: 52:C, 59:C, 61:C
USFS Ecoregions (1994/95): 231Ak:CCC, M221Aa:CCC, M221Ab:CCC, M221Be:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Bluestone, C&O Canal, Catoctin Mountain, Harpers Ferry, Shenandoah); USFS (Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WMDP
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 plots; 6 accuracy assessment points): APPA.0996, APPA.0997, APPA.0999, APPA_AA_0011, APPA_AA_0428, APPA_AA_0702, APPA_AA_0982, APPA_AA_1011, APPA_AA_1315.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming, P.P. Coulling, S.C. Gawler
References: Braunschweig et al. 1999, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Fleming et al. 2007a, Harrison 2004, Lea 2004, Rawinski et al. 1996, Vanderhorst et al. 2008, WVNHP unpubl. data b, Young et al. 2009

A0144 *Tsuga caroliniana* Woodland Alliance

Alliance Summary Description: These forests have dense to open canopies dominated by *Tsuga caroliniana*. Occurrences in gorges sometimes have a substantial admixture of *Tsuga canadensis*. Other associated species may include *Pinus pungens, Pinus rigida, Pinus virginiana, Quercus prinus*, and *Quercus rubra*. The shrub stratum is dense and dominated by ericaceous species, such as *Gaylussacia baccata, Kalmia latifolia, Rhododendron carolinianum, Rhododendron catawbiense, Rhododendron maximum*, and *Vaccinium* spp. Trees may be wind-shorn, gnarled and twisted in exposed situations. These forests occur mostly on cliffs, rocky slopes and ridges, and less commonly on more gentle slopes and flat areas in valleys. Soils are usually nutrient-poor and rocky, with much exposed rock surface. Occurrences of these forests tend to be small and have distinct boundaries. *Tsuga caroliniana* is an Appalachian endemic with a very limited range, scattered in the Southern Blue Ridge and occasional in the Piedmont and Ridge and Valley.

[CEGL006178] *Tsuga caroliniana - Pinus (rigida, pungens, virginiana)* Forest

Translated Name: **Carolina Hemlock - (Pitch Pine, Table Mountain Pine, Virginia Pine) Forest**
Common Name: **Carolina Hemlock Forest (Pine Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Virginia Pine - Table Mountain Pine Woodland & Barrens (G162)
Alliance	*Tsuga caroliniana* Woodland Alliance (A0144)

ELEMENT CONCEPT

Global Summary: This association is known from shallow soils over sedimentary and metasedimentary rock strata on exposed ridges and southwest-facing slopes above 610 m (2000 feet) elevation in the Southern Blue Ridge and upper Piedmont of North Carolina and Tennessee. This xeric forest community is dominated by a mixture of *Tsuga caroliniana* and any or all of the following pine species: *Pinus rigida, Pinus virginiana*, and/or *Pinus pungens*. Additional canopy species may include *Quercus prinus, Quercus rubra*, and *Carya glabra*. The structure of the canopy varies from closed to open depending on disturbance history and environment. The patchy to open shrub layer of Tennessee occurrences is characterized by *Buckleya distichophylla* and *Rhododendron minus* in the upper shrub layer, and *Vaccinium pallidum* and *Gaultheria procumbens* in the lower shrub layer. The patchy to open herbaceous layer is characterized by *Schizachyrium scoparium*. As much as 25% of the ground cover may contain lichens, including *Cladina rangiferina* and *Cladina subtenuis*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This Carolina hemlock forest was sampled at two locations in the park. The sites occur on ridgetops at 680 to 700 m elevation. Soils are rapidly drained loam. The unvegetated surface consists of leaf litter at one site and is a mix of exposed bedrock, large/small rocks, downed wood and bare soil at the other. Evidence of disturbance includes hemlock woolly adelgid damage and some southern pine beetle damage.
Global Environment: This association is known from shallow soils over sedimentary and metasedimentary rock strata on exposed ridges and southwest-facing slopes above 610 m (2000 feet) elevation in the Southern Blue Ridge and upper Piedmont of North Carolina and Tennessee.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is dominated by *Tsuga caroliniana*, with codominance by *Pinus pungens* and *Pinus virginiana*. *Pinus rigida* and *Pinus strobus* are common along with some dry-site oaks, including *Quercus prinus*. Stands vary from closed to open depending on disturbance history and environment. The shrub layer is patchy to open, with *Rhododendron minus, Vaccinium pallidum*, and *Gaultheria procumbens*. Herbs are sparse; typically there is a nonvascular layer that includes lichens such as *Cladina rangiferina* and *Cladina subtenuis* and/or mosses such as *Dicranum scoparium*. This community also supports TN-state imperiled *Buckleya distichophylla*.

Global Vegetation: This xeric forest community is dominated by a mixture of *Tsuga caroliniana* and any or all of the following pine species: *Pinus rigida, Pinus virginiana*, and/or *Pinus pungens*. Additional canopy species may include *Quercus prinus, Quercus rubra*, and *Carya glabra*. The structure of the canopy varies from closed to open depending on disturbance history and environment. The patchy to open shrub layer of Tennessee occurrences is characterized by *Buckleya distichophylla* and *Rhododendron minus* in the upper shrub layer, and *Vaccinium pallidum* and *Gaultheria procumbens* in the lower shrub layer. The patchy to open herbaceous layer is characterized by *Schizachyrium scoparium*. As much as 25% of the ground cover may contain lichens, including *Cladina rangiferina* and *Cladina subtenuis*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus pungens*, *Pinus strobus*, *Pinus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Tall shrub/sapling	Needle-leaved tree	*Tsuga caroliniana*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron minus*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Short shrub/sapling	Dwarf-shrub	*Gaultheria procumbens*
Nonvascular	Moss	*Dicranum scoparium*
Nonvascular	Lichen	*Cladina rangiferina*, *Cladina subtenuis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus pungens*, *Pinus rigida*, *Pinus virginiana*, *Tsuga caroliniana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area):
Global: *Pinus pungens*, *Pinus rigida*, *Pinus virginiana*, *Tsuga caroliniana*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Buckleya distichophylla* (G3, globally imperiled), *Castanea dentata* (G4, TN state-imperiled), *Rhododendron minus* (G4, TN state-imperiled), *Tsuga caroliniana* (G3)
Global: Vulnerable Plants: *Buckleya distichophylla* (G3), *Tsuga caroliniana* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (31-Dec-1997). *Tsuga caroliniana* communities, in general, have a restricted range, occurring only in the Southern Blue Ridge and upper Piedmont and are probably endemic to North Carolina and Tennessee. Occurrences are typically small and restricted to rocky, bluff habitats. All occurrences are threatened by fire suppression and the hemlock woolly adelgid (*Adelges tsugae*), an exotic pest which causes tree decline and ultimately death in *Tsuga canadensis* and *Tsuga caroliniana*.

RELATED CONCEPTS

Global Similar Types:
- *Tsuga caroliniana / Kalmia latifolia - Rhododendron catawbiense* Forest (CEGL007139)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: This association is currently recognized as distinct from *Tsuga caroliniana / Kalmia latifolia - Rhododendron catawbiense* Forest (CEGL007139), due to the presence of *Pinus* species, which may be related to landform and exposure or past fire history or both. The long-term impact of hemlock woolly adelgid on *Tsuga caroliniana* needs systematic study. The role of fires in the ecology of *Tsuga caroliniana* communities is also unclear, since evidence of stand expansion following both fires and periods of fire exclusion have been noted (Schafale and Weakley 1990). Three plots from the Cherokee National Forest (CHER.28, CHER.39, APPA.597), from slopes and ridgetops over the Doe and Nolichucky rivers, were classified as this association in the Appalachian Trail classification project (Fleming and Patterson 2009a). Species with 100% constancy in these three plots include *Tsuga caroliniana, Pinus pungens, Pinus virginiana, Rhododendron minus*, and *Oxydendrum arboreum*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community occurs uncommonly along and near the AT in Unicoi and Carter counties in Tennessee.
Global Range: This association is known to occur in the Southern Blue Ridge of North Carolina and Tennessee. It may also range into Virginia, but its presence there is not currently verified.
Nations: US
States/Provinces: NC, TN
TNC Ecoregions: 51:C, 52:C
USFS Ecoregions (1994/95): 231Aa:CCC, M221Db:CCP, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?); USFS (Cherokee, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 1 accuracy assessment point): APPA.0078, APPA.0597, APPA_AA_0944.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A.S. Weakley and M.P. Schafale
References: Allard 1990, Eyre 1980, Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

[CEGL007139] *Tsuga caroliniana / Kalmia latifolia - Rhododendron catawbiense* Forest

Translated Name: **Carolina Hemlock / Mountain Laurel - Catawba Rosebay Forest**
Common Name: **Carolina Hemlock Forest (Typic Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Virginia Pine - Table Mountain Pine Woodland & Barrens (G162)
Alliance	*Tsuga caroliniana* Woodland Alliance (A0144)

ELEMENT CONCEPT

Global Summary: These forests occur with canopies dominated by *Tsuga caroliniana*, without admixtures of *Pinus* species, although *Quercus prinus* may be present as a minor component. Shrub strata tend to be dense and dominated by ericaceous species such as *Kalmia latifolia, Rhododendron catawbiense*, and *Rhododendron minus*. Other minor components may include *Pinus virginiana, Pinus rigida, Pinus pungens, Nyssa sylvatica*, and *Quercus coccinea*. Other characteristic species can include *Xerophyllum asphodeloides, Leucothoe recurva, Polypodium appalachianum, Smilax rotundifolia*. This forest occurs in the upper Piedmont and Southern Blue Ridge, on narrow ridges and upper north-facing rocky slopes.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This Carolina hemlock forest was sampled at three locations in the park. The sites range from moderate to somewhat steep midslopes and ridgetops at 577 to 942 m elevation on west, northwest and southeast aspects. Soils are xeric, well-drained clay loam. The unvegetated surface is dominated by leaf litter with some downed wood, large rocks and bare soil. Evidence of disturbance includes natural canopy gaps and hemlock/fir woolly adelgid damage.
Global Environment: Over the full range of this type, stands typically occur on narrow ridges and upper, north-facing rocky slopes. Four documented Virginia stands, including three plot-sampled by DCR-DNH ecologists and one studied intensively by Rentch et al. (2000), occurred at elevations from 591-1075 m (1940-3525 feet). Sites include a narrow spur ridge crest, one upper slope, and two middle slopes, with south, southwest, and north aspects. Slopes are strongly convex. Two sites have substantial surface cover of rocks (70% and 31%), while the other two sites have negligible rock cover. Soils are extremely acidic (mean pH = 3.8), with very low calcium and magnesium levels and high iron and aluminum levels.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is dominated by *Tsuga caroliniana*, with little or no pines. Tree oaks, including *Quercus rubra, Quercus alba*, and *Quercus prinus*, may be common to abundant in the canopy. Shrub strata tend to be dense and characterized by ericaceous species such as *Kalmia latifolia, Rhododendron catawbiense*, and *Rhododendron minus*. This community also supports TN-state imperiled *Buckleya distichophylla*.
Global Vegetation: These forests occur with canopies dominated by *Tsuga caroliniana*, without admixtures of *Pinus* species, although *Quercus prinus* may be present as a minor component. Shrub strata tend to be dense and dominated by ericaceous species such as *Kalmia latifolia, Rhododendron catawbiense*, and *Rhododendron minus*. Other minor components may include *Pinus virginiana, Pinus rigida, Pinus pungens, Nyssa sylvatica*, and *Quercus coccinea*. Other characteristic species can include *Xerophyllum asphodeloides, Leucothoe recurva, Polypodium appalachianum*, and *Smilax rotundifolia*.

Virginia stands are strongly dominated by *Tsuga caroliniana*, with *Quercus prinus* the most important canopy associate. *Quercus rubra, Quercus alba*, several *Pinus* spp., *Nyssa sylvatica*, and *Acer rubrum* are minor canopy associates. *Acer rubrum, Amelanchier arborea*, and *Sassafras albidum* are common understory trees, while *Rhododendron catawbiense, Kalmia latifolia*, and *Hamamelis virginiana* are dominant shrubs. Additional shrubs include *Pieris floribunda, Vaccinium pallidum, Rhododendron periclymenoides*, and *Gaylussacia baccata*. The herb layer is generally sparse with scattered individuals or patches of *Aralia nudicaulis, Carex pensylvanica, Chimaphila maculata, Cunila origanoides*, and *Hexastylis virginica*. Species richness ranges from 12 to 19 taxa per 400 m2 (mean = 16).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga caroliniana*
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus prinus*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga caroliniana*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Kalmia latifolia*, *Quercus alba*, *Quercus prinus*, *Rhododendron catawbiense*, *Rhododendron minus*, *Tsuga caroliniana*
Global: *Leucothoe recurva*, *Pieris floribunda*, *Polypodium appalachianum*, *Rhododendron catawbiense*, *Smilax rotundifolia*, *Tsuga caroliniana*, *Xerophyllum asphodeloides*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Buckleya distichophylla* (G3, globally imperiled), *Castanea dentata* (G4, TN state-imperiled), *Tsuga caroliniana* (G3)
Global: Vulnerable Plants: *Buckleya distichophylla* (G3), *Tsuga caroliniana* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (31-Dec-1997). *Tsuga caroliniana* communities, in general, have a restricted range, occurring primarily in the Southern Blue Ridge, with scattered occurrences in the upper Piedmont and Ridge and Valley of North Carolina, Tennessee, South Carolina, and Virginia. Occurrences are typically small and restricted to rocky bluff habitats. All occurrences are threatened by fire suppression and the exotic pest the hemlock woolly adelgid (*Adelges tsugae*) which causes tree decline and ultimately death in *Tsuga canadensis* and *Tsuga caroliniana*. The taxonomy of *Tsuga caroliniana* communities needs further assessment.

RELATED CONCEPTS

Global Similar Types:
- *Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest (CEGL008524)
- *Tsuga caroliniana - Pinus (rigida, pungens, virginiana)* Forest (CEGL006178)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This small group of *Tsuga caroliniana - Quercus* spp. forest plots was crosswalked to Carolina Hemlock Forest (Typic Type) (CEGL007139) for lack of a suitable alternative. Composition of the group, however, differs from the NVC description of CEGL007139 by its low density of ericaceous shrubs and its more mixed rather than purely *Tsuga*-dominated character. Only one of the plots has substantial ericad cover, and that does not even approach 50%. Oaks (*Quercus alba, Quercus prinus*, and/or *Quercus rubra*) essentially share dominance in all but one plot (Fleming and Patterson 2009a).
Global Classification Comments: Although no doubt a rare, small-patch community type in Virginia, additional examples are likely and should be sought. The long-term impact of hemlock woolly adelgid on *Tsuga caroliniana* needs systematic study. The role of fires in the ecology of *Tsuga caroliniana* communities is also unclear, since evidence of stand expansion following both following fires and periods of fire exclusion have been noted (Schafale and Weakley 1990). Rentch et al. (2000) found that *Tsuga caroliniana* dominating a site in Bottom Creek Gorge (Montgomery County, Virginia) was long-lived, very tolerant of drought stresses, and had reproduced episodically over the past 200 years. No evidence of fire is mentioned in this paper.

Six plots from Tennessee and Virginia were classified as this association in the Appalachian Trail classification project (Fleming and Patterson 2009a). These plot samples vary from the core association concept in that they have only moderate coverage (≥ 25%) by ericaceous shrubs and a mixed canopy with 10-75% cover by *Tsuga caroliniana*, with *Quercus rubra, Quercus prinus*, and *Quercus alba*. The most constant species (≥67%) in these plots, in order of descending constancy, are *Tsuga caroliniana, Quercus rubra, Acer rubrum, Quercus prinus, Quercus alba, Nyssa sylvatica, Betula lenta, Pinus strobus, Acer pensylvanicum*, and *Viburnum acerifolium*.

Examples in North Carolina include Hickorynut Gorge, Linville Gorge, Hanging Rock State Park.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This uncommon community occurs along the AT in Unicoi and Carter counties, Tennessee.
Global Range: *Tsuga caroliniana* communities, in general, have a restricted range, occurring primarily in the Southern Blue Ridge, with scattered occurrences in the upper Piedmont and Ridge and Valley of North Carolina, Tennessee, South Carolina, and Virginia.
Nations: US
States/Provinces: NC, SC, TN, VA:S1
TNC Ecoregions: 51:C, 52:C, 59:C
USFS Ecoregions (1994/95): 231Aa:CCC, 231Ae:CCP, M221Aa:CC?, M221Ab:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?); USFS (Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (3 plots; 1 accuracy assessment point): APPA.0573, APPA.0582, APPA.0584, APPA_AA_0920.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay

Global Description Author(s): A.S. Weakley, K.D. Patterson, G. Fleming and P. Coulling
References: Allard 1990, Eyre 1980, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2004, Peet et al. unpubl. data, Rentch et al. 2000, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Weakley et al. 1979

M013. Eastern North American Ruderal Forest

G032. Eastern North American Exotic Ruderal Forest

Group Summary Description: This native ruderal forest group is found in the cool temperate regions of the eastern United States and Canada, from the East Coast, west to the Great Lakes and Tallgrass Prairie region and south to the south-central United States. The vegetation of this group shows evidence of former and heavy human disturbance, particularly to the soils, such as through plowing, grading, skidding, etc., but has otherwise been allowed to succeed more-or-less spontaneously. The vegetation is a disparate mix of exotic species, and the ecological and floristic organization of the vegetation is not clear. The tree layer is dominated (>80% cover) by exotic tree species. The list of exotic tree species include Conifers: *Pinus thunbergiana* and Hardwoods: *Acer platanoides, Ailanthus altissima, Malus fusca*, and *Robinia pseudoacacia*. Although *Robinia pseudoacacia* is a native in the central hardwoods region, it is so widely planted outside of its range that it is exotic in character. Understory shrub and herb species vary from exotic invasives to native generalists. Invasive shrub species include a variety of honeysuckles (*Lonicera japonica, Lonicera morrowii, Lonicera tatarica, Lonicera x bella), Rhamnus cathartica*, and others. The most common exotic tree species found in abandoned plantations include *Larix decidua, Picea abies*, and *Pinus sylvestris*. Sites are often on dry-mesic to wet-mesic sites, suitable for agriculture or forest plantations.

A3230 *Acer platanoides - Ailanthus altissima - Pinus* spp. Exotic Ruderal Forest Alliance

Alliance Summary Description: This alliance includes semi-natural forests dominated by naturalized *Acer platanoides, Ailanthus altissima, Paulownia tomentosa, Pinus nigra*, or *Pinus thunbergiana*. These are all exotic tree species that have locally established in the region. *Pinus thunbergiana* stands occur in the northeastern coastal region and likely beyond, on well-drained to xeric sandy soils, usually on sand dunes or near-coastal glacial tills. Stands are of variable canopy height and closure and dominated by *Pinus thunbergiana* or *Pinus nigra*. *Ailanthus altissima* is a native of eastern Asia. This forest occurs mostly in disturbed areas, along roadsides, urban abandoned lands, and on limestone clifftops. In some parts of the range, this forest is associated with calcareous soils. *Acer platanoides* stands often occur to the exclusion of virtually all other canopy species. Most documented stands are at low elevations, on flat or rolling topography both above and below the glacial boundary. In some stands, native trees, including *Fraxinus americana* and *Acer saccharum* (the latter especially susceptible to exclusion by *Acer platanoides*), may be present in very limited amounts. Other stands may have non-native associates, including *Pinus nigra, Pinus sylvestris*, or *Robinia pseudoacacia*. The deep shade cast by *Acer platanoides* limits understory growth, aside from regeneration of *Acer platanoides*, or incursions by non-native shrubs such as *Rosa multiflora, Berberis vulgaris, Lonicera japonica*, or *Lonicera morrowii*. Native herbs are few, especially compared to more natural deciduous forests in similar settings. A few native or exotic herbaceous species or vines may occupy the ground layer, such as *Alliaria petiolata, Eurybia divaricata (= Aster divaricatus), Toxicodendron radicans*, and *Vinca minor*. *Paulownia tomentosa*, a native of Asia, has become naturalized in portions of the eastern United States, where it occurs as small, scattered populations along roadsides, in disturbed woodlots, and in streamside forests.

[CEGL007191] *Ailanthus altissima* Ruderal Forest

Translated Name: **Tree-of-Heaven Ruderal Forest**
Common Name: **Ruderal Tree-of-Heaven Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Exotic Ruderal Forest (G032)
Alliance	*Acer platanoides - Ailanthus altissima - Pinus* spp. Exotic Ruderal Forest Alliance (A3230)

Element Concept

Global Summary: This forest association generally occurs on nutrient-rich substrates, in disturbed situations on slopes, urban abandoned lands, and on rocky limestone slopes, in association with a wide variety of other exotic species and generalist native species. There are floodplain forests in which invasive exotic *Ailanthus altissima*

makes up 25-50% of the canopy; with other associated canopy species of *Fraxinus pennsylvanica* and *Acer saccharinum*. At this time, these forests are treated as D-ranked examples of native types.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This successional tree-of-heaven forest was sampled at two locations in Clarke County, Virginia, in the Central Appalachian project area. Sites are moderate, east-facing midslopes with dry-mesic, moderately well-drained silt loam or sandy loam soils. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. Evidence of disturbance includes the presence of exotic plant species.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: These are disturbed forests comprised of non-native and early-successional native trees.
Global Environment: This community occurs generally on nutrient-rich substrates, in disturbed situations on slopes, urban abandoned lands, and on rocky limestone slopes.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This successional community is dominated by exotic species in all strata. The sparse (20-40% cover) canopy and subcanopy layers are dominated by *Ailanthus altissima*. Other tree species may include *Fraxinus americana, Liriodendron tulipifera, Paulownia tomentosa*, and *Robinia pseudoacacia*. The sparse (up to 40%) shrub layers include *Celastrus orbiculata, Lindera benzoin, Robinia pseudoacacia*, and *Rosa palustris*. The herb layer is dominated by *Verbesina alternifolia* and by the invasive exotic *Microstegium vimineum*. Vines, mostly *Vitis* spp., often cover the ground or climb into the canopy.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The forest canopy is dominated by *Ailanthus altissima*.
Global Vegetation: This southeastern forest association is strongly dominated by the alien *Ailanthus altissima*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Ailanthus altissima*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Ailanthus altissima*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Ailanthus altissima*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Ailanthus altissima*
Appalachian National Scenic Trail (Lower New England Project Area): *Ailanthus altissima*
Global: *Ailanthus altissima*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Ailanthus altissima* (Medium, invasive/exotic), *Celastrus orbiculata* (High/Medium, invasive/exotic), *Lonicera japonica* (High/Medium, invasive/exotic), *Microstegium vimineum* (High/Medium, invasive/exotic), *Paulownia tomentosa* (Medium/Low, invasive/exotic), *Polygonum persicaria* (invasive/exotic)
Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Ailanthus altissima* (Medium)
Global: Invasive/Exotic Plants: *Ailanthus altissima* (Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (4-Jan-2000). This vegetation is dominated by an invasive, alien species and is thus not a conservation priority.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This vegetation is dominated by an invasive, alien species and is thus not a conservation priority.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This vegetation is dominated by an invasive, alien species and is thus not a conservation priority.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: This community was observed during mapping reconnaissance in the summer of 2012.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled in the Paris area of Clarke County, Virginia.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed in New York and Connecticut during mapping reconnaissance in the summer of 2012.
Global Range: *Ailanthus altissima* Forest occurs throughout the Appalachians, the Piedmont, the Interior Low Plateau, eastern Kentucky, and in the Ozarks and Ouachita Mountains, and probably other areas in the northeastern United States.
Nations: US
States/Provinces: AR, CT, KY, MD, NC, NJ?, NY, PA, TN, VA, WV?
TNC Ecoregions: 38:C, 39:C, 43:P, 44:C, 50:P, 51:C, 52:C, 59:C, 61:C
USFS Ecoregions (1994/95): 221Ae:CCC, 222Eg:CCC, 231A:CC, 231G:CC, 232:C, M221Aa:CPP, M221Ab:CPP, M221Ac:CPP, M221Ad:CPP, M221Ba:CPP, M221Bb:CPP, M221Bc:CPP, M221Bd:CPP, M221Be:CPP, M221Bf:CPP, M221Da:CCP, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Antietam, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appomattox Court House, C&O Canal, Colonial, Natchez Trace); USFS (Ouachita (Mountains)?, Ouachita?, Ozark?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXCH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 observation points): APPA.1286, APPA.1287.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): A.S. Weakley
References: Edinger et al. 2002, Nordman et al. 2011, Patterson 1976, Patterson 2008a, Patterson 2008c, Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

G030. EASTERN NORTH AMERICAN NATIVE RUDERAL FOREST

Group Summary Description: This native ruderal forest group is found in the cool temperate regions of eastern United States and Canada, from the East Coast, west to the Great Lakes and Tallgrass Prairie region and south to the south-central United States. The vegetation of this group shows evidence of former and heavy human disturbance, particularly to the soils, such as through plowing, grading, skidding, etc., but has otherwise been allowed to succeed more-or-less spontaneously. The vegetation is a somewhat disparate mix of weedy and native species, and the ecological and floristic organization of the vegetation is not clear. The tree layer is dominated (>50% cover) by "weedy" or generalist native tree species, sometimes accompanied by exotic/invasive tree species. The list of ruderal tree species is as follows: Conifers: *Juniperus virginiana, Pinus rigida, Pinus strobus, Pinus virginiana*. Hardwoods: *Acer negundo, Acer rubrum, Amelanchier* spp., *Betula populifolia, Crataegus* spp., *Crataegus crus-galli, Crataegus mollis, Diospyros virginiana, Fraxinus americana, Gleditsia triacanthos, Gymnocladus dioicus, Juglans nigra, Liquidambar styraciflua, Liriodendron tulipifera, Morus* spp., *Malus fusca, Morus rubra, Populus tremuloides, Prunus pensylvanica, Prunus serotina, Prunus americana*, and *Robinia pseudoacacia*. Naturalized exotics include the conifer *Pinus thunbergiana* and hardwoods *Acer platanoides* and *Ailanthus altissima*. *Robinia pseudoacacia*,

although a native in the central hardwoods region, is so widely planted outside of its range that it is essentially exotic in character. The weedy natives often form mono-dominant or mixed dominance stands. Understory shrub and herb species vary from exotic invasives to native generalists. Invasive shrub species include a variety of honeysuckles (*Lonicera japonica, Lonicera morrowii, Lonicera tatarica, Lonicera x bella), Rhamnus cathartica*, and others. Sites show evidence of former and heavy human use, particularly with extensive and intensive soil disturbances, including plowing, grading, skidding, etc. Sites are often on dry-mesic to wet-mesic sites, suitable for agriculture or forest plantations.

A3229 *Acer rubrum - Prunus serotina - Pinus strobus* Ruderal Forest Alliance

Alliance Summary Description: This early-successional forest vegetation of the northeastern United States occurs on sites that are becoming reforested after having been cleared for agriculture or otherwise heavily modified in the past. Environmental setting varies, but generally sites are dry-mesic to mesic, with small seepage inclusions in some examples. Physiognomy of this vegetation is highly variable, ranging from closed forest to open woodland and scrub. The generalist set of native, non-planted species include a combination of tree species, such as *Acer rubrum, Fraxinus americana, Liriodendron tulipifera, Pinus strobus*, and *Prunus serotina*. Other associates can include *Acer negundo, Acer saccharinum, Ailanthus altissima, Amelanchier* spp., *Betula lenta, Betula populifolia, Juglans nigra, Juniperus virginiana, Pinus strobus, Populus grandidentata, Quercus* spp., *Robinia pseudoacacia, Sassafras albidum*, and *Ulmus americana*. The low-shrub layer, if present, is usually characterized by the presence of *Rubus* spp. such as *Rubus allegheniensis, Rubus flagellaris, Rubus hispidus*, or *Rubus phoenicolasius*. This layer is often dominated by exotic species such as *Berberis thunbergii, Crataegus* spp., *Lonicera morrowii, Lonicera tatarica, Rhamnus cathartica*, and *Rosa multiflora*. The herbaceous layer is variable, often containing grasses and forbs of both native and exotic origin. The invasive species *Alliaria petiolata, Microstegium vimineum*, and *Polygonum caespitosum* can be abundant in this disturbed forest type. These forests are often young and resulted from the colonization of old agricultural fields by woody species. Recent disturbance or abundant invasive species give these forest stands a weedy character. It is unlikely that these stands will succeed to a natural plant community dominated by native species.

[CEGL006628] *Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest

Translated Name: **Sugar Maple - Birch species - American Beech Ruderal Forest**
Common Name: **Ruderal Sugar Maple - Northern Hardwood Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Acer rubrum - Prunus serotina - Pinus strobus* Ruderal Forest Alliance (A3229)

Element Concept

Global Summary: This is an early-successional variant of the widespread typic northern hardwood forest (CEGL006631) dominated by a monotypic canopy of *Acer saccharum* and/or some combination of young, small-diameter *Acer saccharum, Fraxinus americana, Prunus serotina, Betula alleghaniensis, Fagus grandifolia*, and/or *Betula papyrifera*. A disturbed shrub layer may be present with exotics or, more commonly, there is no shrub layer. The herbaceous layer is patchy and most often consists of a mix of ferns, clubmosses (Lycopodiaceae), and other herbs. This community arises from cutting, farming, or extended grazing. It occurs on acidic soils in central New England and at lower elevations in northern New England and upstate New York.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This is an early-successional variant of the widespread typic Northern Hardwood Forest (CEGL006252) that arises from cutting, farming, or extended grazing. It occurs on acidic soils in central New England and at lower elevations in northern New England and upstate New York.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This community occurs on acidic soils in central New England and at lower elevations in northern New England, New Hampshire, and Maine.

Global Environment: This is an early-successional variant of the widespread typic northern hardwood forest (CEGL006631) that arises from cutting, farming, or extended grazing. It occurs on acidic soils in central New England and at lower elevations in northern New England and upstate New York.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This is an early-successional variant of the widespread typic northern hardwood forest, *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006252), dominated by a monotypic canopy of *Acer saccharum* and/or some combination of young, small-diameter *Acer saccharum, Fraxinus americana, Prunus serotina, Betula alleghaniensis, Fagus grandifolia* and/or *Betula papyrifera*. A disturbed shrub layer may be present with exotics or more commonly, there is no shrub layer. The herbaceous layer is patchy and most often consist of a mix of ferns, clubmosses (Lycopodiaceae), and other herbs.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This community is an early-successional variant of widespread typic northern hardwood forest, with either a monotypic canopy of *Acer saccharum*, or a canopy dominated by some combination of young, small-diameter, even-aged *Acer saccharum, Fraxinus americana, Prunus serotina, Betula alleghaniensis, Fagus grandifolia, Pinus strobus*, and/or *Betula papyrifera*. It arises from cutting and has either a disturbed shrub layer with exotics or no shrub layer. The herb layer is patchy and most often a mix of ferns, clubmosses (Lycopodiaceae), and other herbs.
Global Vegetation: This is an early-successional variant of the widespread typic northern hardwood forest (CEGL006252) dominated by a monotypic canopy of *Acer saccharum* and/or some combination of young, small-diameter *Acer saccharum, Fraxinus americana, Prunus serotina, Betula alleghaniensis, Fagus grandifolia*, and/or *Betula papyrifera*. A disturbed shrub layer may be present with exotics or, more commonly, there is no shrub layer. The herbaceous layer is patchy and most often consists of a mix of ferns, clubmosses (Lycopodiaceae), and other herbs.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer saccharum*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer saccharum*
Global: *Acer saccharum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (15-Aug-2012).

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631)
- *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632)

CLASSIFICATION

Status: Provisional
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: In the Lower New England map, Ruderal Sugar Maple - Northern Hardwood Forest (CEGL006628) and Northeastern Ruderal Hardwood Forest (CEGL006599) are mutually-exclusive The geographic break between these two associations is where *Liriodendron tulipifera* drops out in northern CT, with CEGL006599 to the south and often having *Liriodendron* and CEGL006628 to the north. One stand in Rutland, VT, arose from a century or two of grazing where the "forest" consisted of witness-tree *Acer saccharum* surrounded by pole-stage *Acer saccharum* with no shrubs and a herb layer of *Poa* sp. and *Thelypteris noveboracensis*. This association was originally referred to as CEGL006252.9.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This association consists of successional and disturbed vegetation. It is an early-successional variant of the widespread typic northern hardwood forest *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This successional forest occurs on acidic soils in central New England from northern Connecticut through Massachusetts and at lower elevations in northern New England in Vermont, New Hampshire and upstate New York.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This community occurs in central New England and at lower elevations in northern New England, New Hampshire, and Maine.
Global Range: This successional forest occurs on acidic soils in central New England and at lower elevations in northern New England and upstate New York.
Nations: US
States/Provinces: CT, MA, ME, NH, NY, VT
TNC Ecoregions: 61:C, 63:C
USFS Ecoregions (1994/95): 212D:CC, 221A:CC, 221B:CC, M212B:CC, M212C:CC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXNH
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (14 observation points; 21 accuracy assessment points): APPA.1374, APPA.1481, APPA.1485, APPA.1495, APPA.1504, APPA.1511, APPA.1521, APPA.1698, APPA.1710, APPA.1712, APPA.1713, APPA.1716, APPA.1735, APPA.1738, APPA_AA_1852, APPA_AA_1901, APPA_AA_1989, APPA_AA_2002, APPA_AA_2159, APPA_AA_2277, APPA_AA_2299, APPA_AA_2318, APPA_AA_2363, APPA_AA_2367, APPA_AA_2433, APPA_AA_2591, APPA_AA_2604, APPA_AA_2721, APPA_AA_2815, APPA_AA_2831, APPA_AA_2942, APPA_AA_2952, APPA_AA_3066, APPA_AA_3230, APPA_AA_3279.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (6 observation points; 10 accuracy assessment points): APPA.1653, APPA.1654, APPA.1655, APPA.1656, APPA.1676, APPA.1763, APPA_AA_1741, APPA_AA_1777, APPA_AA_1818, APPA_AA_2192, APPA_AA_2420, APPA_AA_2464, APPA_AA_2742, APPA_AA_2824, APPA_AA_3038, APPA_AA_3126.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): E. Largay and M. Russo
Global Description Author(s): E. Largay after S. Gawler and L. Sneddon
References: Eastern Ecology Working Group n.d.*

[CEGL008503] *Betula lenta - Acer rubrum / Lycopodium annotinum - Dennstaedtia punctilobula* Ruderal Forest

Translated Name: **Sweet Birch - Red Maple / Stiff Clubmoss - Eastern Hay-scented Fern Ruderal Forest**
Common Name: **Central Appalachian Ruderal Sweet Birch - Red Maple Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Acer rubrum* - *Prunus serotina* - *Pinus strobus* Ruderal Forest Alliance (A3229)

ELEMENT CONCEPT

Global Summary: This vegetation type is associated with generally infertile sites that have been altered by logging and fires. Its distribution is centered in the Central Appalachians. Stands are floristically depauperate and characterized by even-aged, nearly pure *Betula lenta, Acer rubrum*, or mixtures of the two. Associated species, minor in importance, vary somewhat with geography and include *Betula alleghaniensis, Fraxinus americana, Fagus grandifolia, Prunus serotina, Quercus rubra, Quercus alba, Quercus velutina, Liriodendron tulipifera, Populus tremuloides, Populus grandidentata*, and/or *Robinia pseudoacacia*. *Magnolia acuminata* and *Magnolia fraseri* are sometimes associates in the southern portion of the range. The subcanopy, when developed, consists mainly of *Fagus grandifolia*. *Tsuga canadensis* forms a scattered canopy or understory in some stands. *Ilex montana* is a characteristic shrub in the southern portion of the type's range, and *Lindera benzoin* is typical elsewhere. Shrub associates include *Kalmia latifolia, Acer pensylvanicum, Hamamelis virginiana, Amelanchier arborea, Viburnum prunifolium, Fagus* sprouts, *Rhododendron calendulaceum, Rhododendron periclymenoides*, and *Rhododendron maximum*. Herb layers may be dominated by dense and extensive colonies of *Lycopodium annotinum*, often in association with *Lycopodium dendroideum, Lycopodium clavatum*, and/or *Lycopodium digitatum*, or by *Dennstaedtia punctilobula*. Herbaceous associates include *Thelypteris noveboracensis, Polystichum acrostichoides, Carex swanii*, and others.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This successional birch-maple forest often originates after severe disturbance such as fire, clear-cutting, or gypsy moth outbreaks. It was sampled at four locations in the Central Appalachian project area. Sites range from gentle to steep upper slopes and summits occurring on infertile and altered soils. Soils are dry, rapidly to well-drained loam. The unvegetated surface consists of a variable mix of leaf litter, large and small rocks, and downed wood. No evidence of disturbance was reported.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This successional birch-maple forest was sampled on a somewhat steep, northeast-facing upper slope rock outcrop with dry well-drained soil. The unvegetated surface is a mix of leaf litter, downed wood, exposed bedrock, and large/small rocks. No evidence of disturbance was reported.

Global Environment: This vegetation type is associated with generally infertile sites that have been severely altered by logging and fires. It occupies various slope and aspect positions. The type is rarely found on bouldery or rocky sites. Soils vary but are often acidic and low in base status. Deep surficial duff, with small pieces of charred wood or thin charcoal lenses are typical of soils at Virginia sampling sites (Fleming and Moorhead 1996).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This successional Central Appalachian mesophytic hardwood forest is codominated by *Betula lenta* and *Acer rubrum* in the canopy and shrub layers. *Nyssa sylvatica* may also be common. Shrub associates include *Kalmia latifolia, Gaylussacia frondosa, Rhus glabra*, and *Vaccinium pallidum*. *Lycopodium* spp., *Dennstaedtia punctilobula*, and *Polypodium virginianum* may be found in the ground layer.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy is made up of successional even-aged *Betula lenta* and *Acer rubrum*. Shrubs are sparse. Dense *Lycopodium* sp. or *Dennstaedtia punctilobula* form the ground cover. *Polytrichum juniperinum* is an abundant moss.

Global Vegetation: Stands are floristically depauperate and characterized by even-aged, nearly pure *Betula lenta, Acer rubrum*, or mixtures of the two. Associated species vary somewhat with geography and include *Betula alleghaniensis, Fraxinus americana, Fagus grandifolia, Prunus serotina, Quercus rubra, Quercus alba, Quercus velutina, Populus tremuloides, Populus grandidentata*, and/or *Robinia pseudoacacia*. *Magnolia acuminata* and *Magnolia fraseri* are sometimes associates in the southern portion of the range. The subcanopy, when developed, consists mainly of *Fagus grandifolia*. *Tsuga canadensis* forms a scattered canopy or understory in some stands. *Ilex montana* is a characteristic shrub in the southern portion of the type's range, and *Lindera benzoin* is typical elsewhere. Shrub associates include *Kalmia latifolia, Acer pensylvanicum, Amelanchier arborea, Viburnum prunifolium, Fagus* sprouts, *Rhododendron calendulaceum, Rhododendron periclymenoides*, and *Rhododendron*

maximum. Herb layers may be dominated by dense and extensive colonies of *Lycopodium annotinum*, often in association with *Lycopodium dendroideum, Lycopodium clavatum*, and/or *Lycopodium digitatum*, or by *Dennstaedtia punctilobula*. Herbaceous associates include *Thelypteris noveboracensis, Polystichum acrostichoides, Carex swanii, Dryopteris intermedia, Smilax rotundifolia, Medeola virginiana, Maianthemum canadense, Monotropa uniflora*, and *Oclemena acuminata (= Aster acuminatus)*. Mean species richness of plot-sampled stands in Virginia is 15 taxa per 400 m2.

Global Dynamics: This community occurs on infertile sites that have been severely altered by disturbance including but not limited to logging and fires.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tree canopy	Broad-leaved deciduous tree	*Betula lenta*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Polypodium virginianum*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tree canopy	Broad-leaved deciduous tree	*Betula lenta*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Polypodium virginianum*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tree canopy	Broad-leaved deciduous tree	*Betula lenta*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area):
Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Betula lenta*, *Dennstaedtia punctilobula*
Global: *Acer rubrum*, *Betula lenta*, *Dennstaedtia punctilobula*, *Lycopodium annotinum*, *Lycopodium clavatum*, *Lycopodium dendroideum*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Carex arctata* (G5, VA state-rare), *Pyrola elliptica* (G5, VA state-rare), *Schizachne purpurascens* (G5, VA state-rare), *Trillium simile* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (21-Jun-2001). This association appears to be an early-successional but persistent vegetation type resulting from major anthropogenic disturbances. It has some significance for conservation in Virginia, however, since its successional development most likely will result in one of the state-rare community types that are confined in Virginia to Allegheny Mountain. For conservation planning in Virginia it is best considered a low-quality occurrence of *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088) or *Picea rubens / Betula alleghaniensis / Bazzania trilobata* Forest (CEGL008501).

RELATED CONCEPTS

Global Similar Types:

- *Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest (CEGL006506) occupies similar mid-successional settings but is generally more northern (*Betula papyrifera* more typical than *Betula lenta*)and contains a component of white pine.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This successional mesophytic hardwood community occurs primarily in the High Allegheny Mountains and Allegheny Plateau and is most common along the AT corridor in Pennsylvania. It is common in West Virginia because so much of the state is in the High Alleghenies. In Virginia, it is uncommon.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This successional Central Appalachian northern hardwood forest extends just into the Lower New England project area at Delaware Water Gap and West Mountain Bear Mountain State Park in New York.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Because of the consistent dominance of *Betula lenta* and/or *Acer rubrum* and locally dense *Lycopodium* or *Dennstaedtia punctilobula* ground cover, this community type is readily identifiable in the field. *Lycopodium* spp. as well as *Dennstaedtia punctilobula* are specialized colonizers of moist, sterile, exposed mineral soils, which were plentiful in these habitats after the burning off of the original forest humus. Current stand composition suggests that the likely successors to this association in Virginia are *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088) or *Picea rubens / Betula alleghaniensis / Bazzania trilobata* Forest (CEGL008501). However, potentially devastating impacts of beech bark disease and hemlock woolly adelgid on Allegheny Mountain could alter some of the present successional trends (Fleming and Moorhead 1996).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: The distribution of this community is centered in the High Allegheny Mountains and Allegheny Plateau but extends north to New York, New Jersey and Pennsylvania; it is common in West Virginia, less common in Virginia. It was sampled in Cumberland, Dauphin, and Lehigh counties in Pennsylvania in the Central Appalachian project area.
Appalachian National Scenic Trail (Lower New England Project Area) Range: The distribution is centered in the Central Appalachians but extends north to New York, New Jersey and Pennsylvania. It was sampled at West Mountain Bear Mountain State Park in New York.
Global Range: This community has been documented from the Central Appalachians in Virginia and West Virginia, north to New York, Pennsylvania and New Jersey. Its range may extend further in the northeastern United States.
Nations: US
States/Provinces: MD?, NJ, NY, PA:S5, VA, WV?
TNC Ecoregions: 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Bd:CCC, M221Ba:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Delaware Water Gap, Upper Delaware); USFS (George Washington, Monongahela); USFWS (Great Swamp)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXCH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (4 observation points; 12 accuracy assessment points): APPA.1207, APPA.1219, APPA.1288, APPA.1297, APPA_AA_0088, APPA_AA_0233, APPA_AA_0265, APPA_AA_0320, APPA_AA_0574, APPA_AA_0603, APPA_AA_0853, APPA_AA_0928, APPA_AA_0987, APPA_AA_0998, APPA_AA_1050, APPA_AA_1204.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 observation point; 4 accuracy assessment points): APPA.1395, APPA_AA_2450, APPA_AA_2731, APPA_AA_2844, APPA_AA_3321.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and S.C. Gawler
References: Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 1996, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Perles et al. 2007, Perles et al. 2008

[CEGL006303] *Populus (tremuloides, grandidentata) - Betula (populifolia, papyrifera)* Ruderal Woodland

Translated Name: **(Quaking Aspen, Bigtooth Aspen) - (Gray Birch, Paper Birch) Ruderal Woodland**
Common Name: **Ruderal Aspen - Birch Woodland**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Acer rubrum - Prunus serotina - Pinus strobus* Ruderal Forest Alliance (A3229)

Element Concept

Global Summary: This is a common successional deciduous woodland/forest of the northern Appalachian Mountains, from New England, New York and adjacent Canada across to the northern Great Lakes. Small patches of this type are found on the Coastal Plain but are dominated by one or more of the following: *Populus tremuloides, Populus grandidentata* or the non-native *Populus alba*, and *Betula populifolia*. It occurs in various settings, often over thin glacial till. Elevation and aspect vary. The community is broadly defined and includes vegetation developing after severe disturbance such as logging, fires, severe hurricanes, or simply heavily fragmented residential development. This community can occur as closed-canopy forest or open woodland; in a few very exposed areas, it has been seen to grade to shrubland. Understory shrub cover varies from sparse to well-developed depending primarily on canopy closure. Herbs are typically sparse but may be locally dense. Bryoids are typically minor. The tree canopy is a heterogeneous mixture of light-requiring, wind-dispersed trees usually composed of several codominant species, including *Populus tremuloides, Populus grandidentata, Betula papyrifera, Betula populifolia, Populus balsamifera, Acer rubrum, Prunus serotina*, and/or *Prunus pensylvanica*. More minor components can include *Pinus strobus, Picea rubens, Abies balsamea, Acer saccharum, Quercus rubra, Fraxinus americana, Fraxinus pennsylvanica*, or *Ulmus americana* in the northern portions of the range. Scattered individuals of *Juniperus virginiana* may occur in southern examples of this community. The shrub layer can include *Viburnum dentatum, Lonicera morrowii, Frangula alnus (= Rhamnus frangula), Rhus typhina, Rhus copallinum, Morella pensylvanica, Rubus* spp., and/or *Viburnum dentatum*, in the southern portion of the range, or *Sorbus americana, Acer pensylvanicum, Viburnum nudum var. cassinoides*, or *Hamamelis virginiana*. *Vaccinium angustifolium, Kalmia angustifolia, Gaylussacia baccata*, and *Comptonia peregrina* may form a dwarf-shrub layer in the northern portion of the range. Associated herbs to the north typically include *Pteridium aquilinum, Deschampsia flexuosa, Festuca trachyphylla (= Festuca ovina), Cornus canadensis, Doellingeria umbellata (= Aster umbellatus), Eurybia macrophylla (= Aster macrophyllus), Danthonia spicata, Carex lucorum* and related species, and *Maianthemum canadense*. Typical bryoids include *Polytrichum commune, Polytrichum juniperinum, Dicranum* spp., and *Cladonia* spp. Herbs in southern examples of this community are typically old-field grasses and *Solidago* spp. In the absence of major disturbance, these forests mostly succeed to northern hardwood, spruce-fir, mixed northern hardwood-spruce-fir, or red oak - northern hardwood forests in the northern portion of the range.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This early-successional aspen - birch woodland was sampled on sites that range from gentle to somewhat steep, mostly south- and north-facing slopes with mesic to dry-mesic moderately well- to well-drained sandy loam, loam and silt loam soils. The unvegetated surface consists of leaf litter, with lesser amounts of downed wood and bare soil. Evidence of disturbance includes a minor presence of exotic plants and tornado blowdowns (in Massachusetts).
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is known from 300 to 900 m (985-2,950 feet) in elevation occurring on low to midslopes. Slopes are flat to moderate and occur on all aspects. Soils are moderately well-drained to well-drained mesic sandy loams.
Global Environment: It occurs in various settings, often over thin glacial till. Elevation and aspect vary. The community is broadly defined, and includes vegetation developing after severe disturbance such as logging, fires, severe hurricanes, or simply heavily fragmented residential development.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This successional northern hardwood community ranges from closed-canopy forest to open woodland. It is dominated by some combination of *Populus tremuloides, Populus grandidentata, Populus alba, Betula papyrifera*, and/or *Betula populifolia*; *Populus balsamifera, Acer rubrum, Prunus serotina, Acer saccharum*, and/or *Prunus pensylvanica* may also be common.

The shrub layer can be sparse or include *Lonicera morrowii, Frangula alnus, Rubus* spp., and/or *Viburnum dentatum*. Old-field grasses and forbs are common in herb layer as are herbs typical of northern hardwood forests, such as *Dryopteris intermedia, Maianthemum canadense, Trientalis borealis*, and *Polygonatum pubescens*.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by forest to woodland vegetation with highly variable canopies dominated by early-successional hardwood species, including *Acer rubrum, Betula papyrifera, Populus grandidentata*, and *Populus tremuloides*. Numerous other canopy associates may occur and a well-developed subcanopy is common. Canopy associates may include *Betula alleghaniensis, Acer saccharum, Betula lenta, Fagus grandifolia, Fraxinus americana, Picea rubens*, and *Prunus serotina*. The shrub layer is often characterized by a dense layer of tree saplings of species occurring in the canopy. Typical shrub species include *Corylus cornuta, Hamamelis virginiana, Prunus virginiana*, and *Viburnum lantanoides*. The herbaceous layer is typically dominated by fern species, including *Athyrium filix-femina, Dryopteris intermedia*, and *Dennstaedtia punctilobula*, although numerous forbs and graminoids may occur.
Global Vegetation: This community can occur as closed-canopy forest or open woodland; in a few very exposed areas, it has been seen to grade to shrubland. Understory shrub cover varies from sparse to well-developed depending primarily on canopy closure. Herbs are typically sparse, but may be locally dense. Bryoids are typically minor. The tree canopy is a heterogeneous mixture of light-requiring, wind-dispersed trees usually composed of several codominant species including *Populus tremuloides, Populus grandidentata, Betula papyrifera, Betula populifolia, Populus balsamifera, Acer rubrum, Prunus serotina*, and/or *Prunus pensylvanica*. More minor components can include *Pinus strobus, Picea rubens, Abies balsamea, Acer saccharum, Quercus rubra, Fraxinus americana, Fraxinus pennsylvanica*, or *Ulmus americana*. The shrub layer in the northern portion of the range includes *Sorbus americana, Acer pensylvanicum, Viburnum nudum var. cassinoides*, or *Hamamelis virginiana*. *Vaccinium angustifolium, Kalmia angustifolia, Gaylussacia baccata*, and *Comptonia peregrina* may form a dwarf-shrub layer. Associated herbs to the north typically include *Pteridium aquilinum, Deschampsia flexuosa, Festuca trachyphylla (= Festuca ovina), Cornus canadensis, Doellingeria umbellata (= Aster umbellatus), Eurybia macrophylla (= Aster macrophyllus), Danthonia spicata, Carex lucorum* and related species, and *Maianthemum canadense*. Typical bryoids include *Polytrichum commune, Polytrichum juniperinum, Dicranum* spp., and *Cladonia* spp. Herbs in southern examples of this community are typically old-field grasses and *Solidago* spp. Small patches of this type are found on the Coastal Plain but are dominated by one or more of the following: *Populus tremuloides, Populus grandidentata*, or the non-native *Populus alba*, and *Betula populifolia* (usually not *Betula lenta* or *Betula alleghaniensis*).
Global Dynamics: In the absence of major disturbance, these forests mostly succeed to northern hardwood, spruce-fir, mixed northern hardwood-spruce-fir, or red oak - northern hardwood forests.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula papyrifera*, *Populus tremuloides*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Acer saccharum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Herb (field)	Flowering forb	*Maianthemum canadense*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula papyrifera*, *Betula populifolia*, *Populus grandidentata*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*, *Prunus virginiana*, *Viburnum lantanoides*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Corylus cornuta*
Herb (field)	Fern (Spore-bearing forb)	*Athyrium filix-femina*, *Dennstaedtia punctilobula*, *Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula papyrifera*, *Betula populifolia*, *Populus grandidentata*, *Populus tremuloides*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Viburnum dentatum*, *Viburnum nudum* var. *cassinoides*
Herb (field)	Graminoid	*Deschampsia flexuosa*, *Festuca trachyphylla*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Betula papyrifera*, *Populus tremuloides*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Betula papyrifera*, *Betula populifolia*, *Populus grandidentata*
Global: *Betula populifolia*, *Populus grandidentata*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Lonicera morrowii* (High/Medium)
Global: Invasive/Exotic Plants: *Festuca trachyphylla* (Medium/Insignificant); **Other Plants**: *Solidago rugosa* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (18-Feb-2015).

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community can occur as closed-canopy forest or open woodland; in a few very exposed areas, it has been seen to grade to shrubland. One example at Warner Hill in Massachusetts consists of an open *Prunus serotina, Betula populifolia*, and *Betula papyrifera* canopy (5% total cover) over a *Dennstaedtia punctilobula* herbaceous layer.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: This community can succeed into a number of northern hardwood community associations, including but not limited to Semi-rich Northern Hardwood Forest (CEGL006211) and Northern Hardwood Forest (CEGL006252).
Global Classification Comments: Given the recent use of this community outside of the spruce-fir zone, the concept used at Acadia National Park was broadened to include all of the Northeast stands dominated by *Populus (tremuloides, grandidentata) - Betula (populifolia, papyrifera)* regardless of the spruce-fir component.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Beartown State Forest, Warner Hill and Mount Williams Reservoir in Massachusetts, and in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from Carter Notch and Rattle River in New Hampshire and Saddleback Mountain, Jones Pond and Joe's Hole in Maine.
Global Range: This is a common successional deciduous woodland/forest of the northern Appalachian Mountains, from New England, New York and adjacent Canada across to the northern Great Lakes. Small patches of this type are found on the Coastal Plain.
Nations: CA, US
States/Provinces: MA, ME:S5, NB, NH, NJ, NY, QC, VT
TNC Ecoregions: 48:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212A:CP, 212Bb:CCC, 212Ca:CCP, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 212Fb:CPP, 221Ae:CCC, 221Bc:CCC, 222Ib:CCC, 222O:CP, 232Aa:CCC, 232Ac:CCC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ae:CCC, M212Af:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Boston Harbor Islands, Gateway, Saratoga); USFS (Finger Lakes); USFWS (Aroostook, Assabet River, Carlton Pond?, Iroquois, Moosehorn, Nulhegan Basin, Rachel Carson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXNH
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (5 observation points; 5 accuracy assessment points): APPA.1455, APPA.1456, APPA.1457, APPA.1503, APPA.1561, APPA_AA_1648, APPA_AA_2034, APPA_AA_2336, APPA_AA_2388, APPA_AA_3249.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 4 observation points; 19 accuracy assessment points): APPA.0469, APPA.1603, APPA.1629, APPA.1643, APPA.1777, APPA.1778, APPA_AA_1655, APPA_AA_1694, APPA_AA_1738, APPA_AA_1803, APPA_AA_1950, APPA_AA_1964, APPA_AA_2008, APPA_AA_2011, APPA_AA_2050, APPA_AA_2095, APPA_AA_2402, APPA_AA_2453, APPA_AA_2458, APPA_AA_2561, APPA_AA_2569, APPA_AA_2626, APPA_AA_2693, APPA_AA_3107, APPA_AA_3193.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M. E. Hall
Global Description Author(s): S.C. Gawler and E. Largay
References: Bridges 1976, CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Edinger et al. 2008a, Gawler 2002, Gawler and Cutko 2010, Largay and Sneddon 2010, Lubinski et al. 2003, NRCS 2001b, NRCS 2004a, Rawinski 1984a, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Walz et al. 2008

[CEGL006599] *Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana - (Robinia pseudoacacia)* Ruderal Forest

Translated Name: **Black Cherry - Tuliptree - Red Maple - White Ash - (Black Locust) Ruderal Forest**
Common Name: **Northeastern Ruderal Hardwood Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Acer rubrum - Prunus serotina - Pinus strobus* Ruderal Forest Alliance (A3229)

ELEMENT CONCEPT

Global Summary: This early-successional woody vegetation of the northeastern United States occurs on sites that are becoming reforested after having been cleared for agriculture or otherwise heavily modified in the past. Environmental setting varies, but generally sites are dry-mesic to mesic, with small seepage inclusions in some examples. Physiognomy of this vegetation is highly variable, ranging from closed forest, open forest, tall dense shrubland, to more open tall shrubland. Early-successional woody species dominate the canopy in a widely variable mix, depending on geographic location. In the Central Appalachians and Mid-Atlantic Piedmont, many stands represent decadent forests that were once dominated by *Robinia pseudoacacia* but are now mixed with various mid-successional hardwoods; other stands in this region regenerated as mixed stands. Tree species often include some combination of *Prunus serotina, Liriodendron tulipifera, Fraxinus americana, Robinia pseudoacacia*, and *Acer rubrum*. Other associates can include *Juglans nigra, Sassafras albidum, Betula populifolia, Juniperus virginiana, Acer negundo, Acer saccharinum, Ailanthus altissima, Ulmus americana, Quercus* spp., *Betula lenta, Amelanchier* spp., *Pinus strobus*, and *Populus grandidentata*. Other woody species may contribute to the canopy or form a tall-shrub layer, including *Lindera benzoin* and *Carpinus caroliniana*. The low-shrub layer, if present, is usually characterized by the presence of *Rubus* spp. such as *Rubus flagellaris, Rubus allegheniensis, Rubus phoenicolasius*, or *Rubus hispidus*. This layer is often dominated by exotic species such as *Lonicera tatarica, Lonicera morrowii, Rhamnus cathartica, Crataegus* spp., *Rosa multiflora*, and *Berberis thunbergii*. The herbaceous layer is variable, often containing grasses and forbs of both native and exotic origin. Common species include *Ageratina altissima var. altissima, Polygonum persicaria, Impatiens capensis, Glechoma hederacea, Polystichum acrostichoides, Calystegia sepium ssp. sepium, Galium aparine, Oxalis stricta, Polygonum virginianum, Dennstaedtia punctilobula, Arisaema triphyllum, Allium vineale*, and *Veronica officinalis*, among many others. The invasive species *Alliaria petiolata, Microstegium vimineum*, and *Polygonum caespitosum* can be abundant in this disturbed forest type. Vines can be absent or abundant. In stands with high vine cover, the vegetation structure can be altered by the weight of the vines pulling down trees and shrubs. Common vines include *Parthenocissus quinquefolia, Toxicodendron radicans, Vitis labrusca*, and the invasive vines *Celastrus orbiculata* and *Lonicera japonica*. These forests are often

young and resulted from the colonization of old agricultural fields by woody species. Recent disturbance or abundant invasive species give these forest stands a weedy character. It is unlikely that these stands will succeed to a natural plant community dominated by native species.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This common, variable, disturbed forest of the Northeast is typically an upland forest but can occur in floodplains and wet settings. It was sampled at 14 locations in the Central Appalachian project area. Sites range from flat to somewhat steep, lower and upper slopes with variable aspects. Soils vary from dry to mesic, rapidly to moderately well-drained silt loam, loam, silty clay, and clay loam. The unvegetated surface may be dominated by leaf litter or can consist of a mix of large and small rocks, downed wood and/or bare soil. Evidence of disturbance includes past logging/clearing, agriculture, grazing, and the abundance of exotic plant species.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This common, variable, disturbed forest of the Northeast is typically an upland forest, but can occur in wet settings such as floodplains and seasonally or temporarily flooded lowlands. Sites range from flat to somewhat steep mid and upper slopes with mostly eastern aspects. Soils are generally dry-mesic and include moderately well- to well-drained loam and sandy loam but can also be poorly drained in flat areas. The unvegetated surface consists of leaf litter, with lesser amounts of large/small rocks, bare soil, and/or downed wood. Evidence of disturbance includes a heavy presence of exotic plants.

Global Environment: This vegetation occurs on sites that have been cleared for agriculture or otherwise heavily modified in the past. Generally sites are dry-mesic and may have small seepage inclusions in some examples. Occasionally this type may occur in formerly agricultural bottomlands, in which case the soils may be temporarily flooded or saturated.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: These anthropogenically-disturbed stands are a variable mixture of young, even-aged hardwoods, especially *Robinia pseudoacacia, Sassafras albidum, Fraxinus americana, Prunus serotina, Liriodendron tulipifera, Acer rubrum, Celtis occidentalis, Juglans nigra, Morus alba, Prunus avium*, and/or *Ailanthus altissima*, any one of which can dominate over small areas. The understory is heavily invaded by exotics *Rosa multiflora, Celastrus orbiculata, Ligustrum vulgare, Rubus phoenicolasius, Berberis thunbergii, Elaeagnus umbellata*, and/or *Lonicera japonica*, among others. *Rubus allegheniensis* and *Vitis* spp. are also common. Herbs are sparse to abundant based on canopy closure, environmental setting and disturbance level. Common upland herbs include *Dactylis glomerata, Polygonum persicaria, Microstegium vimineum*, and other ruderal old-field species.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This forest is a variable mixture of young, even-aged native and non-native hardwoods, especially *Robinia pseudoacacia, Sassafras albidum, Fraxinus americana, Prunus serotina, Liriodendron tulipifera, Acer saccharum, Acer rubrum*, and *Ailanthus altissima*, any one of which can dominate over small areas. The understory heavily invaded by exotics *Rosa multiflora, Celastrus orbiculata*, and *Lonicera japonica*. *Ageratina altissima, Potentilla simplex*, and *Solidago rugosa* are common herbs.

Global Vegetation: Early-successional woody species dominate the canopy in a widely variable mix, depending on geographic location. In the Central Appalachians and Mid-Atlantic Piedmont, many stands represent decadent forests that were once dominated by *Robinia pseudoacacia* but are now mixed with various mid-successional hardwoods; other stands in this region regenerated as mixed stands. Tree species often include some combination of *Prunus serotina, Liriodendron tulipifera, Fraxinus americana, Robinia pseudoacacia*, and *Acer rubrum*. Other associates can include *Juglans nigra, Sassafras albidum, Betula populifolia, Juniperus virginiana, Acer negundo, Acer saccharinum, Ailanthus altissima, Ulmus americana, Quercus* spp., *Betula lenta, Amelanchier* spp., *Pinus strobus*, and *Populus grandidentata*. Other woody species may contribute to the canopy or form a tall-shrub layer, including *Lindera benzoin* and *Carpinus caroliniana*. The low-shrub layer, if present, is usually characterized by the presence of *Rubus* spp. such as *Rubus flagellaris, Rubus allegheniensis, Rubus phoenicolasius*, or *Rubus hispidus*. This layer is often dominated by exotic species such as *Lonicera tatarica, Lonicera morrowii, Rhamnus cathartica, Crataegus* spp., *Rosa multiflora*, and *Berberis thunbergii*. The herbaceous layer is variable, often containing grasses and forbs of both native and exotic origin. Common species include *Ageratina altissima var. altissima, Polygonum persicaria, Impatiens capensis, Glechoma hederacea, Polystichum acrostichoides, Calystegia sepium ssp. sepium, Galium aparine, Oxalis stricta, Polygonum virginianum, Dennstaedtia punctilobula, Arisaema triphyllum, Allium vineale*, and *Veronica officinalis*, among many others. The invasive species *Alliaria petiolata, Microstegium vimineum*, and *Polygonum caespitosum* can be abundant in this disturbed forest type. Vines can be absent or

abundant. In stands with high vine cover, the vegetation structure can be altered by the weight of the vines pulling down trees and shrubs. Common vines include *Parthenocissus quinquefolia, Toxicodendron radicans, Vitis labrusca*, and the invasive vines *Celastrus orbiculata* and *Lonicera japonica*.

Global Dynamics: These forests are often young and resulted from the colonization of old agricultural fields by woody species. Recent disturbance or abundant invasive species give these forest stands a weedy character. It is unlikely that these stands will succeed to a natural plant community dominated by native species.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Fraxinus americana*, *Liriodendron tulipifera*, *Prunus serotina*, *Robinia pseudoacacia*
Tall shrub/sapling	Liana	*Rosa multiflora*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Fraxinus americana*, *Prunus serotina*
Tall shrub/sapling	Liana	*Rosa multiflora*
Short shrub/sapling	Broad-leaved deciduous shrub	*Lonicera morrowii*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*, *Liriodendron tulipifera*, *Prunus serotina*, *Robinia pseudoacacia*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*, *Rosa multiflora*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus* spp.
Herb (field)	Flowering forb	*Alliaria petiolata*, *Polygonum persicaria*
Herb (field)	Graminoid	*Microstegium vimineum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Fraxinus americana*, *Microstegium vimineum*, *Prunus serotina*, *Robinia pseudoacacia*, *Rosa multiflora*, *Rubus allegheniensis*

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Fraxinus americana*, *Lonicera morrowii*, *Prunus serotina*, *Rosa multiflora*

Global: *Acer rubrum*, *Alliaria petiolata*, *Berberis thunbergii*, *Elaeagnus umbellata*, *Fraxinus americana*, *Juglans nigra*, *Liriodendron tulipifera*, *Microstegium vimineum*, *Polygonum persicaria*, *Prunus serotina*, *Robinia pseudoacacia*, *Rosa multiflora*, *Rubus allegheniensis*, *Rubus* spp.

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Ailanthus altissima* (Medium, invasive/exotic), *Alliaria petiolata* (High/Medium, invasive/exotic), *Berberis thunbergii* (High/Medium, invasive/exotic), *Celastrus orbiculata* (High/Medium, invasive/exotic), *Dactylis glomerata* (Medium/Insignificant, invasive/exotic), *Duchesnea indica* (Low/Insignificant, invasive/exotic), *Elaeagnus umbellata* (High, invasive/exotic), *Ligustrum sinense* (High/Medium, invasive/exotic), *Lonicera japonica* (High/Medium, invasive/exotic), *Lonicera morrowii* (High/Medium, invasive/exotic), *Microstegium vimineum* (High/Medium, invasive/exotic), *Morus alba* (High/Medium, invasive/exotic), *Polygonum perfoliatum* (Medium, invasive/exotic), *Polygonum persicaria* (invasive/exotic), *Prunus avium* (High/Low, invasive/exotic), *Rosa multiflora* (Medium/Low, invasive/exotic), *Rubus phoenicolasius* (Medium, invasive/exotic)

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Barbarea vulgaris* (Low/Insignificant), *Berberis thunbergii* (High/Medium), *Elaeagnus umbellata* (High), *Hesperis matronalis* (Medium/Low), *Lonicera morrowii* (High/Medium), *Microstegium vimineum* (High/Medium), *Rhamnus cathartica* (High/Medium), *Rosa multiflora* (Medium/Low)

Global: Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Elaeagnus umbellata* (High), *Lonicera morrowii* (High/Medium), *Lonicera tatarica* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum caespitosum*, *Polygonum persicaria*, *Rhamnus cathartica* (High/Medium), *Rosa multiflora* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (29-Nov-2004). This vegetation is modified by human activity and not of conservation concern.

RELATED CONCEPTS

Global Similar Types:

- *Juglans nigra / Verbesina alternifolia* Ruderal Forest (CEGL007879)
- *Liriodendron tulipifera - Quercus* spp. Ruderal Forest (CEGL007221) is more strongly dominated by *Liriodendron* and is generally in a later successional state as evidenced by taller trees and more closed canopy.
- *Prunus serotina - Sassafras albidum - (Fraxinus americana) / Juniperus virginiana* Ruderal Forest (CEGL004133)
- *Robinia pseudoacacia* Ruderal Forest (CEGL007279)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This forest represents successional vegetation and is thus not of high conservation concern.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: This community should be a high-priority target for forest restoration efforts.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This forest represents successional and often heavily invaded vegetation and is thus not of high conservation concern. Many examples lack *Liriodendron tulipifera* and/or other nominals.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This vegetation is broadly defined and varies widely in composition across its range, presenting a classification challenge at the alliance level. The northern end of its range occurs where *Liriodendron tulipifera* drops out.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled in Pennsylvania (including between Rauch Gap and Swatara Gap) and Virginia (Angels Rest, Front Royal, Shenandoah National Park). It is especially common along the trail near parking lots and other heavily used and impacted areas.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut at Housatonic River Bottom and Mt. Prospect; at Unionville East and Unionville West in New Jersey; and at Bellvale Mountain South in New York.
Global Range: This vegetation is currently described from Pennsylvania, New York, and New Jersey but is of broader distribution in the northeastern U.S.
Nations: US
States/Provinces: CT, DE, IN, MA, MD, NJ, NY, PA, VA, WV
TNC Ecoregions: 48:C, 49:C, 52:?, 58:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fc:CCC, 212G:C?, 221Aa:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Dc:CCC, 221Fa:CCC, 222Ic:CCC, 222Jj:CCC, 231A:??, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232B:C?, 232C:C?, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212E:C?, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Da:CCC
Federal Lands: NPS (Allegheny Portage Railroad, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Boston Harbor Islands, C&O Canal, Catoctin Mountain, Delaware Water Gap, Fort Necessity, Friendship Hill, Gateway, George Washington Parkway, Gettysburg, Harpers Ferry, Indiana Dunes, Johnstown Flood, Manassas, Morristown, National Capital-East, Prince William, Sagamore Hill, Saratoga, Saugus Iron Works, Shenandoah, Upper Delaware, Valley Forge, Weir Farm, Wolf Trap); USFS (Monongahela); USFWS (Cape May, E.B. Forsythe, Erie, Great Meadows?, Montezuma, Patuxent, Prime Hook, Supawna Meadows)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXCH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 12 observation points; 16 accuracy assessment points): APPA.0229, APPA.1154, APPA.1160, APPA.1289, APPA.1290, APPA.1291, APPA.1292, APPA.1293, APPA.1294, APPA.1295, APPA.1298, APPA.1313, APPA.1317, APPA_AA_0012, APPA_AA_0032, APPA_AA_0113, APPA_AA_0425, APPA_AA_0705, APPA_AA_0763, APPA_AA_0876, APPA_AA_1030, APPA_AA_1046, APPA_AA_1155, APPA_AA_1278, APPA_AA_1382, APPA_AA_1450, APPA_AA_1477, APPA_AA_1541, APPA_AA_1579.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 6 observation points; 19 accuracy assessment points): APPA.0916, APPA.1362, APPA.1363, APPA.1365, APPA.1383, APPA.1423, APPA.1450, APPA_AA_1697, APPA_AA_1728, APPA_AA_1831, APPA_AA_2137, APPA_AA_2169, APPA_AA_2256, APPA_AA_2274, APPA_AA_2451, APPA_AA_2462, APPA_AA_2557, APPA_AA_2834, APPA_AA_2955, APPA_AA_2996, APPA_AA_3070, APPA_AA_3116, APPA_AA_3133, APPA_AA_3136, APPA_AA_3173, APPA_AA_3199.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): L.A. Sneddon, S.C. Gawler, E. Largay and G.P. Fleming
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Edinger et al. 2008a, Edinger et al. 2008b, Ehrenfeld 1977, Fike 1999, Fleming and Patterson 2011a, Fleming et al. 2006, Hop et al. 2009, Largay and Sneddon 2008, Largay and Sneddon 2010, Metzler et al. 2009, NRCS 2001b, NRCS 2004a, NatureServe 2009, Perles et al. 2006a, Perles et al. 2006b, Perles et al. 2006c, Perles et al. 2006d, Perles et al. 2006e, Perles et al. 2007, Perles et al. 2008, Podniesinski et al. 2005b, Sneddon et al. 2008, Soil Conservation Service 1987, Walz et al. 2008, Young et al. 2009

[CEGL006506] *Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest

Translated Name: **Northern Red Oak - Red Maple - Birch species - Eastern White Pine Ruderal Forest**
Common Name: **Northeastern Ruderal Oak - Red Maple Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Acer rubrum - Prunus serotina - Pinus strobus* Ruderal Forest Alliance (A3229)

ELEMENT CONCEPT

Global Summary: This deciduous to mixed forest of northern New England is a broadly defined community, usually developing after severe disturbance, including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development. While in some cases it is a successional type, it may persist in some settings, particularly where soils are limited, for example along ridgelines. The canopy trees are mostly 40-100 years old. The canopy ranges from somewhat open to closed; the shrub, herb and bryoid layers are patchy and rarely extensive. Composition is variable depending on site history. The canopy is usually mostly deciduous, dominated by a heterogeneous mixture of *Quercus rubra, Acer rubrum, Pinus strobus*, and *Fagus grandifolia*. Typically these occur in association with light-requiring, wind-dispersed trees such as *Populus tremuloides, Populus grandidentata, Betula papyrifera, Betula populifolia, Fraxinus americana*, and *Prunus serotina*. Minor associates include *Picea rubens* and *Acer saccharum*. Understory species tend to reflect predisturbance conditions and include *Acer pensylvanicum, Corylus cornuta, Viburnum acerifolium*, or *Hamamelis virginiana* in the shrub layer. *Vaccinium angustifolium* is a typical low shrub, although it does not form a coherent layer. *Pteridium aquilinum* is characteristic and may be abundant in the herbaceous layer; other common herbs include *Trientalis borealis, Maianthemum canadense, Deschampsia flexuosa*, and *Aralia nudicaulis*. The bryophyte layer is of variable cover and may include *Polytrichum commune* and *Dicranum polysetum*. This association is differentiated from similar forests and woodlands by its thin canopy that usually includes early-successional species, particularly *Acer rubrum*, low abundance of tolerant hardwoods other than red oak, and the lack of a well-developed heath shrub layer (as is typical in oak-pine woodlands). Unlike oak and oak-pine forests to the south, *Quercus rubra* is the only oak species present in any abundance.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This successional oak - red maple forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development. It is widespread throughout northern and central New England. Sites are mesic moderate low and midslopes with southern and western aspects. Soils are well-drained sand, sandy loam and loam. The unvegetated surface consists of leaf litter, with small amounts of large rocks and downed wood. Evidence of disturbance includes past logging and recent and past fire. Despite being a disturbance community, exotic plants were reported.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is known from one location at 530 m (1,740 feet) in elevation on a moderately steep high slope with a southern aspect. Soils is a rapidly drained sandy loam with a well-developed layer of litter and duff.

Global Environment: This deciduous to mixed forest of northern New England is a broadly defined community, usually developing after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development. While in some cases it is a successional type, it may persist in some settings, particularly where soils are limited, for example along ridgelines.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This early- to mid-successional forest has variable canopy composition depending on site history. *Quercus rubra, Acer rubrum, Pinus strobus* (often emergent), and *Fagus grandifolia* occur in association with light-requiring, wind-dispersed trees such as *Populus tremuloides, Populus grandidentata, Betula populifolia, Fraxinus americana*, and *Prunus serotina*. *Betula papyrifera* and *Picea rubens* are occasional minor associates in northern examples. Shrubs are sparse. *Dennstaedtia punctilobula* is the dominant herb, and *Mitchella repens* is characteristic.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only known stand of this association has a canopy strongly dominated by *Quercus rubra*. *Pinus strobus* and *Picea rubens* are present in the canopy and subcanopy, but at low cover. The shrub layer is strongly dominated by the heath *Vaccinium angustifolium*. The herbaceous layer is dominated by the lawn-forming sedge *Carex lucorum*. Other herbaceous species present include *Botrychium dissectum, Brachyelytrum erectum, Carex debilis, Carex swanii, Deschampsia flexuosa*, and *Uvularia sessilifolia*.

Global Vegetation: Canopy trees are mostly 40-100 years old. The canopy ranges from somewhat open to closed; the shrub, herb, and bryoid layers are patchy and rarely extensive. Composition is variable depending on site history. The canopy is usually mostly deciduous, dominated by a heterogeneous mixture of *Quercus rubra, Pinus strobus*, and *Fagus grandifolia*. Typically these occur in association with light-requiring, wind-dispersed trees such as *Acer rubrum, Populus tremuloides, Populus grandidentata, Betula papyrifera, Betula populifolia, Fraxinus americana*, and *Prunus serotina*. Minor associates include *Picea rubens* and *Acer saccharum*. Understory species tend to reflect predisturbance conditions and include *Acer pensylvanicum, Corylus cornuta, Viburnum acerifolium*, or *Hamamelis virginiana* in the shrub layer. *Vaccinium angustifolium* is a typical low shrub. *Pteridium aquilinum* is characteristic, and may be abundant, in the herbaceous layer; other common herbs include *Trientalis borealis, Maianthemum canadense, Deschampsia flexuosa*, and *Aralia nudicaulis*. The bryophyte layer is of variable cover and may include *Polytrichum commune* and *Dicranum polysetum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tree canopy	Broad-leaved deciduous tree	*Betula papyrifera*, *Prunus serotina*
Tree subcanopy	Broad-leaved deciduous tree	*Fagus grandifolia*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*
Emergent tree	Needle-leaved tree	*Pinus strobus*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium angustifolium*
Herb (field)	Graminoid	*Carex lucorum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Fagus grandifolia*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer pensylvanicum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*, *Viburnum acerifolium*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Corylus cornuta*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium angustifolium*
Herb (field)	Fern (Spore-bearing forb)	*Pteridium aquilinum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Betula papyrifera*, *Dennstaedtia punctilobula*, *Fagus grandifolia*, *Mitchella repens*, *Pinus strobus*, *Prunus serotina*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Quercus rubra*, *Vaccinium angustifolium*
Global: *Fagus grandifolia*, *Pinus strobus*, *Pteridium aquilinum*, *Quercus rubra*, *Vaccinium angustifolium*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (14-May-2012).

RELATED CONCEPTS

Global Similar Types:
- *Betula lenta - Acer rubrum / Lycopodium annotinum - Dennstaedtia punctilobula* Ruderal Forest (CEGL008503)
- *Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest (CEGL006293)
- *Quercus (rubra, velutina, alba) - Betula lenta - (Pinus strobus)* Forest (CEGL006454)
- *Quercus rubra - (Quercus prinus) / Vaccinium* spp. / *Deschampsia flexuosa* Woodland (CEGL006134)
- *Quercus rubra - Acer saccharum - Fagus grandifolia / Viburnum acerifolium* Forest (CEGL006633)
- *Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest (CEGL006635)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This association was first described from the Northern Appalachian-Acadian ecoregion, where it approaches a matrix landscape pattern in the southern portions of the region while being absent from areas to the north. Similar forests extend southward. Further work in Lower New England suggests that this type may represent an earlier successional version of *Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest (CEGL006293), and possibly of other later-successional types, distinguished by the preponderance of *Acer rubrum* in the canopy.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Housatonic Valley - Buck Hill in Connecticut; at Dalton Gulf and East Mountain State Forest in Massachusetts; and at Bear Mountain in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Mount Hayes in New Hampshire.
Global Range: This forest occurs in northern and central New England and adjacent Canada, south to Pennsylvania.
Nations: CA, US
States/Provinces: CT, MA, ME, NB, NH, NY, PA, QC, RI, VT
TNC Ecoregions: 60:C, 61:C, 63:C
USFS Ecoregions (1994/95): 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, 212Fc:CCC, 221Ae:CCC, 221Bc:CCC, M212Ag:CCC, M212C:CC

Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Minute Man, Saratoga, Upper Delaware); USFWS (Assabet River, Eastern Massachusetts, Great Meadows, Montezuma, Moosehorn?, Oxbow, Rachel Carson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXOM
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 2 observation points; 17 accuracy assessment points): APPA.0027, APPA.0826, APPA.1428, APPA.1494, APPA_AA_1665, APPA_AA_1669, APPA_AA_1690, APPA_AA_1719, APPA_AA_1747, APPA_AA_1799, APPA_AA_1828, APPA_AA_2069, APPA_AA_2139, APPA_AA_2219, APPA_AA_2288, APPA_AA_2424, APPA_AA_2456, APPA_AA_2525, APPA_AA_2958, APPA_AA_2960, APPA_AA_2984.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 observation points; 7 accuracy assessment points): APPA.1776, APPA.1779, APPA_AA_2030, APPA_AA_2054, APPA_AA_2316, APPA_AA_2412, APPA_AA_2434, APPA_AA_2962, APPA_AA_3190.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Gawler 2002, Gawler and Cutko 2010, Gawler et al. 2005, Küchler 1956, Lubinski et al. 2003, Moore and Taylor 1927, NRCS 2004a, Perles et al. 2008, Sperduto 2000a, Thompson and Jenkins 1992, Thompson and Sorenson 2000

A3227 *Juniperus virginiana - Pinus virginiana - Pinus echinata* Ruderal Forest Alliance

Alliance Summary Description: This semi-natural forest is found in locally disturbed areas, most commonly in old fields and pastures, and cleared land. Three dominance-based suballiances may be recognized: (1) *Juniperus virginiana var. virginiana* stands occur widely and are more common on calcareous sites. Stand may be very dense, and the stature may be rather low. Associated species include *Acer rubrum, Carya alba, Carya ovata, Cercis canadensis, Fraxinus americana*, and *Pinus virginiana*. The midstory is typically sparse, with canopy species, as well as *Cornus florida, Ilex opaca, Liquidambar styraciflua*, and *Prunus serotina var. serotina*. The vegetation may vary in structure from open-canopy woodland (particularly as it invades herbaceous old fields) to dense, closed-canopy forest. (2) A mixed *Juniperus virginiana var. virginiana - Quercus* spp. suballiance represents stands that may be fire-suppressed native stands, and may not be natural in character. Various oaks (including *Quercus coccinea, Quercus phellos, Quercus rubra, Quercus velutina*) are present. (3) *Pinus* spp. (especially *Pinus echinata, Pinus strobus*, and *Pinus virginiana*) stands occur on old fields (often from abandoned farmland), old pastures, clearcuts, and eroded areas. Soils are typically dry, acidic, and infertile. This forest typically has a very dense canopy of *Pinus virginiana* and little understory vegetation. The dense canopy may also include admixtures of other *Pinus* species (e.g., *Pinus taeda, Pinus echinata, Pinus rigida, Pinus strobus*) or other early-successional deciduous trees (e.g., *Acer rubrum, Liquidambar styraciflua, Prunus serotina, Liriodendron tulipifera, Fraxinus americana, Nyssa sylvatica*). Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species. Shrub and herb layers are frequently very sparse. *Lonicera japonica* and *Rosa multiflora* are common. The herb layer is characterized by weedy natives and exotics such as *Lycopodium digitatum, Achillea millefolium var. occidentalis, Hieracium caespitosum*, and *Lespedeza cuneata*.

[CEGL006024] *Juniperus virginiana* Ruderal Forest

Translated Name: **Eastern Red-cedar Ruderal Forest**
Common Name: **Northeastern Ruderal Red-cedar Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Juniperus virginiana - Pinus virginiana - Pinus echinata* Ruderal Forest Alliance (A3227)

ELEMENT CONCEPT

Global Summary: This association is a broadly defined old-field early-successional community occurring in a variety of environmental settings in the northeastern states. Canopy closure and height are variable, as are shrub and herbaceous associates. *Juniperus virginiana* dominates the canopy layer. Common associates, typically occurring as scattered individuals, may include *Pinus strobus, Acer rubrum, Liriodendron tulipifera, Quercus* spp., and *Prunus serotina*. Shrub cover varies, with the most forested stands having little or no shrub cover. Exotic shrubs such as *Elaeagnus umbellata, Lonicera morrowii, Ligustrum vulgare*, and *Rosa multiflora* are characteristic, along with *Rubus* spp. Herbaceous cover likewise varies. Common species in the more open-canopy stands include old-field denizens such as *Schizachyrium scoparium, Festuca rubra, Anthoxanthum odoratum, Agrostis gigantea, Andropogon virginicus, Elymus repens (= Elytrigia repens), Solidago rugosa, Solidago gigantea, Euthamia graminifolia, Monarda fistulosa, Toxicodendron radicans, Achillea millefolium*, and *Daucus carota*. In dense forest stands, herbs may be absent or limited to scattered shade-tolerant species such as *Alliaria petiolata* and *Allium vineale*, and *Dennstaedtia punctilobula*. These forests are often young and result from the colonization of old agricultural fields by *Juniperus virginiana* over native and exotic forbs and grasses. These stands may eventually succeed to other forest types as mid- and late-successional canopy species colonize and subsequently overtop the *Juniperus*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This association is a broadly defined old-field early-successional community occurring in a variety of environmental settings on former agricultural land and other disturbed or degraded environmental settings. Soils are mesic to dry-mesic and moderately well-drained to well-drained.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This early-successional, common community is found throughout the Northeast. It is a broadly defined old-field early-successional community occurring in a variety of environmental settings on former agricultural land and other disturbed or degraded environmental settings. Soils are mesic to dry-mesic and moderately well-drained to well-drained.

Global Environment: This is a broadly defined old-field early-successional community occurring in a variety of environmental settings, typically on former agricultural land and other disturbed or degraded environmental settings. Soils are mesic to dry-mesic and moderately well-drained to well-drained.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Juniperus virginiana* is the sole dominant in these shrublands. Canopy closure and height are variable, as are shrub and herbaceous associates.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This community comprises *Juniperus virginiana*-dominated old fields. Canopy closure and height are variable, as are shrub and herbaceous associates.

Global Vegetation: *Juniperus virginiana* dominates the canopy layer in stands of this type, which ranges from broadly-spaced woodlands to dense and nearly impenetrable thickets. Common associates, typically occurring as scattered individuals, may include *Pinus strobus, Acer rubrum, Liriodendron tulipifera, Quercus* spp., and *Prunus serotina*. Shrub cover varies according to canopy closure, with the most forested stands having little or no shrub cover. Exotic shrubs such as *Elaeagnus umbellata, Lonicera morrowii, Ligustrum vulgare*, and *Rosa multiflora* are most characteristic, along with *Rubus* spp. Herbaceous cover likewise varies. Common species in the more open-canopy stands include old-field denizens such as *Schizachyrium scoparium, Andropogon virginicus, Festuca rubra, Anthoxanthum odoratum, Agrostis gigantea, Elymus repens (= Elytrigia repens), Solidago rugosa, Solidago gigantea, Euthamia graminifolia, Monarda fistulosa, Toxicodendron radicans, Achillea millefolium*, and *Daucus carota*. In dense forest stands, herbs may be absent or limited to scattered shade-tolerant species such as *Alliaria petiolata, Allium vineale*, and *Dennstaedtia punctilobula*.

Global Dynamics: These forests are often young and result from the colonization of old agricultural fields by *Juniperus virginiana* over native and exotic forbs and grasses. These stands may eventually succeed to other forest types as mid- and late-successional canopy species colonize and subsequently overtop the *Juniperus*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana*
Tall shrub/sapling	Needle-leaved tree	*Juniperus virginiana*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lonicera morrowii*
Tall shrub/sapling	Needle-leaved tree	*Juniperus virginiana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Elaeagnus umbellata*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rosa multiflora*
Short shrub/sapling	Liana	*Toxicodendron radicans*
Herb (field)	Flowering forb	*Solidago rugosa*
Herb (field)	Graminoid	*Schizachyrium scoparium*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Juniperus virginiana*, *Lonicera morrowii*, *Schizachyrium scoparium*, *Solidago rugosa*, *Toxicodendron radicans*
Appalachian National Scenic Trail (Lower New England Project Area): *Juniperus virginiana*
Global: *Elaeagnus umbellata*, *Juniperus virginiana*, *Lonicera morrowii*, *Rosa multiflora*, *Schizachyrium scoparium*, *Solidago rugosa*, *Toxicodendron radicans*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Elaeagnus umbellata* (High), *Lonicera morrowii* (High/Medium), *Rosa multiflora* (Medium/Low)
Global: Invasive/Exotic Plants: *Agrostis gigantea* (Medium/Low), *Alliaria petiolata* (High/Medium), *Allium vineale* (Medium/Insignificant), *Anthoxanthum odoratum*, *Daucus carota* (Low), *Elaeagnus umbellata* (High), *Elymus repens* (High/Medium), *Ligustrum vulgare* (High/Medium), *Lonicera morrowii* (High/Medium), *Rosa multiflora* (Medium/Low); **Other Plants**: *Andropogon virginicus* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (10-Oct-2001). This forest represents early-successional, modified, or silviculturally managed vegetation and is thus not of high conservation concern and does not receive a conservation status rank. This vegetation may be easily restorable by either management, time, or restoration of ecological processes.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This forest represents early-successional vegetation and is thus not of high conservation concern.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Observed by the UMESC mapping reconnaissance team in New Jersey, New York and Connecticut during summer 2012.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This association is currently very generally defined.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This association is of broad distribution, occurring widely throughout the northeastern U.S.
Appalachian National Scenic Trail (Lower New England Project Area) Range: Observed by the UMESC mapping reconnaissance team in New Jersey, New York and Connecticut during summer 2012.

Global Range: This association is of broad distribution, occurring widely throughout the northeastern U.S. It has been documented from only a limited range but is undoubtedly more widely distributed.
Nations: US
States/Provinces: CT, DC, DE, MA, MD?, NJ, NY, PA, VA, WV
TNC Ecoregions: 52:C, 58:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Ab:CCC, 221Bd:CCC, 231Ae:CCC, 231Ak:CCC, 231An:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Br:CCC, M221Be:CCC
Federal Lands: NPS (Antietam, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appomattox Court House, Bluestone, Boston Harbor Islands, C&O Canal, Cape Cod, Delaware Water Gap, Fire Island, Fredericksburg-Spotsylvania, George Washington Birthplace, Harpers Ferry, Manassas, Richmond); USFS (Monongahela); USFWS (Cape May, E.B. Forsythe, National Conservation Training Center, Supawna Meadows)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXER
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: Observed by the UMESC mapping reconnaissance team in New Jersey, New York and Connecticut during summer 2012 and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 accuracy assessment points): APPA_AA_0457, APPA_AA_0796, APPA_AA_1456.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (8 accuracy assessment points): APPA_AA_2157, APPA_AA_2212, APPA_AA_2243, APPA_AA_2543, APPA_AA_2849, APPA_AA_3137, APPA_AA_3201, APPA_AA_3323.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): L.A. Sneddon, R.E. Zaremba, M. Pyne and S.C. Gawler
References: Clark 1986a, Eastern Ecology Working Group n.d.*, Klopfer et al. 2002, Largay and Sneddon 2010, Lea 2004, NatureServe 2009, Patterson 2008a, Patterson 2008d, Patterson 2008e, Patterson 2008f, Perles et al. 2007, Sneddon and Lundgren 2001, Sneddon et al. 2010, Taverna and Patterson 2008, Vanderhorst et al. 2008, WVNHP unpubl. data b

[CEGL007944] *Pinus strobus* Ruderal Forest

Translated Name: **Eastern White Pine Ruderal Forest**
Common Name: **Ruderal Eastern White Pine Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Juniperus virginiana - Pinus virginiana - Pinus echinata* Ruderal Forest Alliance (A3227)

ELEMENT CONCEPT

Global Summary: This is an early-successional forest dominated by *Pinus strobus*, typically with a very dense canopy and little understory. It is considered ruderal because it is commonly associated with anthropogenic disturbance (e.g., former old fields and formerly cleared flats along streams) that have caused a mix of species not found with natural disturbances. Associated woody and herbaceous species vary with geography. In the northeastern states, the tree canopy is often monotypic and even-aged, with occasional associates including *Acer rubrum, Juniperus virginiana, Liriodendron tulipifera* (within its range), or scattered *Quercus rubra* or *Quercus velutina*. In regions where northern hardwoods are more prevalent, canopy associates include *Fraxinus americana* and *Acer saccharum*. In the Southern Blue Ridge and nearby areas, typical canopy and subcanopy associates include *Liriodendron tulipifera, Acer rubrum, Pinus rigida*, and *Liquidambar styraciflua*, with *Tsuga canadensis* often forming a dense shrub stratum. The understory is typically poorly developed or characterized by scattered individuals found in the canopy. The herbaceous cover is variable depending on the density of tree and shrub cover, and may be characterized by ruderal or exotic species that favor openings or disturbance. In more open stands, typical species are those associated with old fields, including *Solidago rugosa, Solidago gigantea, Anthoxanthum*

odoratum, Poa pratensis, Schizachyrium scoparium, Elymus repens (= Elytrigia repens), Bromus inermis, Agrostis gigantea, Euthamia graminifolia, Achillea millefolium, and *Daucus carota*. In stands that are more heavily forested, typical herbs include *Aralia nudicaulis, Ageratina altissima, Galium triflorum, Maianthemum canadense, Trientalis borealis, Mitchella repens, Polystichum acrostichoides*, and *Lycopodium* species. The particular composition of the herb layer will vary with geography. The substrate is usually covered by a thick layer of pine needle duff. In the Daniel Boone National Forest of Kentucky, *Pinus strobus* is spreading from plantings, especially in the Red River Gorge.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This wide-ranging successional forest is commonly associated with anthropogenic disturbance and could potentially occur anywhere within the range of *Pinus strobus*. It typically occurs on former agricultural lands and old fields that are no longer intensively mowed, plowed or managed, developing as *Pinus strobus* colonizes the open fields. Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species that favor openings or disturbance.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This is a successional eastern white pine or eastern hemlock forest (in VT). The sites are typically abandoned pine plantations. One site is a moderate, northwest-facing slope with dry-mesic well-drained sandy loam. The unvegetated surface consists of leaf litter, with a very small amount of large rocks and downed wood. Evidence of disturbance includes previous tree plantings and the presence of exotic plants.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This wide-ranging successional forest is commonly associated with anthropogenic disturbance and could potentially occur anywhere within the range of *Pinus strobus*. It typically occurs on former agricultural lands and old fields that are no longer intensively mowed, plowed or managed, developing as *Pinus strobus* colonizes the open fields. Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species that favor openings or disturbance.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This is an early-successional white pine forest that arises from disturbance and not evidently from planting.

Global Environment: This wide-ranging semi-natural forest is commonly associated with anthropogenic disturbance. It typically occurs on former agricultural lands and old fields that are no longer intensively mowed, plowed or managed, developing as *Pinus strobus* colonizes the open fields. Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species that favor openings or disturbance.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: These successional or planted forests typically have a very dense canopy (greater than 60% cover of canopy/overstory combined) of *Pinus strobus* and little understory. They are usually of mixed-age and include a mixture of other successional species.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These are successional stands of *Pinus strobus* and, in some cases in Vermont, *Tsuga canadensis*. *Acer rubrum, Betula lenta, Fraxinus americana*, and/or *Prunus serotina* may be common in canopy and/or subcanopy. *Rubus flagellaris* and *Rubus occidentalis* are common in the shrub layer. Herbs include *Dryopteris intermedia, Maianthemum canadense*, and *Veronica officinalis*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The tree canopy ranges from woodland to forest closure, with 25-85% cover. It is often monotypic and even-aged *Pinus strobus*, with occasional associates, including *Acer rubrum, Betula lenta, Juniperus virginiana*, or scattered *Quercus rubra* or *Quercus velutina*. In regions where northern hardwoods are more prevalent, canopy associates include *Fraxinus americana* and *Acer saccharum*. In the Southern Blue Ridge and nearby areas, typical canopy and subcanopy associates include *Liriodendron tulipifera, Acer rubrum, Pinus rigida*, and *Liquidambar styraciflua*, with *Tsuga canadensis* often forming a dense shrub stratum. The understory is poorly developed or characterized by scattered individuals found in the canopy. Shrubs are often present in the more open stands and include native species, such as *Cornus racemosa, Rhus glabra, Viburnum prunifolium*, and *Rubus* spp., as well as exotics, such as *Elaeagnus umbellata, Rosa multiflora, Lonicera morrowii*, and *Berberis thunbergii*. The herbaceous cover is variable depending on the density of tree and shrub cover, and may be characterized by ruderal or exotic species that favor openings or disturbance. In more open stands, typical species are those associated with old fields, such as *Solidago rugosa, Solidago gigantea, Anthoxanthum odoratum, Poa pratensis, Schizachyrium scoparium, Elymus repens (= Elytrigia repens), Bromus inermis, Agrostis gigantea, Euthamia graminifolia, Achillea millefolium*, and *Daucus carota*. In stands that are more heavily forested, typical herbs include *Aralia nudicaulis, Ageratina altissima, Galium*

triflorum, Maianthemum canadense, Medeola virginiana, Polystichum acrostichoides, Trientalis borealis, Mitchella repens, and *Lycopodium* species. The particular composition of the herb layer will vary with geography. The substrate is usually covered by a thick layer of pine needle duff.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This successional even-aged or mixed-age forest is composed of *Pinus strobus* with greater than 40% cover of the canopy. It may also contain a mixture of other successional species, including *Quercus* spp., *Acer* spp. and/or *Betula* spp. Shrubs, often exotic species, may be present. Old-field grasses and forbs may be common in the herbaceous layer.

Global Vegetation: The tree canopy ranges from woodland to forest closure, with 25-85% cover. It is often monotypic and even-aged *Pinus strobus*, with occasional associates, including *Acer rubrum, Betula lenta, Juniperus virginiana*, or scattered *Quercus rubra* or *Quercus velutina*. In regions where northern hardwoods are more prevalent, canopy associates include *Fraxinus americana* and *Acer saccharum*. In the Southern Blue Ridge and nearby areas, typical canopy and subcanopy associates include *Liriodendron tulipifera, Acer rubrum, Pinus rigida*, and *Liquidambar styraciflua*, with *Tsuga canadensis* often forming a dense shrub stratum. The understory is poorly developed or characterized by scattered individuals found in the canopy. Shrubs are often present in the more open stands and include native species, such as *Cornus racemosa, Rhus glabra, Viburnum prunifolium*, and *Rubus* spp., as well as exotics, such as *Elaeagnus umbellata, Rosa multiflora, Lonicera morrowii*, and *Berberis thunbergii*. The herbaceous cover is variable depending on the density of tree and shrub cover, and may be characterized by ruderal or exotic species that favor openings or disturbance. In more open stands, typical species are those associated with old fields, such as *Solidago rugosa, Solidago gigantea, Anthoxanthum odoratum, Poa pratensis, Schizachyrium scoparium, Elymus repens (= Elytrigia repens), Bromus inermis, Agrostis gigantea, Euthamia graminifolia, Achillea millefolium*, and *Daucus carota*. In stands that are more heavily forested, typical herbs include *Aralia nudicaulis, Ageratina altissima, Galium triflorum, Maianthemum canadense, Medeola virginiana, Polystichum acrostichoides, Trientalis borealis, Mitchella repens*, and *Lycopodium* species. The particular composition of the herb layer will vary with geography. The substrate is usually covered by a thick layer of pine needle duff.

Global Dynamics: In the Daniel Boone National Forest of Kentucky, *Pinus strobus* is spreading from plantings, especially in the Red River Gorge.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Pinus strobus*
Appalachian National Scenic Trail (Lower New England Project Area): *Pinus strobus*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Pinus strobus*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Pinus strobus*
Global: *Pinus strobus*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium), *Euonymus alatus* (Low), *Frangula alnus* (High/Medium), *Lonicera morrowii* (High/Medium), *Lysimachia nummularia* (Medium/Low)

Global: Invasive/Exotic Plants: *Achillea millefolium*, *Agrostis gigantea* (Medium/Low), *Anthoxanthum odoratum*, *Berberis thunbergii* (High/Medium), *Daucus carota* (Low), *Elaeagnus umbellata* (High), *Elymus repens* (High/Medium), *Lonicera morrowii* (High/Medium), *Rosa multiflora* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (23-Jun-2013). This forest represents semi-natural vegetation, i.e., the vegetation contains combinations of species that are not found under natural disturbance regimes, many of them exotic. Thus it is not of high conservation concern and does not receive a conservation status rank.

RELATED CONCEPTS

Global Similar Types:
- *Pinus strobus* Forest Plantation (CST007178)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This forest represents successional vegetation and is thus not of high conservation concern.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This forest represents successional vegetation and is thus not of high conservation concern.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: In one part of Vermont, *Tsuga canadensis* is replacing *Pinus strobus* in the canopy. These stands are the result of disturbance 30-50 years ago, and most of these areas are not notably affected by hemlock woolly adelgid.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This community is known to occur along the trail, but no plots or observation points were collected.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This association was not sampled along the trail in the Southern Blue Ridge section; however, it was observed within the AT corridor in the Southern Blue Ridge during mapping reconnaissance. It can be differentiated from white pine plantations by the lack of rows and successional understory.
Global Classification Comments: This semi-natural type may be expected to occur throughout the range of the alliance but has primarily been attributed in areas where The Nature Conservancy ecoregional planning or other project-specific needs have documented its occurrence. Rangewide review should greatly expand its geographic scope. Association may need to be split based on northern hardwood associates and central hardwood associates.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This successional type may be expected to occur from Maine and New Hampshire south to Georgia and Tennessee.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Sharon Mountain in Connecticut and at Norwich River Lagoon, Moseley Hill and elsewhere in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This community is known to occur along the trail, but no plots or observation points were collected.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This association is present to common in Tennessee from Tanyard Gap north to Cross Mountain.
Global Range: This semi-natural type may be expected to occur throughout the range of the alliance (i.e., from Michigan, northern Wisconsin, northern and eastern Minnesota, extreme northeastern Iowa, and from Maine and New Hampshire south to Georgia and Tennessee, as well as in Ontario, Canada). It has been documented primarily in areas where project-specific needs have required it.
Nations: US
States/Provinces: CT, GA, KY, MA, MD?, ME, MI, MN, NC, NH, NJ?, NY, OH?, PA, RI, SC, TN, VA, VT, WI, WV
TNC Ecoregions: 47:P, 48:P, 49:C, 50:C, 51:C, 59:C, 60:C, 61:C, 63:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Ae:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Fa:CCC, 221Ha:CCC, 221Hc:CCC, 221He:CCC, 222En:CCC, 222Eo:CCC, M212Ba:CCC, M212Bb:CCC, M221Aa:CCC, M221Ab:CCC, M221Be:CCC, M221Cb:CCC, M221Cd:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Bluestone, Carl Sandburg Home, Delaware Water Gap, Gettysburg, Great Smoky Mountains, Marsh-Billings-Rockefeller, Natchez Trace, New River Gorge, Obed River, Saint-Gaudens, Saratoga); USFS (Cherokee?, Daniel Boone, George Washington, Jefferson, Monongahela); USFWS (Great Meadows, Moosehorn)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXWP
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: The community was observed during mapping reconnaissance in the summer of 2010 and during accuracy assessment.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: The community was observed during mapping reconnaissance in the summer of 2010 and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (12 accuracy assessment points): APPA_AA_0053, APPA_AA_0057, APPA_AA_0178, APPA_AA_0356, APPA_AA_0470, APPA_AA_0714, APPA_AA_0842, APPA_AA_0945, APPA_AA_1104, APPA_AA_1168, APPA_AA_1251, APPA_AA_1359.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (6 observation points; 18 accuracy assessment points): APPA.1442, APPA.1567, APPA.1572, APPA.1573, APPA.1737, APPA.1741, APPA_AA_1672, APPA_AA_1790, APPA_AA_1825, APPA_AA_1885, APPA_AA_1984, APPA_AA_2224, APPA_AA_2441, APPA_AA_2585, APPA_AA_2702, APPA_AA_2795, APPA_AA_2839, APPA_AA_2894, APPA_AA_3197, APPA_AA_3207, APPA_AA_3221, APPA_AA_3250, APPA_AA_3295, APPA_AA_3327.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (4 accuracy assessment points): APPA_AA_1704, APPA_AA_2121, APPA_AA_2881, APPA_AA_3165.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (8 accuracy assessment points): APPA_AA_0393, APPA_AA_0461, APPA_AA_0607, APPA_AA_0644, APPA_AA_0734, APPA_AA_0775, APPA_AA_1000, APPA_AA_1199.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay
Global Description Author(s): K.D. Patterson, L.A. Sneddon and S.C. Gawler
References: Chapman et al. 1989, Edinger 2003b, Edinger et al. 2002, Edinger et al. 2007, Faber-Langendoen 2001, Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming et al. 2006, Gawler and Bowman 2012, MNNHP 1993, NRCS 2004a, NatureServe Ecology - Southeastern U.S. unpubl. data, Perles et al. 2007, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d.*, Swain and Kearsley 2001, TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2008, WVNHP unpubl. data b, White 2003

[CEGL002591] *Pinus virginiana* Ruderal Forest

Translated Name: **Virginia Pine Ruderal Forest**
Common Name: **Ruderal Virginia Pine Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Juniperus virginiana - Pinus virginiana - Pinus echinata* Ruderal Forest Alliance (A3227)

ELEMENT CONCEPT

Global Summary: This ruderal Virginia pine forest of the southeastern states occurs in areas where canopy removal has created dry, open conditions and bare mineral soil, allowing for the establishment of *Pinus virginiana*. These habitats include old fields, old pastures, clearcuts, and eroded areas; soils are typically dry, acidic, and infertile. It is common on abandoned farmland. This forest typically has a very dense canopy of *Pinus virginiana* and little understory vegetation. The dense canopy may also include admixtures of other *Pinus* species (e.g., *Pinus taeda, Pinus echinata, Pinus rigida, Pinus strobus*) or other early-successional deciduous trees (e.g., *Acer rubrum, Liquidambar styraciflua, Prunus serotina, Liriodendron tulipifera, Fraxinus americana, Nyssa sylvatica*).

Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species. Shrub and herb layers are frequently very sparse. Stands are short-lived, generally less than 75 years.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This Virginia pine planted/successional semi-natural forest occupies flat to moderately sloping land that was heavily plowed or grazed and eroded in the recent past (10-60 years). It was sampled at two locations in the Central Appalachian project area in Cumberland and Perry counties, Pennsylvania. Sites are moderate west-facing slopes with dry, well-drained sandy loam and silt loam soils. The unvegetated surface is dominated by leaf litter with some downed wood. Evidence of disturbance includes past logging/clearing and the presence of exotic plant species.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This early-successional Virginia pine forest is the result of disturbance less than 25 years ago. The one sampled stand is found on a moderate, south-facing ridge with moderately well-drained clay loam soil. The unvegetated surface is dominated almost exclusively by needle litter with some downed wood. Evidence of disturbance includes past logging and pine bark beetle damage.

Global Environment: This community occurs in areas where canopy removal has created open conditions and bare mineral soil, allowing for the establishment of *Pinus virginiana*. These conditions can include old fields, old pastures, clearcuts, and eroded areas. In the Ridge and Valley of Tennessee, northeastern Monroe County, early successional forests with *Pinus virginiana* dominance were found on low slopes in areas that were cleared for agriculture prior to the 1970s, when Tellico Lake was created (Andreu and Tukman 1995). In the Central Appalachians, this vegetation occurs where soft shales have been farmed (in valleys or on plateaus), resulting in stands with nothing but successional species in the understory. Soils underlying these communities are of two general types, i.e., those derived in residuum from calcareous shale and calcareous sandstone of the Middle Ordovician and those of some other origin. Series of the former type include Dandridge (Lithic Ruptic-Alfic Eutrochrepts), Tellico (Typic Rhododults), and Steekee (Ruptic-Ultic Dystrochrepts). Other soil series that this forest type may occur on include Litz, Dewey, Alcoa, Bland, Etowah, Lobdell and Neubert. All of these soils are well-drained and range in pH from moderate acidic to very strongly acidic.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The moderately dense (50-60% cover) canopy is dominated by *Pinus virginiana* and may include *Acer rubrum, Pinus rigida*, and *Sassafras albidum* which may also form a sparse to moderate subcanopy along with other species such as *Amelanchier arborea, Betula lenta, Carya glabra*, and *Quercus rubra*. The sparse to moderate shrub layers include canopy species as well as *Hamamelis virginiana, Kalmia latifolia, Lindera benzoin, Rubus* spp., *Vaccinium pallidum, Vaccinium stamineum*, and *Viburnum prunifolium*. The herbaceous layer may be sparse or, in separate instances, be covered by a dense layer of *Gaultheria procumbens* or *Lycopodium digitatum*.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: *Pinus virginiana* dominates the canopy. *Pinus echinata* or *Pinus rigida* may be occasional. *Acer rubrum* dominates the subcanopy. There is little to no *Quercus* spp. except sometimes abundant *Quercus prinus* in extremely fire-suppressed examples. There are few herbaceous or understory species. Vines including *Smilax rotundifolia, Toxicodendron radicans* and *Parthenocissus quinquefolia* are common. *Lycopodium digitatum* and a few other herbs do occur in the sampled plot.

Global Vegetation: This forest typically has a very dense canopy of *Pinus virginiana* and little understory vegetation. *Pinus taeda, Pinus echinata*, or *Pinus strobus* may co-occur with *Pinus virginiana* in the canopy. The canopy can also have significant admixtures of early-successional deciduous trees (e.g., *Acer rubrum, Liquidambar styraciflua, Prunus serotina, Liriodendron tulipifera, Fraxinus americana, Oxydendrum arboreum, Betula lenta, Nyssa sylvatica*). Older stands on abandoned farmland may have tall canopies (>20 m) of decadent *Pinus virginiana* overtopping the shade-tolerant *Tsuga canadensis*, which often dominates the subcanopy and shrub layers. Scattered *Pinus rigida* may be mixed in these stands. Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species; *Lonicera japonica* and *Rosa multiflora* are common. The herb layer is characterized by weedy natives and exotics such as *Lycopodium digitatum, Achillea millefolium var. occidentalis, Hieracium caespitosum*, and *Lespedeza cuneata*. Shrub and herb strata, where present at all, are usually sparse in coverage. In eastern Tennessee, the subcanopy may contain *Acer saccharum* and *Cornus florida*; other associated species may include *Cercis canadensis, Parthenocissus quinquefolia, Lonicera japonica*, and *Microstegium vimineum* (Andreu and Tukman 1995). In the Central Appalachians, associates include *Pinus strobus, Pinus echinata*, and *Pinus rigida*. Some stands may have a dense ericaceous shrub stratum containing *Vaccinium* spp., *Gaylussacia* spp., *Kalmia latifolia*, and *Rhododendron* spp. This community contains many exotics species such as

Albizia julibrissin, Lonicera japonica, and *Pueraria montana var. lobata*. *Lonicera japonica* when present has an average cover of 27%. The associated species in all strata are highly variable.
Global Dynamics: This is an early-successional forest type. Damage from ice storms was the main disturbance observed in these stands in the Tellico Pilot Project study area. In addition, fire and insect infestation are likely damaging agents.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*, *Sassafras albidum*
Tree canopy	Needle-leaved tree	*Pinus rigida*, *Pinus virginiana*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*, *Vaccinium stamineum*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana*
Tree subcanopy	Needle-leaved tree	*Juniperus virginiana*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Cornus florida*, *Nyssa sylvatica*, *Oxydendrum arboreum*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Cornus florida*, *Oxydendrum arboreum*
Tall shrub/sapling	Needle-leaved tree	*Tsuga canadensis*
Tall shrub/sapling	Broad-leaved deciduous tree	*Nyssa sylvatica*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium stamineum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Vaccinium arboreum*
Short shrub/sapling	Broad-leaved deciduous tree	*Cercis canadensis*, *Quercus alba*, *Sassafras albidum*
Herb (field)	Liana	*Lonicera japonica*, *Smilax glauca*, *Toxicodendron radicans*
Herb (field)	Fern (Spore-bearing forb)	*Lycopodium* sp.
Nonvascular	Lichen	*Cladonia* sp.

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Pinus virginiana*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer rubrum*, *Lycopodium digitatum*, *Pinus virginiana*, *Smilax glauca*, *Toxicodendron radicans*
Global: *Pinus virginiana*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Lonicera morrowii* (High/Medium), *Polygonum persicaria*
Global: Invasive/Exotic Plants: *Albizia julibrissin* (High/Low), *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Pueraria montana* var. *lobata*, *Rosa multiflora* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (13-Jun-2000). This forest represents early-successional vegetation and is thus not of high conservation concern.

RELATED CONCEPTS

Global Similar Types:
- *Pinus echinata - Quercus prinus - Quercus (coccinea, velutina)* Forest (CEGL004761)
- *Pinus echinata* Ruderal Forest (CEGL006327) occurs in similar environments but is dominated (>50% of canopy) by *Pinus echinata* instead of *Pinus virginiana*.
- *Pinus taeda - Liquidambar styraciflua* Ruderal Forest (CEGL008462) is commonly found in the same area as CEGL002591 in the Piedmont. CEGL008462 contains at least 50% *Pinus taeda* in the canopy, whereas CEGL002591 is mostly *Pinus virginiana*.

- *Pinus taeda / Liquidambar styraciflua - Acer rubrum var. rubrum / Vaccinium stamineum* Ruderal Forest (CEGL006011) occurs in similar environments with similar disturbance histories but is dominated by (>50% of canopy) *Pinus taeda* instead of *Pinus virginiana*.
- *Pinus virginiana - Juniperus virginiana var. virginiana - Ulmus alata* Ruderal Forest (CEGL007121) on more calcareous or circumneutral substrates.
- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119) can have a very similar canopy in the Piedmont and Blue Ridge ecoregions, but CEGL007119 is generally created and maintained by fire and/or logging but not heavy plowing and/or erosion. CEGL002591 generally has signs of heavy agricultural use such as sparse herbaceous or shrub layers, large percentage of invasive exotics such as *Lonicera japonica* in the herbaceous layer, old plowlines, human debris, and extremely even-aged canopy, whereas CEGL007119 generally has a more intact herbaceous/shrub layer (especially *Vaccinium pallidum*) and less signs of severe human disturbance.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This forest represents early-successional vegetation and is thus not of high conservation concern.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This successional forest was sampled in Tennessee. It occurs throughout the Southern Blue Ridge and Central Appalachian sections of the trail.
Global Classification Comments: Early-successional *Pinus virginiana* vegetation occurring over calcareous substrates is classed in *Pinus virginiana - Juniperus virginiana var. virginiana - Ulmus alata* Ruderal Forest (CEGL007121) and has species indicative of calcareous substrates. Like many ruderal USNVC communities, this community has a wide geographic range and vegetation composition of associated species varies over this range.

After conducting fieldwork on Maryland's Inner Coastal Plain during the USFWS Patuxent Research Refuge vegetation mapping project, it was determined that near-pure stands of *Pinus rigida* and stands mixed with *Pinus virginiana* or early-successional deciduous trees such as *Acer rubrum* need to be reflected in the global concept of this type. It is unclear how these stands have developed or been managed, but contemporary fire suppression is an obvious factor as are signs of historical clearing for agriculture and military use (J. Harrison pers. comm. 2011).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled in Cumberland and Perry counties, Pennsylvania.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This successional forest was sampled in Tennessee. It occurs throughout the Southern Blue Ridge and Central Appalachian sections of the trail.
Global Range: This successional community is possible in the Piedmont from New Jersey and Pennsylvania south to Alabama and ranges west into the Appalachians, Ridge and Valley, the Cumberland Plateau, and in scattered locales of the Interior Low Plateau.
Nations: US
States/Provinces: AL, DC, DE, GA, IN, KY, MD, NC, NJ, PA, SC, TN, VA, WV
TNC Ecoregions: 43:C, 44:C, 49:P, 50:C, 51:C, 52:C, 58:C, 59:C, 61:C
USFS Ecoregions (1994/95): 221Da:CCC, 221Ha:CCC, 221Hc:CCC, 221He:CCC, 221J:CC, 222Cg:CCC, 222Dg:CCC, 222Eg:CCC, 222Ej:CCC, 222En:CCC, 222Eo:CCC, 231Ae:CCC, 231Ak:CCC, 231An:CCC, 231Be:CCC, 231Cc:CCC, 231Cd:CCC, 232Ad:???, 232Br:?CC, 232Bt:?CC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Be:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCP, M221Cd:CCC, M221Ce:CCP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Abe Lincoln Birthplace, Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Appomattox Court House, Big South Fork, Blue Ridge Parkway?, Bluestone, Booker T. Washington, C&O Canal, Cumberland Gap, Fredericksburg-Spotsylvania, Gauley River, George Washington Parkway, Gettysburg, Great Smoky Mountains, Guilford Courthouse, Kings Mountain, Little River Canyon, Mammoth Cave, Manassas, Natchez Trace, National Capital-East, New River Gorge, Obed River, Prince William, Rock Creek, Shenandoah, Shiloh, Thomas Stone, Wolf Trap); TVA (Tellico); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, George Washington, Jefferson, Monongahela, Sumter, Sumter (Mountains), Sumter (Piedmont), Uwharrie?); USFWS (Patuxent)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXVP
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 observation points; 31 accuracy assessment points): APPA.1304, APPA.1305, APPA_AA_0034, APPA_AA_0035, APPA_AA_0049, APPA_AA_0055, APPA_AA_0064, APPA_AA_0074, APPA_AA_0126, APPA_AA_0253, APPA_AA_0275, APPA_AA_0339, APPA_AA_0397, APPA_AA_0436, APPA_AA_0517, APPA_AA_0534, APPA_AA_0548, APPA_AA_0559, APPA_AA_0585, APPA_AA_0602, APPA_AA_0623, APPA_AA_0753, APPA_AA_0824, APPA_AA_0845, APPA_AA_0874, APPA_AA_0878, APPA_AA_1045, APPA_AA_1176, APPA_AA_1218, APPA_AA_1384, APPA_AA_1446, APPA_AA_1467, APPA_AA_1594.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 3 accuracy assessment points): APPA.0615, APPA_AA_0673, APPA_AA_0832, APPA_AA_0858.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): M. Andreu, M. Tukman, J.P. Vanderhorst, K.D. Patterson and S.C. Gawler
References: Allard 1990, Ambrose 1990a, Andreu and Tukman 1995, Burns and Honkala 1990a, Collins and Anderson 1994, Coxe 2009, Eyre 1980, Faller 1975, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2011a, Fleming and Weber 2003, Fleming et al. 2006, Hall and Mathews 1974, Harrison 2004, Harrison, J. pers. comm., Homoya et al. 1988, Lea et al. 2012, Nelson 1986, Nordman et al. 2011, Patterson 2008a, Patterson 2008b, Patterson 2008e, Patterson et al. 1999, Perles et al. 2006c, Pyne 1994, Pyne et al. 2010, Schmalzer and DeSelm 1982, Schotz et al. 2008, Schotz pers. comm., Shreve et al. 1910, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, TNC 1998c, Taverna and Patterson 2008, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2008, Vanderhorst et al. 2010, WVNHP unpubl. data b, White 2006, White and Govus 2005, White and Pyne 2003, Windisch 2014a, Young et al. 2006, Young et al. 2009

A3228 *Liriodendron tulipifera - Juglans nigra - Robinia pseudoacacia* Ruderal Forest Alliance

Alliance Summary Description: This alliance includes deciduous forests dominated by *Gleditsia triacanthos, Juglans nigra, Liriodendron tulipifera*, or *Robinia pseudoacacia* primarily in areas which were once clearcut, old fields, or cleared by fire or other natural disturbances, and then planted to these species, but with no regular maintenance. Three suballiances are recognized based on dominant species: (1) *Liriodendron tulipifera* stands occur on old clearcut sites and old fields. This suballiance includes pure, often even-aged stands of *Liriodendron tulipifera*. Associated species vary with geographic location. Throughout most of the range of this suballiance *Acer rubrum, Robinia pseudoacacia, Betula lenta, Acer saccharum*, and *Acer negundo* are common components. (2) *Juglans nigra - Gleditsia triacanthos* stands are often associated with former homesites or other disturbances on fertile alluvial deposits. Associated canopy trees vary from site to site and can include *Liriodendron tulipifera, Juglans cinerea, Robinia pseudoacacia, Fraxinus americana, Ulmus americana, Platanus occidentalis, Acer saccharum, Acer nigrum*, and *Morus rubra*. The shrub layer may or may not be well-developed; common species include *Asimina triloba, Viburnum prunifolium, Lindera benzoin, Corylus americana*, and the exotic invasive *Rosa multiflora*. (3) *Robinia pseudoacacia* stands occur in pure stands or makes up the majority of the canopy. These are short-lived forests that typically result from planting or invasion following land abandonment or fire, or from other severe disturbance.

[CEGL004184] *Crataegus punctata - Crataegus flabellata* Ruderal Forest

Translated Name: **Dotted Hawthorn - Fanleaf Hawthorn Ruderal Forest**
Common Name: **Southern & Central Appalachian Ruderal Hawthorn Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Liriodendron tulipifera - Juglans nigra - Robinia pseudoacacia* Ruderal Forest Alliance (A3228)

ELEMENT CONCEPT

Global Summary: Stands of this ruderal orchard-like open to closed-canopy woodland are dominated by *Crataegus punctata* and *Crataegus flabellata*. In addition, *Amelanchier laevis* and *Prunus pensylvanica* may be present in the canopy. Some dominant tall herbs include *Ageratina altissima var. roanensis, Angelica triquinata, Helenium autumnale*, and *Solidago puberula*. Open-canopied stands may have *Rubus allegheniensis* or shrubs beneath.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This dotted hawthorn successional woodland/forest/orchard is found at high elevations of 1,000-1,525 m (3,200-5,000 feet) in the Southern and Central Appalachians. Vegetation typically occurs over well-drained, loamy soils underlain by Precambrian gneisses, schists and granites. These soils are classified as Typic, Umbric, or Lithic Dystrochrepts, and Typic Haplumbrepts (Golden 1974). Vegetation could occur on most of the major mountain ranges within its range, on broad ridges and mid to upper slopes. Moisture regimes are typically dry-mesic to mesic. A large patch occurs along the AT in the saddle between Beech and Whitetop mountains in Virginia.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This high-elevation successional orchard, tall shrubland, or forest occurs in the Southern Appalachians and southern portion of the Central Appalachians at elevations between 1,000 and 1,525 m (3,200-5,000 feet). The rooting substrate contains less than 50% and usually less than 10% surface rocks and boulders. There is a well-drained, well-developed soil layer present.

Global Environment: The environment of this association is essentially similar to that of high-elevation northern red oak forests of the Southern Appalachians and southern portion of the Central Appalachians, at elevations of 1000-1525 m (3200-5000 feet). Vegetation typically occurs over well-drained, loamy soils underlain by Precambrian gneisses, schists and granites. These soils are classified as Typic, Umbric, or Lithic Dystrochrepts, and Typic Haplumbrepts (Golden 1974). Vegetation could occur on most of the major mountain ranges within its range, on broad ridges and mid to upper slopes. Moisture regimes are typically dry-mesic to mesic.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Crataegus punctata* dominates this successional woodland/forest/orchard. It is a forest of moderate stature (5-15 m). The canopy may be mixed with some combination of *Quercus rubra, Betula alleghaniensis, Prunus pensylvanica*, and/or *Aesculus flava*. If stands have an open canopy, they may have *Rubus allegheniensis* or shrubs beneath; or they may have residual grasses and graminoids, either *Danthonia compressa, Carex pensylvanica*, and/or *Phleum pratense*. Some other dominant tall forbs include *Eurybia chlorolepis* and/or *Oclemena acuminata*.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This community is a forest or tall shrubland of moderate stature. The canopy is composed of *Crataegus punctata*, possibly mixed with some combination of *Quercus rubra, Betula alleghaniensis, Prunus pensylvanica*, and/or *Aesculus flava*. *Rubus allegheniensis* can be a common shrub. Old-field grasses and forbs are common under more open canopies.

Global Vegetation: Stands of this forest are dominated by *Crataegus punctata* and *Crataegus flabellata*. The tree and tall-shrub stratum is 5 to 15 m tall and ranges from approximately 25-60% cover. In addition, *Amelanchier laevis* and *Prunus pensylvanica* may be present in the canopy. Some dominant tall herbs include *Ageratina altissima var. roanensis, Angelica triquinata, Helenium autumnale*, and *Solidago puberula*. If stands have an open canopy, they may have *Rubus allegheniensis* or shrubs beneath; or they may have residual grasses and graminoids, either *Danthonia compressa, Agrostis perennans, Carex pensylvanica*, and/or *Phleum pratense*. Some other dominant tall forbs include *Eurybia chlorolepis* and/or *Oclemena acuminata*.

Global Dynamics: This vegetation is transitional between, and located adjacent to, high-elevation northern red oak forests and grass/shrub balds. It is distinctive from either of these, having a composition different from northern red oak forests, and a physiognomy distinctive from grass and shrub balds. It may arise from the relaxation of grazing pressure and other management actions in the grassy balds, or it could have arisen from removal of northern red oak, under which an understory of *Crataegus* may occur.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Crataegus punctata*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Crataegus punctata*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Crataegus flabellata*, *Crataegus punctata*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Rubus allegheniensis*
Herb (field)	Flowering forb	*Ageratina altissima* var. *roanensis*, *Angelica triquinata*, *Helenium autumnale*, *Solidago puberula*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Crataegus punctata*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Crataegus punctata*
Global: *Amelanchier laevis*, *Crataegus flabellata*, *Crataegus punctata*, *Prunus pensylvanica*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (4-Nov-2010). This type has increased in its cover and abundance because of the reduction of fire frequency and grazing intensity. It may arise from the relaxation of grazing pressure and other management actions in the grassy balds, or it could have arisen from removal of northern red oak, under which an understory of *Crataegus* may occur.

RELATED CONCEPTS

Global Similar Types:
- *Quercus rubra / Carex pensylvanica - Ageratina altissima var. roanensis* Forest (CEGL007298)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: *Crataegus punctata* is a major old-field invader at high elevations of the Southern and Central Appalachians.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Some examples of High-Elevation Red Oak Forest (Tall Herb Type) (CEGL007298) may have a *Crataegus* understory.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: *Crataegus punctata* is a common old-field invader at high elevations of both the Southern and Central Appalachians.
Global Classification Comments: This type has increased in its cover and abundance because of the reduction of fire frequency and grazing intensity. Stands only seem to be found where the grazing effects are particularly strong, where grazing was unusually heavy, prolonged, or recent. For conservation target purposes, it can be treated as a complex with the other shrub and grass bald types with which it typically co-occurs, or conversely as a component of the adjacent northern hardwoods forest.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: A large patch occurs along the AT in the saddle between Beech and Whitetop mountains in Virginia in the Central Appalachian project area.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This vegetation was observed in the saddle between Beech and Whitetop mountains in Virginia.
Global Range: This vegetation is found on the higher elevations of major mountain ranges in the Southern and Central Appalachians.
Nations: US
States/Provinces: NC, TN, VA
TNC Ecoregions: 51:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ab:CCC, M221Ba:CCC, M221Cc:CC?, M221Ce:CCC, M221Da:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee?); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains, Shenandoah?); USFS (Cherokee, George Washington?, Jefferson?, Nantahala?, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXHO
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: No plots or observation points were sampled for this community; however, it was observed in the Southern Blue Ridge and the Central Appalachians during field visits by NatureServe and Natural Heritage ecologists.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: This community was observed by NatureServe ecologists and the UMESC mapping team in the summer of 2010 and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (12 accuracy assessment points): APPA_AA_0091, APPA_AA_0269, APPA_AA_0448, APPA_AA_0722, APPA_AA_0751, APPA_AA_0871, APPA_AA_1122, APPA_AA_1147, APPA_AA_1452, APPA_AA_1486, APPA_AA_1497, APPA_AA_1504.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): C. Nordman and M. Pyne, mod. M. Russo and E. Largay
Global Description Author(s): C. Nordman and M. Pyne
References: Golden 1974, Govus pers. comm., Kartesz 1999, Schafale pers. comm., Southeastern Ecology Working Group n.d.*, Weakley 2010, Weakley pers. comm., Young et al. 2009

[CEGL007879] *Juglans nigra / Verbesina alternifolia* Ruderal Forest

Translated Name: **Black Walnut / Wingstem Ruderal Forest**
Common Name: **Ruderal Black Walnut Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Liriodendron tulipifera - Juglans nigra - Robinia pseudoacacia* Ruderal Forest Alliance (A3228)

ELEMENT CONCEPT

Global Summary: This successional black walnut forest of the eastern United States occurs in a variety of habitats, all associated with disturbance, and frequently associated with rich or circumneutral soils, usually having a neutral to basic pH. These habitats include ridgetops, slopes, floodplains, alluvial terraces, and the floors of sinkholes. These are all generally areas that were cleared for agriculture or homesites. It has been documented from various-sized drainages. The community was originally defined from former homesites in Great Smoky Mountains National Park, where this association is an open, successional forest. It has since been found on some old pasture sites, associated with former settlements, from Georgia northeast to Pennsylvania, and is potentially a wide-ranging type. It has also been sampled from the floors of sinkholes and other related areas at Mammoth Cave National Park. The canopy can be closed to somewhat open. *Juglans nigra* forms at least half of the canopy and is often the sole canopy tree. Associated canopy trees vary from site to site and can include *Liriodendron tulipifera, Juglans cinerea, Robinia pseudoacacia, Fraxinus americana, Ulmus americana, Platanus occidentalis, Acer saccharum, Acer nigrum, Morus rubra*, and *Aesculus flava*. Additional tree species in the subcanopy can include *Carya cordiformis* and *Celtis occidentalis*. *Sassafras albidum* and/or *Carpinus caroliniana* may be present as small trees. The shrub layer may or may not be well-developed; common species include *Asimina triloba, Viburnum prunifolium, Lindera benzoin, Corylus americana*, and the exotic invasive *Rosa multiflora*. The herb layer is variable, often with one or a few species providing most of the cover. *Verbesina alternifolia* (within its range) and *Ageratina altissima* are characteristic and may be dominant; other herbs include *Ambrosia trifida, Amphicarpaea bracteata, Agrimonia pubescens, Apios americana, Cryptotaenia canadensis, Galium triflorum, Osmorhiza longistylis, Dichanthelium clandestinum, Packera aurea, Polygonum virginianum, Rudbeckia laciniata, Podophyllum peltatum, Impatiens capensis, Circaea lutetiana ssp. canadensis, Viola striata*, and *Ambrosia trifida*. The invasive exotics *Microstegium vimineum, Alliaria petiolata, Rosa multiflora*, and *Polygonum caespitosum* can be common in this community.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This successional black walnut forest is frequently found on post-cultivation soil or former orchard sites around old homesites. It was sampled at five locations in the Central Appalachian project area. Sites are gentle to moderate low and mid slopes with dry-mesic, moderately well- to well-drained silt loam soil. The unvegetated surface is dominated by leaf litter with some downed wood, large/small rocks and/or bare soil. Evidence of disturbance includes the presence of exotic plant species.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This successional black walnut forest is frequently found on post-cultivation soil or former orchard sites around old homesites.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This successional black walnut forest was sampled twice in the park, but it is common along the trail. One site is a gentle, northwest-facing summit with mesic, well-drained loam soil; the other is in a valley floor. These forests are frequently found on post-cultivation soils or former orchard sites around old homesites. The unvegetated surface is made up almost entirely of leaf litter. Evidence of disturbance includes past logging and the presence of exotic species.

Global Environment: This successional community occurs in a variety of habitats, all associated with disturbance, and frequently associated with rich or circumneutral soils. These habitats include ridgetops, slopes, floodplains, alluvial terraces, and the floors of sinkholes. These are all generally areas that were cleared for agriculture or homesites. It has been sampled on former homesites along streams at 460-610 m (1500-2000 feet) elevation in the Smokies, as well as on ridgetops, slopes, and stream areas in the Cumberlands, Alleghenies, and Central Appalachians at 430-1070 m (1400-3500 feet). In addition, the association was sampled from the Piedmont of South Carolina in low-lying, poor-drainage areas from approximately 170-200 m (550-650 feet) in elevation. At Mammoth Cave National Park, it was most frequently sampled from terraces in the bottoms of sinkholes. Along the Delaware River and nearby waters, the substrate varies from silt loam to gravelly sandy loams.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This forest is dominated by *Juglans nigra* with an understory of *Verbesina* spp. and/or *Symphoricarpos orbiculatus*. Other common and/or abundant trees may include *Acer negundo, Acer rubrum, Celtis occidentalis, Robinia pseudoacacia, Fraxinus americana, Prunus serotina*, and/or *Ulmus rubra*. *Lindera benzoin* and *Viburnum prunifolium* are dominant shrubs along with exotics such as *Lonicera morrowii, Ligustrum vulgare*, and *Rubus phoenicolasius*. Vines include exotics *Lonicera japonica* and *Celastrus orbiculata*. Dominant herbs can include *Carex* spp., *Polygonum virginianum, Sanicula canadensis*, and the invasive exotic *Microstegium vimineum*. *Parthenocissus quinquefolia* is a common vine.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This forest is dominated by *Juglans nigra* with an understory of *Lindera benzoin* and an herbaceous layer dominated by *Verbesina* spp. or *Sanicula canadensis*; *Celtis occidentalis* may be abundant.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This forest is dominated by *Juglans nigra* with an understory of *Verbesina occidentalis* and/or *Symphoricarpos orbiculatus*. Additional tree species may include *Acer negundo, Acer rubrum, Carpinus caroliniana, Cercis canadensis, Liquidambar styraciflua*, and *Tsuga canadensis*. *Lindera benzoin, Symphoricarpos orbiculatus*, and/or *Viburnum prunifolium* are dominant shrubs. Common and/or abundant herbs include *Ambrosia trifida, Verbesina occidentalis*, and *Microstegium vimineum* (exotic).

Global Vegetation: The canopy can be closed to somewhat open. *Juglans nigra* forms at least half of the canopy and is often the sole canopy tree. Associated canopy trees vary from site to site and can include *Liriodendron tulipifera, Juglans cinerea, Robinia pseudoacacia, Fraxinus americana, Ulmus americana, Platanus occidentalis, Acer saccharum, Acer nigrum, Morus rubra*, and *Aesculus flava*. Additional tree species in the subcanopy can include *Carya cordiformis* and *Celtis occidentalis*. *Sassafras albidum* and/or *Carpinus caroliniana* may be present as small trees. The shrub layer may or may not be well-developed; common species include *Asimina triloba, Viburnum prunifolium, Lindera benzoin, Corylus americana*, and the exotic invasive *Rosa multiflora*. The herb layer is variable, often with one or a few species providing most of the cover. *Verbesina alternifolia* (within its range) and *Ageratina altissima* are characteristic and may be dominant; other herbs include *Amphicarpaea bracteata, Agrimonia pubescens, Apios americana, Cryptotaenia canadensis, Galium triflorum, Osmorhiza longistylis, Dichanthelium clandestinum, Packera aurea, Polygonum virginianum, Rudbeckia laciniata, Podophyllum peltatum, Impatiens capensis, Circaea lutetiana ssp. canadensis, Viola striata*, and *Ambrosia trifida*. The invasive exotics *Microstegium vimineum, Alliaria petiolata*, and *Polygonum caespitosum* can be common in this community.

Global Dynamics: Since this community is the product of an anthropogenic catastrophic disturbance, the canopy is likely to change drastically as new species of trees colonize gaps left by senescent walnuts. *Juglans nigra* may obtain canopy dominance it is resistant to grazing pressure on young seedlings due to the unpalatable juglone present in the leaves and stems. This allelopathic compound also inhibits the growth of *Rubus argutus, Rubus allegheniensis*, and other related species (blackberries), which would help keep the shrub layer open and reduce species diversity.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tree canopy	Broad-leaved deciduous tree	*Celtis occidentalis*, *Juglans nigra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*, *Symphoricarpos orbiculatus*, *Viburnum prunifolium*
Herb (field)	Flowering forb	*Sanicula canadensis*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Celtis occidentalis*, *Juglans nigra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Flowering forb	*Sanicula canadensis*, *Verbesina alternifolia*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Juglans nigra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin*, *Symphoricarpos orbiculatus*, *Viburnum prunifolium*
Herb (field)	Flowering forb	*Verbesina occidentalis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Juglans nigra*
Herb (field)	Flowering forb	*Verbesina alternifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Juglans nigra*, *Lindera benzoin*
Appalachian National Scenic Trail (Lower New England Project Area): *Juglans nigra*, *Lindera benzoin*, *Verbesina alternifolia*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Juglans nigra*, *Lindera benzoin*, *Symphoricarpos orbiculatus*, *Verbesina occidentalis*, *Viburnum prunifolium*
Global: *Cercis canadensis*, *Juglans nigra*, *Rosa multiflora*, *Verbesina alternifolia*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Ligustrum vulgare* (High/Medium), *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum persicaria*, *Prunus avium* (High/Low), *Rosa multiflora* (Medium/Low), *Rubus phoenicolasius* (Medium)
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium, invasive/exotic), *Lolium arundinaceum* (High/Medium, invasive/exotic), *Lonicera japonica* (High/Medium, invasive/exotic), *Microstegium vimineum* (High/Medium, invasive/exotic), *Rosa multiflora* (Medium/Low, invasive/exotic)
Global: Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum caespitosum*, *Rosa multiflora* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (2-Apr-2001). This association represents vegetation created by anthropogenic disturbance and is thus not a conservation priority.

RELATED CONCEPTS

Global Similar Types:

- *Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana - (Robinia pseudoacacia)* Ruderal Forest (CEGL006599) is a modified successional forest that may also have a large component of *Juglans nigra* and occurs on disturbed sites, but it is largely dominated by early-successional trees in the canopy.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This association represents vegetation created by anthropogenic disturbance and is thus not a conservation priority.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed by UMESC in New Jersey, New York, and Connecticut during the summer 2012 mapping reconnaissance.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This association was originally described from Great Smoky Mountains National Park where this association can be distinguished with aerial photography.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled in Cumberland County, Pennsylvania, and at Front Royal in Warren County, Virginia.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed by UMESC in the mapping area during summer 2012 mapping reconnaissance.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled in Tennessee, but it occurs along the trail throughout the Southern Blue Ridge and Central Appalachians.
Global Range: This association is currently known from Georgia and the Carolinas to Tennessee and Kentucky, north to Pennsylvania and New Jersey where *Juglans nigra* is near the northern end of its range. It may range into adjacent states.
Nations: US
States/Provinces: GA, KY, MD, NC, NJ, NY?, PA, SC, TN, VA, WV
TNC Ecoregions: 44:C, 50:C, 51:C, 52:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Bd:CCC, 221Hc:CCC, 221Ja:C??, 222Dg:CCC, 231Aa:PPP, 231Ae:PPP, M221Bb:CCC, M221Be:CCC, M221Cc:CCC, M221Ce:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Antietam, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Southern Blue Ridge], Appomattox Court House, Big South Fork, Blue Ridge Parkway, Bluestone, C&O Canal, Chickamauga-Chattanooga, Colonial, Cumberland Gap, Delaware Water Gap, Great Smoky Mountains, Harpers Ferry, Kings Mountain, Mammoth Cave, Manassas, Monocacy, Ninety Six, Richmond); USFS (Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXCH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (5 observation points; 1 accuracy assessment point): APPA.1282, APPA.1283, APPA.1284, APPA.1285, APPA.1334, APPA_AA_0611.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 accuracy assessment point): APPA_AA_2796.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 1 observation point): APPA.0617, APPA.0631.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo
Global Description Author(s): K.D. Patterson, R. White, S.C. Gawler, and M. Pyne
References: Fleming and Patterson 2011a, Fleming et al. 2006, Holman pers. comm., Lea 2004, NatureServe Ecology - Southeastern U.S. unpubl. data, Patterson 2008a, Patterson 2008c, Patterson 2008f, Peet et al. unpubl. data, Perles et al. 2007, Pyne et al. 2010, Rawinski et al. 1996, Southeastern Ecology Working Group n.d.*, TDNH

unpubl. data, Vanderhorst et al. 2008, WVNHP unpubl. data b, White 2006, White and Govus 2003, White and Govus 2005

[CEGL007219] *Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia* Ruderal Forest

Translated Name: **Tuliptree - Red Maple - Black Locust Ruderal Forest**
Common Name: **Appalachian Ruderal Hardwood Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Liriodendron tulipifera - Juglans nigra - Robinia pseudoacacia* Ruderal Forest Alliance (A3228)

Element Concept

Global Summary: This early-successional or semi-natural vegetation occurs at approximately 700-1220 m (2300-4000 feet) elevation in the southern Appalachian Mountains and Appalachian Plateaus. Examples are typical of areas which were once clearcut, old fields, strip-mined, graded for road construction, or otherwise cleared. Stands are typically revegetated from root and stump sprouts and wind dispersed seeds. Stands have canopies which are typically dominated by *Liriodendron tulipifera* and *Acer rubrum*, with lesser amounts of *Robinia pseudoacacia*. *Robinia pseudoacacia* is listed as a nominal to indicate the Appalachian distribution of this type. Associated species may vary. Some examples may contain *Pinus virginiana*. Tall shrubs (*Rhododendron periclymenoides, Rhododendron calendulaceum, Kalmia latifolia, Calycanthus floridus*) sprout from root stocks and occur as scattered, dense clumps, while shorter shrubs (*Gaylussacia ursina, Leucothoe fontanesiana, Rubus* spp., *Vaccinium* spp.) can have dense, continuous cover. Composition of the herbaceous stratum varies with site conditions and moisture regime and may contain field-adapted species, tolerant of high light intensities, as well as many shade-tolerant forest herbs. *Lycopodium digitatum* may also form dense cover.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This early-successional or semi-natural forest was sampled twice in the park. One site is on a gently midslope with dry-mesic sandy loam soil; the other is a steep, southeast-facing slope with moderately well-drained silt loam soil. The unvegetated surface is dominated by leaf litter with occasional downed wood and bare soil. These sites are very disturbed, the result of clearing, and contain exotic species.
Global Environment: This community occurs on gentle to moderately steep, middle to upper slopes at approximately 700-1220 m (2300-4000 feet) elevation. Important environmental factors, such as solar irradiation, soil moisture/temperature, and air temperature, vary within and between sites and are related to the size of the opening, age of the stand, and slope direction (Phillips and Shure 1990). Soils are primarily Hapludults and Dystrochrepts. This successional forest occurs on upland areas in the southern Appalachian Mountains and Appalachian Plateaus. It typically occurs as 8- to 16-ha patches in the landscape. These forests are typical of areas which were once clearcut, old fields, strip-mined, or cleared by fire or other natural disturbances.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: These young forests are dominated by *Liriodendron tulipifera*, sometimes codominated by *Robinia pseudoacacia* and/or *Acer rubrum* with less than 25% cover of oaks. More diverse examples are dominated by a variable mixture of successional hardwoods, including *Acer rubrum, Acer saccharum, Robinia pseudoacacia, Betula lenta, Betula alleghaniensis, Oxydendrum arboreum, Amelanchier laevis, Nyssa sylvatica*, and *Magnolia fraseri*. Herbs are generally sparse.
Global Vegetation: Some stands of this successional vegetation have canopies which are dominated by *Liriodendron tulipifera* and *Acer rubrum*, with lesser amounts of *Robinia pseudoacacia*. Other stands may have *Liriodendron tulipifera* at lower cover, and instead be dominated by a variable combination of other successional hardwoods, including *Acer rubrum, Robinia pseudoacacia, Sassafras albidum, Betula lenta, Amelanchier laevis, Prunus serotina, Nyssa sylvatica*, and/or *Magnolia fraseri*. The subcanopy may contain *Oxydendrum arboreum* and/or *Cornus florida*. Some examples may contain *Pinus virginiana*. Associated species vary. Taller shrubs include *Rhododendron periclymenoides, Rhododendron calendulaceum, Ilex montana, Pyrularia pubera, Kalmia latifolia*, and *Calycanthus floridus*; shorter shrubs include *Gaylussacia ursina, Leucothoe fontanesiana, Rubus* spp., and *Vaccinium* spp. Composition of the herbaceous stratum varies with site conditions and moisture regime and may

contain field-adapted species which are tolerant of high light intensities, as well as many shade-tolerant forest herbs. *Lycopodium digitatum* may also form dense cover. Most of the regeneration is from stump and root sprouts, however, *Liriodendron tulipifera* establishment is primarily from seedlings. The upper canopy ranges from 5-9 m, but most of the regeneration is in a shrub/sapling layer at 1-3 m. Cover of woody species may be patchy to dense and is characterized by clumps of *Robinia pseudoacacia* and *Acer rubrum*, occurring as stump sprouts. Scattered thickets of evergreen ericads (*Rhododendron* and *Kalmia*) are also typical. Other species occurring as shrubs/saplings include *Calycanthus floridus, Halesia carolina, Pinus strobus, Castanea dentata, Prunus serotina, Pyrularia pubera, Sassafras albidum, Castanea pumila, Hydrangea arborescens, Viburnum acerifolium, Gaylussacia ursina, Rubus* spp., and *Vaccinium* ssp. Short shrubs (<2 m), such as *Gaylussacia ursina, Rubus* spp. and, *Vaccinium* ssp., often form a dense, continuous vegetation layer. Herbaceous species and tree seedlings occur in openings and beneath the shrub cover and include ferns (*Thelypteris noveboracensis, Dennstaedtia punctilobula, Polystichum acrostichoides*, and *Pteridium aquilinum*), other forests forbs (*Potentilla* spp., *Viola* spp., *Ageratina altissima*, Asteraceae spp., *Solidago* spp., *Galium latifolium, Lysimachia quadrifolia*, and *Desmodium* spp.) and grasses (*Arundinaria gigantea, Panicum* spp., and *Dichanthelium* spp.). Vines are also an important component in these forests with *Vitis* spp., *Smilax* spp., *Parthenocissus quinquefolia*, and *Dioscorea villosa* typical.

Global Dynamics: Presumably, individuals arising from sprouts are more susceptible to wind breakage because of constricted vascular tissue at the stump attachment (Phillips and Shure 1990). This is an early-successional forest, on recently cut-over land, dominated by pioneer species. Prior to cutting these areas were dominated by *Pinus strobus* and/or *Quercus* spp. (*Quercus alba, Quercus prinus, Quercus rubra*), occurring with other upland hardwood species such as *Carya* spp. and *Liriodendron tulipifera*. Canopy closure occurs rapidly after time of harvest, and by the fourth year, little unshaded, unvegetated area remains. Mid- and late-successional species will slowly re-establish dominance. Considerable competition of tree species with *Vitis* spp. and *Rhododendron* spp. may affect future stand development on some sites (McGee and Hooper 1970).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Acer saccharum*, *Liriodendron tulipifera*, *Robinia pseudoacacia*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Liriodendron tulipifera*, *Robinia pseudoacacia*
Shrub/sapling (tall & short)	Liana	*Smilax* spp., *Vitis* spp.
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer rubrum*, *Magnolia fraseri*, *Robinia pseudoacacia*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Calycanthus floridus*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Tall shrub/sapling	Shrub	*Rhododendron* spp.
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia ursina*, *Rubus* spp.
Short shrub/sapling	Shrub	*Vaccinium* ssp.
Herb (field)	Flowering forb	*Ageratina altissima*, *Potentilla* spp., *Viola* spp., Asteraceae spp.
Herb (field)	Graminoid	*Arundinaria gigantea*, *Dichanthelium* spp., *Panicum* spp.
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer rubrum*, *Acer saccharum*, *Betula lenta*, *Liriodendron tulipifera*, *Robinia pseudoacacia*

Global: *Acer rubrum*, *Betula lenta*, *Castanea dentata*, *Castanea pumila*, *Cornus florida*, *Desmodium* spp., *Dioscorea villosa*, *Galium latifolium*, *Halesia carolina*, *Hydrangea arborescens*, *Liriodendron tulipifera*, *Lysimachia quadrifolia*, *Nyssa sylvatica*, *Parthenocissus quinquefolia*, *Pinus strobus*, *Prunus serotina*, *Pteridium aquilinum*, *Pyrularia pubera*, *Robinia pseudoacacia*, *Sassafras albidum*, *Solidago* spp., *Viburnum acerifolium*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Invasive/Exotic Plants: *Holcus lanatus* (High/Medium), *Miscanthus sinensis* (Medium)
Global: Vulnerable Plants: *Anemone quinquefolia* var. *minima* (G5T3), *Isotria medeoloides* (G2?)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (7-Dec-2000). This forest represents early successional vegetation or vegetation resulting from anthropogenic activities and is thus not a conservation priority. These forests are typical of areas which were once clearcut, old fields, strip-mined, or cleared by fire or other natural disturbances.

RELATED CONCEPTS

Global Similar Types:
- *Liriodendron tulipifera - Quercus* spp. Ruderal Forest (CEGL007221) resulting from less severe disturbance; a more widespread type as well.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: Some examples of this type are not dominated by, and may not even contain, *Liriodendron tulipifera*. It is restricted to the Appalachian ecoregions (TNC Ecoregions 50 and 51) in contrast to other successional *Liriodendron tulipifera* forests (CEGL007220, CEGL007221). This community differs from *Liriodendron tulipifera - Quercus* spp. Ruderal Forest (CEGL007221) by its lack or relative lack of *Quercus* spp. It differs from other successional *Liriodendron tulipifera* types by the presence of *Robinia pseudoacacia* as well as other hardwoods characteristic of the Southern Appalachians (e.g., *Betula lenta, Amelanchier laevis, Magnolia fraseri*).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled in North Carolina and Tennessee.
Global Range: This community occurs in upland areas of the Blue Ridge escarpment where there has been removal of the above-ground portion of canopy trees within the past ten years. It occurs in North Carolina, South Carolina, Georgia, and Tennessee, in the Blue Ridge Physiographic Province and is likely in the Cumberland Plateau and Ridge and Valley Province.
Nations: US
States/Provinces: GA, KY, NC, SC, TN, VA
TNC Ecoregions: 50:C, 51:C
USFS Ecoregions (1994/95): 221Ha:CCC, 221He:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXAH
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 observation points; 27 accuracy assessment points): APPA.1078, APPA.1118, APPA_AA_0020, APPA_AA_0029, APPA_AA_0056, APPA_AA_0190, APPA_AA_0329, APPA_AA_0330, APPA_AA_0377, APPA_AA_0537, APPA_AA_0605, APPA_AA_0652, APPA_AA_0657, APPA_AA_0666, APPA_AA_0676, APPA_AA_0699, APPA_AA_0708, APPA_AA_0755, APPA_AA_0779, APPA_AA_0794, APPA_AA_0933, APPA_AA_0962, APPA_AA_0991, APPA_AA_1017, APPA_AA_1236, APPA_AA_1361, APPA_AA_1391, APPA_AA_1489, APPA_AA_1508.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo
Global Description Author(s): K.D. Patterson and M. Pyne
References: Allard 1990, Eyre 1980, Golden 1974, Govus 1982, Horn 1976, Horn 1980, McGee and Hooper 1970, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Phillips and Shure 1990, Schmalzer 1978, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Thomas 1966, USFS 1988

[CEGL007221] *Liriodendron tulipifera - Quercus* spp. Ruderal Forest

Translated Name: **Tuliptree - Oak species Ruderal Forest**
Common Name: **Ruderal Tuliptree Forest (Typic Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Liriodendron tulipifera - Juglans nigra - Robinia pseudoacacia* Ruderal Forest Alliance (A3228)

ELEMENT CONCEPT

Global Summary: This broadly defined ruderal or successional community is one of several described upland associations dominated by *Liriodendron tulipifera*. It ranges from the southern Cumberland Plateau, Piedmont, and Interior Low Plateau of the southeastern U.S. north to the northern Piedmont of New Jersey. These successional forests often follow cropping, clearcut logging, or other severe disturbance, and are successional to mixed oak-hickory forests. Examples are common across large areas of the upland landscape which have previously been disturbed. Soils usually exhibit evidence of disturbance and may have little to no organic horizon development. They are typically acidic and well-drained, dry to moist sand, sandy loam, sandy clay loam, or silt loam. Environmental setting is variable, ranging from level to gently sloping uplands to well-drained floodplains and stream terraces. Species found in stands attributable to this type may include a fairly diverse and varied composition. *Acer rubrum, Quercus* spp., *Betula lenta, Oxydendrum arboreum, Acer saccharum*, and occasionally *Liquidambar styraciflua, Ilex opaca*, or *Robinia pseudoacacia* may be common in stands of this type. Where oaks are present, they are frequently multi-stemmed, resulting from coppicing. The conifer *Tsuga canadensis* is abundant in the understories of some stands. Shrub composition is variable but may include *Sambucus nigra ssp. canadensis, Rhododendron maximum, Hamamelis virginiana*, and *Vaccinium pallidum*. Herbs are likewise variable; West Virginia samples feature *Dioscorea quaternata, Lysimachia quadrifolia, Maianthemum racemosum, Solidago curtisii, Symphyotrichum prenanthoides, Polystichum acrostichoides, Dryopteris intermedia, Arisaema triphyllum ssp. triphyllum, Packera aurea, Amphicarpaea bracteata, Thelypteris noveboracensis, Lycopodium digitatum*, and *Geranium maculatum*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This typic successional acidic tuliptree - oak forest was sampled at three locations in this section of the park. It also occurs in the Southern Blue Ridge. The sites are moderate mid and lower slopes with well-drained sandy loam soil. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. These sites are likely the result of past stand-initiating disturbance such as logging or fire, further evidenced by the presence of exotic plant species.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This widely distributed and common successional tuliptree forest was sampled at nine locations in the park. Sites range from gentle to somewhat steep, lower and upper slopes and ridges. Soils are typically mesic, well-drained loam. The unvegetated surface is dominated by leaf litter (up to 98% cover) with small amounts of large rocks and downed wood. Evidence of disturbance includes past clearing.
Global Environment: These ruderal upland deciduous forests are found primarily in areas which were once clearcuts, old fields, or were cleared by fire or other natural disturbances. These successional forests often follow cropping, clearcut logging, or other severe disturbance, and are successional to mixed oak-hickory forests. Examples are common across large areas of the upland landscape which have previously been disturbed. Soils usually exhibit evidence of disturbance and may have little to no organic horizon development. Environmental setting is variable, ranging from level to gently sloping uplands to well-drained floodplains and stream terraces.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The dense (up to 90% cover) 20- to 35-m tall canopy is dominated by *Liriodendron tulipifera*. Additional tree species include *Acer rubrum, Betula lenta, Carya cordiformis, Cornus florida, Nyssa sylvatica, Quercus rubra, Quercus alba, Quercus coccinea*, and *Quercus prinus*. The sparse (up to 20%) shrub layers include canopy species as well as *Rubus allegheniensis, Lindera benzoin* (in small amounts), and *Vaccinium pallidum*. Herbs include *Dennstaedtia punctilobula*. *Toxicodendron radicans* is a dominant vine; *Smilax rotundifolia*, and *Vitis* sp. are also common.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The dense canopy is dominated by *Liriodendron tulipifera* and often codominated by young *Quercus* spp., *Acer rubrum*, and/or *Betula alleghaniensis* (greater than 25% of understory/canopy). In sampled stands, *Liriodendron tulipifera* is the clear dominant, but other common and/or abundant trees may include *Acer rubrum, Acer saccharum, Carya glabra, Fraxinus americana, Halesia tetraptera var. monticola*, and *Nyssa sylvatica*. *Rubus allegheniensis* dominates the

shrub layers; additional shrubs may include *Acer pensylvanicum, Carya ovalis, Castanea dentata, Cornus florida, Fagus grandifolia*, and *Toxicodendron radicans*. Common and/or abundant herbs include *Ageratina altissima, Desmodium nudiflorum, Eupatorium purpureum, Solidago curtisii (= Solidago caesia var. curtisii)*, and *Stellaria pubera*.

Global Vegetation: The canopy of this ruderal upland association is dominated by *Liriodendron tulipifera*. *Quercus* species (*Quercus alba, Quercus rubra, Quercus falcata, Quercus nigra, Quercus velutina*) are often present; additional associates may include *Acer barbatum, Acer rubrum, Carya* spp., *Fagus grandifolia, Nyssa sylvatica, Cornus florida*, and *Robinia pseudoacacia*. *Betula lenta* is a common associate at the northern range limit. Shrub layers may include saplings of the canopy species and *Acer pensylvanicum, Amelanchier arborea, Hamamelis virginiana, Lindera benzoin* (in small amounts), and *Vaccinium pallidum*. Herbs vary across the range but may include *Actaea racemosa, Dichanthelium clandestinum, Dioscorea quaternata, Galium circaezans, Geranium maculatum, Goodyera pubescens, Medeola virginiana, Potentilla simplex, Scutellaria serrata, Thelypteris noveboracensis*, and *Uvularia perfoliata*. *Lycopodium digitatum* may be abundant in some stands.

Global Dynamics: This community is widespread in areas that had stand-initiating disturbance such as heavy logging or plowing in the recent past. In areas that have been protected for more than 80 years, this community is uncommon.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera*
Tree canopy	Broad-leaved deciduous tree	*Quercus* spp.
Herb (field)	Liana	*Toxicodendron radicans*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera*
Tall shrub/sapling	Broad-leaved deciduous tree	*Cornus florida*
Herb (field)	Fern (Spore-bearing forb)	*Lycopodium digitatum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Liriodendron tulipifera*, *Quercus* spp., *Vaccinium pallidum*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer pensylvanicum*, *Acer rubrum*, *Liriodendron tulipifera*, *Rubus allegheniensis*, *Solidago curtisii*

Global: *Acer pensylvanicum*, *Acer rubrum*, *Actaea racemosa*, *Amelanchier arborea*, *Carya glabra*, *Dichanthelium clandestinum*, *Fagus grandifolia*, *Galium circaezans*, *Geranium maculatum*, *Goodyera pubescens*, *Hamamelis virginiana*, *Lycopodium digitatum*, *Medeola virginiana*, *Nyssa sylvatica*, *Quercus falcata*, *Quercus rubra*, *Quercus velutina*, *Robinia pseudoacacia*, *Thelypteris noveboracensis*, *Uvularia perfoliata*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium)

Global: Vulnerable Plants: *Hexastylis naniflora* (G3), *Trillium rugelii* (G3), *Trillium simile* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (19-Aug-2002). This forest represents early-successional vegetation and is thus not a priority for conservation. This is a successional vegetation type composed of native species. Its conservation value is limited, but mature examples could provide buffer for communities of greater conservation value. It may also support rare animal and plant species.

RELATED CONCEPTS

Global Similar Types:
- *Liriodendron tulipifera - Acer negundo* Ruderal Forest (CEGL007184) a bottomland type.
- *Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia* Ruderal Forest (CEGL007219) is generally found on steeper slopes and/or shallow soils and with a more intense history of disturbance.
- *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Ruderal Forest (CEGL007220) is generally found on calcareous or at least pH neutral soils.
- *Liriodendron tulipifera* Ruderal Forest (CEGL007218) more early-successional.
- *Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana - (Robinia pseudoacacia)* Ruderal Forest (CEGL006599)
- *Prunus serotina - Sassafras albidum - (Fraxinus americana) / Juniperus virginiana* Ruderal Forest (CEGL004133)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Distinguished from Ruderal Tuliptree Forest (Rich Type) (CEGL007220) by the presence of oaks in canopy and/or subcanopy (>10% cover) and understory lacking calcium-rich indicators. Can occur with nearly all *Liriodendron* in canopy.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: It differs from other described types within its range based on the lack of a significant pine component [see *Liriodendron tulipifera - Pinus taeda* Ruderal Forest (CEGL007521)] and the absence of species affiliated with circumneutral conditions [see *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Ruderal Forest (CEGL007220)]; it is later successional and more diverse than *Liriodendron tulipifera* Ruderal Forest (CEGL007218) and tends to be found on more stable soil substrates and less steep slopes than *Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia* Ruderal Forest (CEGL007219).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was observed in Dauphin County in central Pennsylvania, at Harpers Ferry, West Virginia, and in Clarke County, in the Frogtown area of Virginia.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This association ranges from the Southern Appalachians to the Central Appalachians. It was sampled in Georgia (8 sites) and Tennessee (1 site) along the trail.
Global Range: This association is known from the southern Cumberland Plateau, Piedmont, and Interior Low Plateau of the southeastern U.S. and may also occur in the Upper East Gulf Coastal Plain. It ranges north to the northern Piedmont of New Jersey and adjacent Pennsylvania. It is also known from Alabama, Georgia, Kentucky, Maryland, North Carolina, South Carolina, Tennessee, West Virginia, Virginia, and possibly Delaware.
Nations: US
States/Provinces: AL, DC, DE?, GA, KY, MD, NC, NJ, PA, SC, TN, VA, WV
TNC Ecoregions: 43:P, 44:C, 50:C, 51:C, 52:C, 58:C, 59:C, 61:C
USFS Ecoregions (1994/95): 221Hc:CCC, 221He:CCC, 222Cg:CCC, 222Dg:CCC, 222Eb:CCC, 222Eg:CCC, 222En:CCC, 222Eo:CCC, 231Aa:CCP, 231Ab:CCC, 231Ae:CCC, 231Ak:CCC, 231An:CCC, 231Bc:CCC, 231Bh:CCC, 231Cd:CCP, 231Dc:CCC, 232Ad:C??, 232Br:CCC, M221Bb:CCC, M221Ca:CCC, M221Cb:CCC, M221Cd:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); DOD (Fort Benning); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Appomattox Court House, Big South Fork, Blue Ridge Parkway, Booker T. Washington, C&O Canal, Carl Sandburg Home, Catoctin Mountain, Chattahoochee River, Chickamauga-Chattanooga?, Cowpens, Cumberland Gap, Fredericksburg-Spotsylvania, Gauley River, George Washington Parkway, Great Smoky Mountains, Guilford Courthouse, Horseshoe Bend, Kennesaw Mountain, Kings Mountain, Mammoth Cave, Morristown, Natchez Trace, National Capital-East, New River Gorge, Ninety Six, Obed River, Petersburg, Prince William, Richmond, Rock Creek, Shiloh, Valley Forge, Wolf Trap); USFS (Bankhead, Daniel Boone, Oconee?, Talladega, Talladega (Oakmulgee)?, Talladega (Talladega)); USFWS (Patuxent)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXTT
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: This community was observed by Pennsylvania Natural Heritage Program ecologists in the summer of 2010 while collecting observation points for the project.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 observation points; 9 accuracy assessment points): APPA.1233, APPA.1280, APPA.1281, APPA_AA_0008, APPA_AA_0146, APPA_AA_0280, APPA_AA_0725, APPA_AA_1008, APPA_AA_1039, APPA_AA_1149, APPA_AA_1406, APPA_AA_1416.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (9 observation points; 26 accuracy assessment points): APPA.1026, APPA.1030, APPA.1038, APPA.1041, APPA.1041B, APPA.1051, APPA.1053B, APPA.1054, APPA.1121, APPA_AA_0048, APPA_AA_0078, APPA_AA_0104, APPA_AA_0175, APPA_AA_0197, APPA_AA_0219, APPA_AA_0294, APPA_AA_0387, APPA_AA_0522, APPA_AA_0578, APPA_AA_0589, APPA_AA_0627, APPA_AA_0684, APPA_AA_0685, APPA_AA_0806, APPA_AA_0837, APPA_AA_1057, APPA_AA_1058, APPA_AA_1062, APPA_AA_1069, APPA_AA_1223, APPA_AA_1230, APPA_AA_1269, APPA_AA_1522, APPA_AA_1568, APPA_AA_1578.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo
Global Description Author(s): R.E. Evans, M. Pyne, L.A. Sneddon, R. White and S.C. Gawler
References: Ehrenfeld 1977, Fleming 2002b, Fleming and Patterson 2003, Gallyoun et al. 1996, Keever 1973, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman et al. 2011, Overlease 1987, Patterson 2008a, Patterson 2008b, Patterson 2008e, Patterson 2008f, Podniesinski et al. 2005b, Pyne et al. 2010, Russell and Schuyler 1988, Schmalzer and DeSelm 1982, Schotz pers. comm., Sneddon et al. 2008, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Taverna and Patterson 2008, Vanderhorst 2001a, Vanderhorst and Streets 2006, Vanderhorst et al. 2007, Vanderhorst et al. 2010, White 2003, White 2004, White 2006, White and Govus 2003, White and Govus 2005, White and Pyne 2003

[CEGL007220] *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Ruderal Forest

Translated Name: **Tuliptree / (Eastern Redbud) / (Northern Spicebush) Ruderal Forest**
Common Name: **Ruderal Tuliptree Forest (Rich Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Liriodendron tulipifera - Juglans nigra - Robinia pseudoacacia* Ruderal Forest Alliance (A3228)

ELEMENT CONCEPT

Global Summary: This ruderal or successional community dominated by *Liriodendron tulipifera* occurs in the Ridge and Valley of Tennessee and Virginia, the Interior Low Plateau of Kentucky, and the Central Appalachians, Piedmont and inner Coastal Plain regions of Virginia, West Virginia, Pennsylvania, and Maryland. Plots attributable to this type are also known from the Piedmont of Georgia. It may also occur in similar regions of Delaware. It is distinguished from other upland communities dominated by *Liriodendron tulipifera* by the presence of species associated with soils with moderately high base saturation levels (rich soils). Species found in stands attributable to this type may be fairly diverse and result in a varied composition. In addition to *Liriodendron tulipifera*, other canopy species may include *Liquidambar styraciflua, Acer saccharum, Aesculus flava, Platanus occidentalis, Quercus rubra, Acer rubrum, Robinia pseudoacacia, Juglans nigra, Halesia tetraptera, Fraxinus americana, Fagus grandifolia, Magnolia acuminata, Ulmus rubra, Quercus imbricaria, Quercus muehlenbergii*, and *Carya ovata*. Species often found in the subcanopy include *Acer saccharum, Cercis canadensis, Ulmus alata, Fraxinus americana, Morus rubra*, and *Cornus florida*. Shrubs include saplings of the subcanopy and canopy species, as well as *Lindera benzoin, Symphoricarpos orbiculatus, Asimina triloba, Staphylea trifolia, Acer negundo*, and *Juniperus virginiana var. virginiana*. Exotic shrubs, including *Rosa multiflora, Rubus phoenicolasius*, and *Lonicera japonica*, are present at some sites. Herb-layer species include the exotics *Microstegium vimineum, Alliaria petiolata*, and *Veronica hederifolia*, as well as *Toxicodendron radicans, Parthenocissus quinquefolia, Smilax tamnoides, Actaea racemosa, Caulophyllum thalictroides, Laportea canadensis, Impatiens pallida, Hydrophyllum canadense,*

Adiantum pedatum, Polygonatum pubescens, Verbesina alternifolia, Amphicarpaea bracteata, and *Polystichum acrostichoides*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: These early-successional, post-disturbance forests are typically 50-75 years old. They occur on relatively fertile substrates. Sites are gentle to somewhat steep midslopes with dry-mesic rapidly to moderately well-drained sandy loam and silt loam soils. The unvegetated surface is dominated by leaf litter with some downed wood and occasional rocks and bare soil. Evidence of disturbance includes past clearing and the presence of exotic species.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: These early-successional, post-disturbance forests are typically 50-75 years old. They occur on relatively fertile substrates. Sites are gentle to somewhat steep midslopes with dry-mesic rapidly to moderately well-drained sandy loam and silt loam soils. The unvegetated surface consists of leaf litter with some downed wood and occasional rocks and bare soil. Evidence of disturbance includes past clearing and the presence of exotic species.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: These are early-successional, even-aged, post-disturbance forests, which are typically 50-75 years old. They occur in a variety of landscape settings, most often abandoned old fields, on high calcium or base rich soils. Evidence of disturbance includes past clearing and an abundance of exotic plant species.
Global Environment: These forests are found on disturbed mesic areas underlain by rich soils with moderately high base saturation levels. It occurs on abandoned farmland and townsites, old strip mines, old clearcuts, burned areas, and other areas where the canopy was removed or heavily disturbed in the past. Small patches may occur in areas where canopy disturbance has resulted from natural causes such as windfall or landslides. Soils may be underlain by a variety of geologic strata that weather to base-rich soils including limestone, dolomite, calcareous shale, shell deposits, metabasalts and granitic complexes. In Kentucky this association may occur on calcareous substrates in the Dripping Springs Escarpment. At Shenandoah National Park in Virginia, this community is underlain by Catoctin metabasalt or a pyroxene-bearing granitic complex. In West Virginia, parent materials include sandstone, shale, and alluvium. Soils in plots were described as moderately well-drained to well-drained clay, silt loam, and sandy loam with pH ranging from 5.0 to 7.5, with relatively high levels of organic matter, estimated N release, Ca, Cu, K, Mg, and Mn, and relatively low levels of S, Al, B, Fe, P, and Zn compared to average values in the area.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is dominated by *Liriodendron tulipifera* with greater than 30% cover of the canopy. Additional trees, any one of which may be codominant in some stands, include *Acer rubrum, Carya glabra, Fraxinus americana*, and/or *Quercus rubra*. Understory species are indicative of high-calcium or base-rich soils, such as *Cercis canadensis, Symphoricarpos orbiculatus*, or *Lindera benzoin* (clear dominant in the sampled plots). Common herbs include *Arisaema triphyllum, Circaea lutetiana ssp. canadensis, Galium circaezans, Polygonum virginianum*, and *Viola* spp. Invasive exotic shrubs, including *Rosa multiflora, Rubus phoenicolasius*, and/or *Lonicera japonica*, may be common. In addition, this community supports VA-state critically imperiled *Bromus ciliatus* and *Cardamine clematitis*.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy is dominated by *Liriodendron tulipifera*. Understory species are indicative of high-calcium or base-rich soils, such as *Lindera benzoin*. Common herbs include *Circaea lutetiana ssp. canadensis, Galium circaezans, Polygonum virginianum*, and *Viola* spp. Invasive exotic shrubs, including *Rosa multiflora, Rubus phoenicolasius*, and/or *Lonicera japonica*, may be common.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is dominated by *Liriodendron tulipifera* with greater than 50% cover of the canopy. Additional trees may include *Acer rubrum, Carya glabra, Fraxinus americana*, and *Quercus rubra*. Understory species are indicative of high calcium or base rich soils such as *Cercis canadensis, Symphoricarpos orbiculatus*, or *Lindera benzoin* (clear dominant in the sampled plots). Common herbs include *Arisaema triphyllum, Circaea lutetiana ssp. canadensis, Galium circaezans, Polygonum virginianum*, and *Viola* spp. In addition, this community supports VA-state critically imperiled and regional endemic *Cardamine clematitis*.
Global Vegetation: Stands are dominated by *Liriodendron tulipifera* but also include various other species, including ones indicative of nutrient-rich or circumneutral environments. Other species include *Liquidambar styraciflua, Acer saccharum, Aesculus flava, Platanus occidentalis, Quercus rubra, Acer rubrum, Robinia pseudoacacia, Juglans nigra, Halesia tetraptera, Fraxinus americana, Fagus grandifolia, Magnolia acuminata, Ulmus rubra, Quercus imbricaria, Quercus muehlenbergii*, and *Carya ovata* (NatureServe Ecology unpubl. data,

VDNH unpubl. data, WVNHP unpubl. data.). Species often found in the subcanopy include *Acer saccharum, Cercis canadensis, Ulmus alata, Morus rubra, Sassafras albidum*, and *Cornus florida*. *Cercis canadensis* is often abundant on soils underlain by carbonate strata. Shrubs include saplings of the subcanopy and canopy species, as well as *Symphoricarpos orbiculatus, Lindera benzoin, Asimina triloba*, and *Juniperus virginiana var. virginiana*. *Lindera benzoin* is often abundant in occurrences of this community in the Central Appalachians, Piedmont and Inner Coastal Plain regions of Virginia, West Virginia, and Maryland. Exotic shrubs, including *Rosa multiflora, Rubus phoenicolasius*, and *Lonicera japonica*, are present at some sites. Vines, which may be abundant, include *Aristolochia macrophylla, Toxicodendron radicans, Parthenocissus quinquefolia, Smilax tamnoides*, and *Vitis aestivalis var. bicolor*. Herbaceous species include the exotics *Microstegium vimineum, Alliaria petiolata*, and *Veronica hederifolia*, as well as *Actaea racemosa, Ageratina altissima, Arisaema triphyllum, Asarum canadense, Caulophyllum thalictroides, Cryptotaenia canadensis, Galium triflorum, Laportea canadensis, Impatiens pallida, Hydrophyllum canadense, Osmorhiza longistylis, Adiantum pedatum, Polygonatum pubescens, Polystichum acrostichoides, Verbesina alternifolia, Amphicarpaea bracteata, Solidago caesia*, and *Polystichum acrostichoides*. (Andreu and Tukman 1995, NatureServe Ecology unpubl. data, VDNH unpubl. data, WVNHP unpubl. data). Examples at Fort Donelson that have been very heavily disturbed may have local dominance by *Celtis laevigata* and *Juglans nigra*.

Global Dynamics: This community occurs in successional situations, generally where forest clearing has a taken place in the past. In West Virginia, this type is found in areas that have been logged repeatedly, as well as on abandoned farmland and mines.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Arisaema triphyllum*, *Carya glabra*, *Galium circaezans*, *Lindera benzoin*, *Liriodendron tulipifera*, *Quercus rubra*
Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Carya glabra*, *Circaea lutetiana* ssp. *canadensis*, *Galium circaezans*, *Lindera benzoin*, *Liriodendron tulipifera*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Acer rubrum*, *Arisaema triphyllum*, *Carya glabra*, *Galium circaezans*, *Lindera benzoin*, *Liriodendron tulipifera*, *Quercus rubra*
Global: *Acer saccharum*, *Aesculus flava*, *Ageratina altissima*, *Arisaema triphyllum*, *Aristolochia macrophylla*, *Asarum canadense*, *Asimina triloba*, *Carya ovata*, *Cercis canadensis*, *Cryptotaenia canadensis*, *Galium triflorum*, *Lindera benzoin*, *Osmorhiza longistylis*, *Parthenocissus quinquefolia*, *Polystichum acrostichoides*, *Toxicodendron radicans*, *Ulmus rubra*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Bromus ciliatus* (G5, VA state-critically imperiled), *Cardamine clematitis* (G3, globally vulnerable & VA state-critically imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Celastrus orbiculata* (High/Medium), *Glechoma hederacea* (Low), *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum cuspidatum* (High/Medium), *Polygonum persicaria*, *Rosa multiflora* (Medium/Low), *Stellaria media* (Low)
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Cardamine clematitis* (G3, VA state-critically imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium,

invasive/exotic), *Alliaria petiolata* (High/Medium, invasive/exotic), *Celastrus orbiculata* (High/Medium, invasive/exotic), *Glechoma hederacea* (Low, invasive/exotic), *Lonicera japonica* (High/Medium, invasive/exotic), *Microstegium vimineum* (High/Medium, invasive/exotic), *Polygonum persicaria* (invasive/exotic), *Rosa multiflora* (Medium/Low, invasive/exotic), *Stellaria media* (Low, invasive/exotic)
Global: Vulnerable Plants: *Cardamine clematitis* (G3), *Panax quinquefolius* (G3G4, under collection pressure), *Penstemon smallii* (G3), *Schisandra glabra* (G3), *Scutellaria saxatilis* (G3), *Trillium rugelii* (G3); **Invasive/Exotic Plants**: *Alliaria petiolata* (High/Medium), *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Rosa multiflora* (Medium/Low), *Rubus phoenicolasius* (Medium), *Veronica hederifolia*

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (28-Oct-2003). This forest represents successional vegetation and is thus not of high conservation concern. It is composed largely of native species, though exotics may be locally abundant. Its conservation value is limited, but mature examples could provide buffer for communities of greater conservation value.

RELATED CONCEPTS

Global Similar Types:
- *Liriodendron tulipifera - Pinus taeda* Ruderal Forest (CEGL007521) supports a significant pine component.
- *Liriodendron tulipifera - Quercus rubra - Fraxinus americana / Asimina triloba / Actaea racemosa* Forest (CEGL006186)
- *Liriodendron tulipifera - Quercus* spp. Ruderal Forest (CEGL007221) on more acidic substrates, lacks species affiliated with circumneutral conditions.
- *Liriodendron tulipifera* Ruderal Forest (CEGL007218) is less diverse and earlier successional.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Oaks are generally absent, with a large presence of understory species indicative of high-calcium or base-rich soils such as *Cercis canadensis, Symphoricarpos orbiculatus*, or *Lindera benzoin*.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: This is common in successional association that occurs on the landscape with modified successional forests, abandoned farmland, townsites, old strip mines, old clearcuts, burned areas, and other areas where the canopy was removed or heavily disturbed in the past.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed by UMESC during summer 2012 mapping reconnaissance.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Limited to the northern portion of the Southern Blue Ridge in southwestern Virginia and more common in the Central Appalachians. This community was not sampled but is probable in the project area.
Global Classification Comments: This type was originally described from the work of Andreu and Tukman (1995) but was later modified to emphasize stands with moderately high base saturation levels. It is apparently a widespread successional forest of relatively fertile substrates in all provinces of the Mid-Atlantic states and in parts of the Southeast.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was observed at Angels Rest, Bluff City North, the Frogtown area, Front Royal, Kimberling Creek, and McAfee Knob in Virginia. One observation point is from Lebanon County in central Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed by UMESC in New Jersey and New York during summer 2012 mapping reconnaissance.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This is a relatively uncommon type in APPA and is mostly restricted to Virginia. In the Central Appalachian project area, it was sampled at Angels Rest, Bluff City North, and McAfee Knob.
Global Range: This type occurs in the Ridge and Valley and Cumberland Plateau of Tennessee, the Interior Low Plateau of Kentucky, the Upper East Gulf Coastal Plain of Mississippi, and the Central Appalachian, Piedmont and Inner Coastal Plain regions of Virginia, West Virginia, Maryland, Pennsylvania, and possibly Delaware. Plots attributable to this type are also known from the Georgia Piedmont. Its full range has not been documented.

Nations: US
States/Provinces: AL, DC, DE, GA, KY, MD, MS, NY, PA, TN, VA, WV
TNC Ecoregions: 43:C, 44:C, 50:C, 51:C, 52:C, 58:C, 59:C
USFS Ecoregions (1994/95): 221Hc:CCC, 221He:CCC, 221Jb:CCC, 222Dg:CCC, 222Dj:CCC, 222Eg:CCC, 231Ae:CCC, 231Al:CCC, 231Ap:CCC, 231Bd:CCC, 232Ad:CCC, M221Ab:CCC, M221Bb:CCC, M221Be:CCC, M221Cb:CCC, M221Da:CCC
Federal Lands: NPS (Abe Lincoln Birthplace, Antietam, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Bluestone, C&O Canal, Catoctin Mountain, Chattahoochee River, Chickamauga-Chattanooga, Cumberland Gap, Fort Donelson, George Washington Parkway, Great Smoky Mountains, Harpers Ferry, Mammoth Cave, Monocacy, Natchez Trace, National Capital-East, New River Gorge, Obed River, Rock Creek, Shenandoah, Thomas Stone, Vicksburg, Wolf Trap); TVA (Tellico); USFS (Cherokee?, Monongahela); USFWS (National Conservation Training Center)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXTT
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed by UMESC in New Jersey and New York during summer 2012 mapping reconnaissance and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (14 observation points; 12 accuracy assessment points): APPA.1145, APPA.1147, APPA.1155, APPA.1187, APPA.1234, APPA.1273, APPA.1274, APPA.1275, APPA.1276, APPA.1277, APPA.1278, APPA.1279, APPA.1299, APPA.1328, APPA_AA_0024, APPA_AA_0240, APPA_AA_0378, APPA_AA_0532, APPA_AA_0549, APPA_AA_0756, APPA_AA_0766, APPA_AA_0769, APPA_AA_0770, APPA_AA_0883, APPA_AA_1032, APPA_AA_1373.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (5 accuracy assessment points): APPA_AA_1646, APPA_AA_2279, APPA_AA_2600, APPA_AA_2617, APPA_AA_2791.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 accuracy assessment point): APPA_AA_0993.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): R.E. Evans, M. Pyne, J. Teague, C.W. Nordman, R. White, S.C. Gawler
References: Andreu and Tukman 1995*, Coxe 2009, Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming et al. 2006, Fleming pers. comm., Hall and Mathews 1974, Lea 2000, Lea 2003, Lea 2004, Lea et al. 2012, Lea et al. 2013, Martin 1989, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman et al. 2011, Pyne et al. 2010, Rentch et al. 2005, Schmalzer and DeSelm 1982, Shreve et al. 1910, Southeastern Ecology Working Group n.d., TDNH unpubl. data, VDNH unpubl. data, Vanderhorst 2001a, Vanderhorst et al. 2007, Vanderhorst et al. 2008, WVNHP unpubl. data b, White 2005, White 2006, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL007279] *Robinia pseudoacacia* Ruderal Forest

Translated Name: **Black Locust Ruderal Forest**
Common Name: **Ruderal Black Locust Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	*Liriodendron tulipifera - Juglans nigra - Robinia pseudoacacia* Ruderal Forest Alliance (A3228)

ELEMENT CONCEPT

Global Summary: This black locust ruderal forest is found locally throughout the eastern United States. Stands often establish on old fields abandoned after agricultural cropping or pasturing or around old homesites. In some areas it occurs on post-agricultural floodplain terraces. This vegetation has also become established following the

planting of *Robinia pseudoacacia* to stabilize and enrich nutrient-poor soils that are subject to erosion. The vegetation is dominated by *Robinia pseudoacacia*. Associated woody species vary from site to site and include *Prunus serotina, Juniperus virginiana, Ulmus americana, Ulmus rubra, Carya ovata, Celtis occidentalis, Juglans nigra, Quercus rubra, Ulmus rubra*, and in some areas *Acer platanoides* or *Ailanthus altissima*. Understory vegetation is highly variable depending on site history and often includes *Toxicodendron radicans*; *Lindera benzoin* is sometimes present. The invasive non-native *Rosa multiflora* may be present as a shrub, along with the non-native bramble *Rubus phoenicolasius*. Non-native species such as *Alliaria petiolata, Chelidonium majus, Glechoma hederacea*, and *Convallaria majalis* can characterize the herb layer, which may also have a native component.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This black locust successional forest is frequently found in abandoned fields and other post-cultivation lands. Sampled sites are moderate to somewhat steep upper slopes and summits at elevations ranging from 850 to 1,200 m. Soils are mesic, moderately well- to well-drained loam. The unvegetated surface is made up entirely by leaf litter or with a small amount of downed wood. Evidence of disturbance includes past clearing, fire, and the presence of exotic plant species.

Global Environment: This type often establishes on old fields abandoned after agricultural cropping or pasturing or around old home sites. This vegetation has also become established following the planting of *Robinia pseudoacacia* to stabilize and enrich nutrient-poor soils that are subject to erosion (Rabie 2000). Soils are variable and may be highly acidic, especially where established on old mine sites.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The relatively sparse canopy is dominated by *Robinia pseudoacacia*; additional canopy or subcanopy trees can include *Fraxinus americana, Liriodendron tulipifera*, and *Quercus rubra*. Shrubs are sparse but include *Rubus occidentalis*. Dominants in the dense herbaceous layer may be *Dichanthelium clandestinum, Verbesina alternifolia*, and/or *Verbesina occidentalis*.

Global Vegetation: The vegetation is dominated by *Robinia pseudoacacia* forming a partial to nearly complete canopy. Associated woody species vary from site to site and include *Prunus serotina, Juniperus virginiana, Ulmus americana, Ulmus rubra, Carya ovata, Celtis occidentalis, Juglans nigra, Quercus rubra, Ulmus rubra, Acer rubrum, Nyssa sylvatica*, and in some areas *Acer platanoides* or *Ailanthus altissima*. In addition, *Cornus florida* may be present in the subcanopy. Understory vegetation is highly variable depending on site history and often includes *Toxicodendron radicans*; *Lindera benzoin* is sometimes present. The invasive non-natives *Rosa multiflora* and *Elaeagnus umbellata* are typically the most common shrubs, along with the non-native bramble *Rubus phoenicolasius*. Non-native species such as *Alliaria petiolata, Chelidonium majus, Glechoma hederacea, Dactylis glomerata, Daucus carota*, and *Convallaria majalis* can characterize the herb layer, which may have a native component as well, for example with (depending on geography) *Ageratina altissima, Dichanthelium clandestinum, Elymus hystrix var. hystrix, Leersia virginica, Parthenocissus quinquefolia, Pilea pumila, Solidago canadensis, Solidago rugosa, Verbesina alternifolia, Verbesina occidentalis*, and *Viola* spp.

Most Abundant Species

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera*, *Robinia pseudoacacia*
Herb (field)	Flowering forb	*Verbesina alternifolia*
Herb (field)	Graminoid	*Dichanthelium clandestinum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Robinia pseudoacacia*

Characteristic Species

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Dichanthelium clandestinum*, *Robinia pseudoacacia*, *Rubus occidentalis*, *Verbesina alternifolia*

Global: *Acer rubrum*, *Robinia pseudoacacia*, *Rosa multiflora*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium, invasive/exotic), *Leonurus cardiaca* (invasive/exotic), *Lonicera japonica* (High/Medium, invasive/exotic), *Lonicera morrowii* (High/Medium, invasive/exotic), *Taraxacum officinale* (invasive)
Global: Invasive/Exotic Plants: *Acer platanoides* (High/Medium), *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Chelidonium majus* (Medium/Insignificant), *Convallaria majalis*, *Dactylis glomerata* (Medium/Insignificant), *Daucus carota* (Low), *Elaeagnus umbellata* (High), *Glechoma hederacea* (Low), *Rosa multiflora* (Medium/Low), *Rubus phoenicolasius* (Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (24-Oct-2002). Although *Robinia pseudoacacia* is a native species found in the Central Appalachians and Ozark Mountains, it does not typically become a dominant species in these natural habitats (Elias 1980). It is now widespread in the eastern U.S. in disturbed habitats. This forest represents early-successional vegetation and is thus not of high conservation concern and does not receive a conservation status rank.

RELATED CONCEPTS

Global Similar Types:

- *Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana - (Robinia pseudoacacia)* Ruderal Forest (CEGL006599) can have *Robinia* as an important canopy component but is not dominated by it as is this type.
- *Prunus serotina - Sassafras albidum - (Fraxinus americana) / Juniperus virginiana* Ruderal Forest (CEGL004133)
- *Robinia pseudoacacia - Celtis occidentalis - (Fraxinus americana, Liriodendron tulipifera)* Ruderal Forest (CEGL007281)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This community was sampled in Tennessee and at Pass Mountain, Virginia, but is likely more common along the trail in the Southern and Central Appalachians.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled in Tennessee and at Pass Mountain, Virginia, but is likely more common along the trail in the Southern and Central Appalachians.
Global Range: This black locust ruderal forest is found locally throughout the eastern United States.
Nations: US
States/Provinces: AR, DC?, DE, IA, KY, MA, MD, MS, NC, NJ, NY, OH, OK, PA, TN, VA, VT, WV
TNC Ecoregions: 38:C, 39:C, 43:C, 44:C, 48:C, 49:C, 50:C, 51:C, 59:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 221Aa:CCP, 221Ab:CCC, 221Ae:CCC, 221Ai:CCC, 221Bc:CCC, 221Fa:CCC, 222Ab:CCC, 222Ag:CCC, 222An:CCC, 222Ic:CCC, 231Bh:CCC, 232Ad:CCC, M212Ba:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCP, M221Ad:CCP, M221Ba:CCP, M221Bb:CCC, M221Bc:CCP, M221Bd:CCP, M221Be:CCC, M221Bf:CCP, M221Ca:CPP, M221Cb:CPP, M221Cc:CPP, M221Ce:CPP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCP, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: NPS (Antietam, Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Bluestone, Buffalo River?, C&O Canal, Cape Cod, Catoctin Mountain, Cuyahoga Valley, George Washington Birthplace, Great Smoky Mountains, Marsh-Billings-Rockefeller, Minute Man, Morristown, Natchez Trace, National Capital-East, New River Gorge, Saratoga, Vicksburg); USFS (George Washington, Jefferson, Monongahela, Nantahala, Ouachita, Ouachita (Mountains), Ozark, Pisgah); USFWS (Montezuma)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXBL
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 observation points; 4 accuracy assessment points): APPA.1122, APPA.1123, APPA_AA_0201, APPA_AA_1133, APPA_AA_1370, APPA_AA_1559.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay

Global Description Author(s): D. Faber-Langendoen, S.C. Gawler and L.A. Sneddon
References: Baalman 1965, CAP pers. comm. 1998, Edinger et al. 2002, Edinger et al. 2007, Ehrenfeld 1977, Elias 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming et al. 2006, Gaertner 1955, Gawler et al. 2005, Hoagland 2000, INAI n.d., Lea et al. 2013, McDonald 1938, NRCS 2004a, Patterson 2008d, Rabie 2000, Rawinski et al. 1996, Sneddon et al. 2008, Sneddon et al. 2010, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Vanderhorst et al. 2007, Vanderhorst et al. 2008, WVNHP unpubl. data b

M014. Laurentian-Acadian Mesic Hardwood - Conifer Forest

G632. Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest

Group Summary Description: These are upland spruce-fir forests and woodlands, or spruce-fir-hardwood forests of eastern North America. They are found within the range of *Picea rubens*, at progressively higher elevations from the Central to the Southern Appalachians. They occur in cool, mostly mesic settings on ridgetops and steep slopes with thin soils. Substrate geology also varies, although soils are generally acidic. At their southern extent, these forests occur only at the highest elevations (above 1370 m [4500 feet]). *Picea rubens* is generally present, and often dominant, but the canopy may be dominated by *Abies fraseri*. Typical canopy associates include *Betula alleghaniensis* and *Tsuga canadensis*. The density and composition of shrub and herbaceous strata vary with association and geographic location. Characteristic shrubs include *Acer spicatum, Rhododendron catawbiense, Rhododendron maximum, Vaccinium erythrocarpum*, and *Viburnum lantanoides*. Characteristic herbs rangewide include *Clintonia borealis, Dryopteris campyloptera, Mitchella repens, Oxalis montana*, and *Trillium undulatum*. The bryophyte layer is generally very well-developed, characterized by *Bazzania trilobata, Dicranum* spp., *Pleurozium schreberi*, and many others. Mosses, liverworts, and lichens grow densely on fallen logs, tree trunks, and the forest floor, giving these forests a distinctive carpeted appearance.

A0136 *Picea rubens - Abies fraseri* Forest Alliance

Alliance Summary Description: Canopies can be dominated by *Abies fraseri* and/or *Picea rubens*; *Betula alleghaniensis* and other northern hardwood species may be codominant in mixed stands. Canopy/subcanopy species of minor importance can include *Acer spicatum, Acer pensylvanicum, Amelanchier laevis, Betula alleghaniensis, Prunus pensylvanica*, and *Sorbus americana*. Forests on extreme sites may have an open canopy, with stunted appearance and, in some communities, standing dead stems of *Abies fraseri* are common, with extensive patches of *Abies fraseri* seedlings in canopy gaps. The density and composition of the shrub and herbaceous strata vary among associations in this alliance. Forests in this alliance typically have a well-developed bryophyte layer. Mosses, liverworts, and lichens grow densely on fallen logs, tree trunks, and the forest floor, giving these forests a distinctive carpeted appearance. This alliance contains many species endemic to the Southern Blue Ridge or that have the bulk of their worldwide range in that region. This vegetation is restricted to the highest mountain systems of the Southern Blue Ridge, in eastern Tennessee, western North Carolina, and southwestern Virginia, as well as outliers in the Central Appalachians of West Virginia, primarily within the distributional range of *Abies fraseri*. These forests occur on all topographic positions except the steepest rocky cliffs. Elevations range from 1350-2300 m (4400-6600 feet), with pure *Abies fraseri* associations best developed above 1830 m (6000 feet). The dominant soils are Inceptisols with scattered occurrences of Spodosols at the highest elevations. Generally, soils can be described as rocky, with well-developed organic and A horizons. All soils in these high-elevation forests are low in base saturation, high in organic matter, and are acidic in reaction (pH 3-5), with a high aluminum content. The moisture regimes of these areas are mesic to wet due to high rainfall, abundant cloud cover, fog deposition, and low temperatures. The climate has been classified as perhumid, with the temperature varying elevationally from mesothermal to microthermal. The regional geology is dominated by complexly folded metamorphic, sedimentary, and igneous rocks of the Precambrian and early Paleozoic age, including phyllites, slates, schists, sandstones, quartzites, granites, and gneisses. These forests are affected by debris avalanches, wind and ice disturbance, and lightning fire. Because of the rocky soils and extreme wind exposure, these forests are susceptible to large blowdowns, particularly in areas damaged by the invasive balsam woolly adelgid (*Adelges piceae*).

[CEGL006308] *Abies fraseri / (Rhododendron catawbiense, Rhododendron carolinianum)* Forest

Translated Name: **Fraser Fir / (Catawba Rosebay, Carolina Azalea) Forest**
Common Name: **Fraser Fir Forest (Evergreen Shrub Type)**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	*Picea rubens - Abies fraseri* Forest Alliance (A0136)

ELEMENT CONCEPT

Global Summary: This community occurs as island-like stands in the southern Appalachian Mountains of eastern Tennessee, and western North Carolina. It occurs on rocky spurs, steep ridges, and south-facing slopes above 1830 m (6000 feet) elevation, often adjacent to montane shrublands. This forest has a canopy strongly dominated by *Abies fraseri*, occurring over a shrub stratum dominated by evergreen species, typically *Rhododendron catawbiense, Rhododendron carolinianum*, or *Rhododendron maximum*. *Abies fraseri* in the canopy are 17-23 cm in diameter and 10-11 m tall, giving these forests a stunted appearance. Other species that may occur with low coverage in the canopy or subcanopy are *Picea rubens, Sorbus americana, Betula alleghaniensis, Prunus pensylvanica*. Herbaceous cover is typically sparse. On steep, rocky, northerly slopes, coverage by mosses, liverworts, and lichens can approach 100%. Bryophyte species include *Hylocomium splendens, Ptilium crista-castrensis, Sphagnum* spp., and *Polytrichum ohioense*. This forest may grade into forests dominated by *Picea rubens* and *Abies fraseri*, montane grasslands, high-elevation shrublands, or high-elevation rock outcrop communities.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: No data are available.
Global Environment: These forests occur on rocky spurs, steep ridges, and south-facing slopes above 1830 m (6000 feet) elevation, often adjacent to montane shrublands. These forests occur on all topographic positions except the steepest rocky cliffs of the highest summits. Soils that support this community are classified as Inceptisols and are shallow, rocky, and often have a thick organic layer. Moisture regimes are mesic to wet, due to high rainfall, abundant cloud cover, fog deposition, and low temperatures. This forest may grade into forests dominated by *Picea rubens* and *Abies fraseri*, montane grasslands, high-elevation shrublands, or high-elevation rock outcrop communities.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: *Abies fraseri* is dominant and occurs over a shrub stratum dominated by evergreen species, typically *Rhododendron catawbiense, Rhododendron maximum*, and *Rhododendron carolinianum*.
Global Vegetation: This needle-leaved evergreen forest has greater than 75% canopy coverage by *Abies fraseri*. *Abies fraseri* in the canopy are 17-23 cm in diameter and 10-11 m tall, giving these forests a stunted appearance. Other species that may occur with low coverage in the canopy or subcanopy are *Picea rubens, Sorbus americana, Betula alleghaniensis, Prunus pensylvanica*. The tall-shrub stratum is dominated by evergreen species and, although there may be considerable variation, is usually quite dense. Typical shrub dominants include *Rhododendron catawbiense, Rhododendron carolinianum*, and *Rhododendron maximum*. Herbaceous cover is typically sparse. On steep, rocky, northerly slopes, coverage by mosses, liverworts, and lichens can approach 100%. Bryophyte species include *Hylocomium splendens, Ptilium crista-castrensis, Sphagnum* spp., and *Polytrichum ohioense*. Rare or regionally rare vascular plant species associated with this community include *Abies fraseri, Betula papyrifera var. cordifolia, Cardamine clematitis, Glyceria nubigena, Phegopteris connectilis, Poa palustris, Rhododendron vaseyi, Stachys clingmanii*, and *Streptopus amplexifolius*. Rare nonvascular plants include *Bazzania nudicaulis, Brachydontium trichodes, Leptodontium excelsum, Metzgeria temperata, Nardia scalaris, Plagiochila corniculata*, and *Sphenolobopsis pearsonii*.
Global Dynamics: This community is affected by debris avalanches, wind disturbance and lightning fire. Because of the shallow soils and extreme wind exposure, this forest is susceptible to large blowdowns. Logging and damage by the balsam woolly adelgid has greatly increased the effect of natural windfall. An exotic insect, the balsam woolly adelgid (*Adelges piceae*), invaded the Southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation. This community is a late-successional type, but it is subject to repeated disturbance. *Prunus pensylvanica* is a dominant species immediately following disturbance. In later successional stages, *Betula alleghaniensis* increases in dominance. In areas where mature *Abies fraseri* has been lost to woolly adelgid infestation, thickets of *Rubus* spp., *Abies fraseri* seedlings and saplings, *Betula alleghaniensis*, and *Sorbus americana* are dominant. Over time, *Picea rubens, Betula alleghaniensis, Abies fraseri, Acer spicatum*, and *Sorbus americana* increase in the tree layer, while *Abies fraseri, Menziesia pilosa, Rubus idaeus ssp. strigosus*, and *Sambucus racemosa* increase in the shrub layer (White et al. 1993). Succession is especially slow after severe disturbance such as logging and slash fires. The most severely disturbed sites are predominately *Prunus pensylvanica* and *Rubus* spp. and may remain in a non-forested stage of succession for 60 years or more.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies fraseri*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron carolinianum*, *Rhododendron catawbiense*, *Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies fraseri*
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron catawbiense*, *Rhododendron maximum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron carolinianum*
Nonvascular	Moss	*Hylocomium splendens*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Abies fraseri*, *Rhododendron carolinianum*, *Rhododendron catawbiense*, *Rhododendron maximum*
Global: *Abies fraseri*, *Rhododendron carolinianum*, *Rhododendron catawbiense*, *Rhododendron maximum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Abies fraseri* (G2)
Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Bazzania nudicaulis* (G2G3, regionally rare), *Betula papyrifera* var. *cordifolia* (G5T5, regionally rare), *Brachydontium trichodes* (G2G4, regionally rare), *Cardamine clematitis* (G3, regionally rare), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Leptodontium excelsum* (G2), *Metzgeria temperata* (G4, regionally rare), *Nardia scalaris* (G5, regionally rare), *Phegopteris connectilis* (G5, regionally rare), *Plagiochila corniculata* (G4?, regionally rare), *Poa palustris* (G5, regionally rare), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Solidago glomerata* (G3), *Sphenolobopsis pearsonii* (G2?), *Stachys clingmanii* (G2), *Streptopus amplexifolius* (G5, regionally rare); **Other Plants**: *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (4-Jan-2000). This community has a naturally restricted distribution, occurring only on the highest elevation peaks of the southern Appalachian Mountains. It exists in only a small portion of its original range due to the impact of early 20th century, post-logging fires and the ongoing outbreak of balsam woolly adelgid, an exotic pest that infests and kills mature *Abies fraseri*. Well-developed, undisturbed examples of this community are extremely rare. Most remaining examples of this community exist as patches of dense young trees or dense *Rubus* thickets beneath forests of dead snags or tangles of fallen logs.

RELATED CONCEPTS

Global Similar Types:

- *Abies fraseri / Viburnum lantanoides / Dryopteris campyloptera - Oxalis montana / Hylocomium splendens* Forest (CEGL006049) is a similar forest with a canopy dominated by *Abies fraseri* but lacking an evergreen-dominated shrub stratum.
- *Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum)* Forest (CEGL007130) *Abies fraseri* can codominate with *Picea rubens*.
- *Picea rubens - (Abies fraseri) / Vaccinium erythrocarpum / Dryopteris campyloptera / Hylocomium splendens* Forest (CEGL007131) *Abies fraseri* can codominate with *Picea rubens*.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Great Smoky Mountains National Park only, known the highest peaks; can cover an extensive area. Substantial fir regeneration and recruitment is underway at Great Smoky Mountains National Park especially with the release of fir resulting from spruce mortality from spruce budworm. Release seems to encourage evergreen shrub growth, too.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: No data are available.
Global Range: This community occurs as island-like stands on the highest areas, above 1830 m (6000 feet), in the southern Appalachian Mountains of eastern Tennessee, western North Carolina, and southwestern Virginia. It is extremely limited in distribution and is restricted to the following mountain areas: Great Smoky Mountains, Black Mountains, Balsam Mountain, Plott Balsam Mountain, Grandfather Mountain, and Mount Rogers (Ramseur 1960).
Nations: US
States/Provinces: NC:S1, TN
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Cherokee, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FFFS
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay and M.J. Russo
Global Description Author(s): K.D. Patterson
References: Allard 1990, Anderson et al. 1990, Braun 1950, Brown 1941, Bruck 1988, Busing et al. 1988, Crandall 1958, Davis 1930, Eyre 1980, Fleming and Patterson 2009a, McLeod 1988, NCNHP 1993, Nicholas et al. 1992, Oosting and Billings 1951, Pyne 1994, Ramseur 1960, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, USFS 1988, Weakley 1993, White 1984a, White 1984b, White and Pickett 1985, White et al. 1993, Whittaker 1956

[CEGL006049] *Abies fraseri / Viburnum lantanoides / Dryopteris campyloptera - Oxalis montana / Hylocomium splendens* Forest

Translated Name: **Fraser Fir / Hobblebush / Mountain Woodfern - Mountain Woodsorrel / Splendid Feathermoss Forest**
Common Name: **Fraser Fir Forest (Deciduous Shrub Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	*Picea rubens - Abies fraseri* Forest Alliance (A0136)

ELEMENT CONCEPT

Global Summary: This community occurs as island-like stands in the southern Appalachian Mountains. It occurs on steep ridges and mesic, north-facing slopes above 1830 m (6000 feet) elevation, although it may extend lower on some sites. Occurrences of this community have shallow, rocky soils and are often steep and bouldery with seepage areas. This forest has at least 75% of the canopy coverage composed of *Abies fraseri*, occurring over a sparse to moderate shrub stratum dominated by deciduous species, a diverse herb stratum, and, typically, a well-developed bryophyte layer. The tree canopy has standing dead stems of *Abies fraseri* and extensive patches of *Abies fraseri* saplings in canopy gaps. *Oxalis montana, Dryopteris campyloptera*, and *Athyrium filix-femina* are often dominant in the herbaceous stratum. Other characteristic species include *Vaccinium erythrocarpum, Sambucus racemosa var. racemosa (= Sambucus racemosa var. pubens), Rubus allegheniensis, Rubus idaeus ssp. strigosus, Oclemena acuminata (= Aster acuminatus), Eurybia chlorolepis (= Aster chlorolepis), Clintonia borealis, Solidago glomerata, Rugelia nudicaulis, Ageratina altissima var. roanensis, Chelone lyonii, Circaea alpina ssp. alpina, Streptopus lanceolatus var. roseus (= Streptopus roseus), Viola macloskeyi ssp. pallens, Geum radiatum, Huperzia lucidula, Ptilium crista-castrensis, Rhytidiadelphus triquetrus*, and *Hylocomium splendens*. This is a relatively broadly defined community element with much structural and compositional variation.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This forest association occurs at the highest elevations (above 1,830 m [6,000 feet]) and in areas formerly strongly dominated by Fraser fir, now with many standing and dead trees, occurring as isolated islands on exposed summits, usually with heavy fir regeneration.

Global Environment: This community typically occurs on steep ridges and north-facing slopes above 1830 m (6000 feet) elevation, although it may extend lower on some sites. These forests occur on all topographic positions except the steepest rocky cliffs of the highest summits. Soils that support this community are classified as Inceptisols and are shallow, rocky, and often have a thick organic layer. Moisture regimes are mesic to wet, due to high rainfall, abundant cloud cover, fog deposition, and low temperatures.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This needle-leaved evergreen forest has greater than 75% canopy coverage by *Abies fraseri*, typically with many standing dead trees. Other species that may occur in the canopy or subcanopy with low coverage are *Picea rubens, Sorbus americana, Betula alleghaniensis, Prunus pensylvanica*, and *Acer spicatum*. A deciduous shrub layer is present; *Viburnum lantanoides* is characteristic, or the shrub layer may be dominated by *Picea rubens* or *Abies fraseri*. The herb layer is diverse with *Oxalis montana, Dryopteris campyloptera, Athyrium filix-femina ssp. asplenioides, Clintonia borealis, Oclemena acuminata*, and *Eurybia chlorolepis* common. However, some stands are so dense with heavy fir regeneration that they have no herb layer.

Global Vegetation: This needle-leaved evergreen forest has greater than 75% canopy coverage by *Abies fraseri*, typically with many standing dead stems. Canopy trees are of small diameter (less than 20 cm) and short stature (less than 10 m tall), giving these forests a stunted appearance. Other species that may occur in the canopy or subcanopy with low coverage are *Picea rubens, Sorbus americana, Betula alleghaniensis, Prunus pensylvanica*, and *Acer spicatum*. There may be considerable variation in the density of shrub cover, but it is typically low (<20%) and dominated by deciduous species. Typical shrub species include *Viburnum lantanoides, Vaccinium erythrocarpum, Sambucus racemosa var. racemosa (= Sambucus racemosa var. pubens), Menziesia pilosa, Rubus allegheniensis*, and *Rubus idaeus ssp. strigosus*. Where shrubs are sparse, herb cover is usually dense, with *Oxalis montana, Athyrium filix-femina ssp. asplenioides*, and *Dryopteris campyloptera* often dominant. Other common herbs include *Oclemena acuminata (= Aster acuminatus), Eurybia chlorolepis (= Aster chlorolepis), Clintonia borealis, Solidago glomerata, Rugelia nudicaulis, Ageratina altissima var. roanensis, Chelone lyonii, Circaea alpina ssp. alpina, Streptopus lanceolatus (= Streptopus roseus), Viola macloskeyi ssp. pallens, Geum radiatum*, and *Huperzia lucidula*. Mosses, liverworts, and lichens grow densely on fallen logs, tree trunks, and the forest floor, giving the community a distinctive carpeted appearance. Characteristic bryophyte species include *Hylocomium splendens, Ptilium crista-castrensis, Rhytidiadelphus triquetrus*, and *Hylocomiastrum umbratum*.

Global Dynamics: This community is affected by debris avalanches, wind disturbance and lightning fire. Because of the shallow soils and extreme wind exposure, this forest is susceptible to large blowdowns. Logging and damage by the balsam woolly adelgid has greatly increased the effect of natural windfall. This community is a late-successional type, but it is subject to repeated disturbance. *Prunus pensylvanica* is a dominant species immediately following disturbance. In later successional stages, *Betula alleghaniensis* increases in dominance. An exotic insect, the balsam woolly adelgid (*Adelges piceae*), invaded the Southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation. *Abies fraseri* is the only rare plant species associated with this vegetation in Virginia. In areas where mature *Abies fraseri* has been lost to woolly adelgid infestation, thickets of *Rubus* spp., *Abies fraseri* seedlings and saplings, *Betula alleghaniensis*, and *Sorbus americana* are dominant. Over time, *Picea rubens, Betula alleghaniensis, Abies fraseri, Acer spicatum*, and *Sorbus americana* increase in the tree layer, while *Abies fraseri, Menziesia pilosa, Rubus idaeus ssp. strigosus*, and *Sambucus racemosa* increase in the shrub layer (White et al. 1993). Succession is especially slow after severe disturbance such as logging and slash fires. The most severely disturbed sites are predominately *Prunus pensylvanica* and *Rubus* spp. and may remain in a non-forested stage of succession for 60 years or more.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies fraseri*, *Picea rubens*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies fraseri*
Tall shrub/sapling	Broad-leaved deciduous tree	*Sambucus racemosa* var. *racemosa*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Rubus allegheniensis*, *Viburnum lantanoides*
Herb (field)	Flowering forb	*Oxalis montana*
Herb (field)	Fern (Spore-bearing forb)	*Athyrium filix-femina* ssp. *asplenioides*, *Dryopteris campyloptera*, *Huperzia lucidula*
Nonvascular	Moss	*Hylocomium splendens*, *Ptilium crista-castrensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Abies fraseri*, *Athyrium filix-femina* ssp. *asplenioides*, *Dryopteris campyloptera*, *Eurybia chlorolepis*, *Oclemena acuminata*, *Oxalis montana*, *Picea rubens*

Global: *Abies fraseri*, *Angelica triquinata*, *Dryopteris campyloptera*, *Eurybia chlorolepis*, *Houstonia serpyllifolia*, *Hylocomium splendens*, *Oxalis montana*, *Ribes rotundifolium*, *Rubus allegheniensis*, *Rugelia nudicaulis*, *Solidago glomerata*, *Vaccinium erythrocarpum*, *Viburnum lantanoides*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Abies fraseri* (G2, globally imperiled)

Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Bazzania nudicaulis* (G2G3), *Brachydontium trichodes* (G2G4), *Cardamine clematitis* (G3), *Geum radiatum* (G2, Southern Appalachian endemic), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Leptodontium excelsum* (G2), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Sphenolobopsis pearsonii* (G2?), *Stachys clingmanii* (G2); **Other Plants**: *Betula papyrifera* var. *cordifolia* (G5T5), *Metzgeria temperata* (G4), *Nardia scalaris* (G5), *Phegopteris connectilis* (G5), *Plagiochila corniculata* (G4?), *Poa palustris* (G5), *Streptopus amplexifolius* (G5), *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (15-Jul-1994). This community occurs as island-like stands in the southern Appalachian Mountains. It has a naturally restricted distribution and exists in only a small portion of its original range due to the impact of early 20th century, post-logging fires and the ongoing outbreak of balsam woolly adelgid (*Adelges piceae*). Well-developed, undisturbed examples of this community are extremely rare.

RELATED CONCEPTS

Global Similar Types:

- *Abies fraseri / (Rhododendron catawbiense, Rhododendron carolinianum)* Forest (CEGL006308) is a similar forest with a canopy dominated by *Abies fraseri* but with a shrub stratum dominated by evergreen species.
- *Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum)* Forest (CEGL007130) *Abies fraseri* can codominate with *Picea rubens*.
- *Picea rubens - (Abies fraseri) / Vaccinium erythrocarpum / Dryopteris campyloptera / Hylocomium splendens* Forest (CEGL007131) *Abies fraseri* can codominate with *Picea rubens*.

CLASSIFICATION

Status: Standard

Classification Confidence: 1 - Strong

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This is the classic Southern Appalachian Fraser fir forest, restricted to the highest elevations (plots averaging >1800 m elevation).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community occurs near the AT in Great Smoky Mountains National Park, on Roan Mountain, and on Mount Rogers. Only one plot within the AT corridor was sampled at Roan Mountain on Pisgah National Forest in North Carolina.

Global Range: This community occurs as island-like stands on the highest areas (>1830 m [6000 feet]) in the southern Appalachian Mountains of eastern Tennessee, western North Carolina, and southwestern Virginia. It is

extremely limited in distribution and is restricted to the following mountain areas: Great Smoky Mountains, Black Mountains, Balsam Mountain, Plott Balsam Mountain, Grandfather Mountain, and Mount Rogers (Ramseur 1960).
Nations: US
States/Provinces: NC:S1, TN, VA:S1
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FFFS
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 35 accuracy assessment points): APPA.0171, APPA_AA_0001, APPA_AA_0119, APPA_AA_0125, APPA_AA_0127, APPA_AA_0153, APPA_AA_0161, APPA_AA_0268, APPA_AA_0372, APPA_AA_0441, APPA_AA_0492, APPA_AA_0504, APPA_AA_0550, APPA_AA_0653, APPA_AA_0812, APPA_AA_0839, APPA_AA_0893, APPA_AA_0956, APPA_AA_0959, APPA_AA_0971, APPA_AA_0984, APPA_AA_0995, APPA_AA_0997, APPA_AA_1010, APPA_AA_1235, APPA_AA_1237, APPA_AA_1318, APPA_AA_1372, APPA_AA_1387, APPA_AA_1409, APPA_AA_1415, APPA_AA_1432, APPA_AA_1496, APPA_AA_1502, APPA_AA_1597, APPA_AA_1627.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson
References: Adams and Stephenson 1991, Adams et al. 1985, Allard 1990, Anderson et al. 1990, Belden et al. 1994, Braun 1950, Brown 1941, Bruck 1988, Busing et al. 1988, Crandall 1958, Davis 1930, Dull et al. 1988a, Eyre 1980, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, McLeod 1988, NCNHP 1993, Nicholas et al. 1992, Oosting and Billings 1951, Peet et al. unpubl. data, Pyne 1994, Ramseur 1960, Rawinski 1992, Rheinhardt and Ware 1984, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, Stephenson and Adams 1984, TDNH unpubl. data, USFS 1988, VDNH 2003, Weakley 1993, White 1984a, White 1984b, White and Pickett 1985, White et al. 1993, Whittaker 1956

[CEGL007130] *Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum)* Forest

Translated Name: **Red Spruce - (Fraser Fir) / (Catawba Rosebay, Great Laurel) Forest**
Common Name: **Red Spruce - Fraser Fir Forest (Evergreen Shrub Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	*Picea rubens - Abies fraseri* Forest Alliance (A0136)

ELEMENT CONCEPT

Global Summary: This community is restricted to the highest mountain systems of the Southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia. These forests are typically found on moderately steep to steep, convex slopes at elevations between 1550 and 1830 m (5100-6000 feet). This association includes forests of the Southern Appalachians, within the range of *Abies fraseri*, currently dominated by *Picea rubens* but showing some evidence of the historical presence of *Abies fraseri* (either standing dead individuals or ample regeneration), over a shrub stratum dominated by evergreen species, typically *Rhododendron catawbiense* and *Rhododendron maximum*. Herb coverage is characteristically low, but on moist north-facing sites, mosses, ferns and forbs may be dense beneath the shrub stratum.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: The community occurs at lower elevations within the spruce-fir zone (1,555-1,830 m [5,100-6,000 feet]). The sampled sites include a somewhat steep, northwest-facing slope and moderately sloping ridgetops. Soils include well-drained sandy loam and moderately well-drained loam. The unvegetated surface is dominated by needle litter with occasional rocks,

boulders, and downed wood. Evidence of disturbance includes past catastrophic fire, past logging, trails, erosion, wind/ice damage, balsam woolly adelgid damage, and possible impacts from ozone and nitrogen deposition.
Global Environment: This forest is best developed between 1550 and 1830 m (5100-6000 feet) elevation but may occur at lower elevations and is typically found on moderately steep to steep, convex slopes. Soils are highly variable, from deep mineral soils to well-developed boulderfields, where a thin organic layer and moss mat overlie the rocks and there are pockets of mineral soil in deep crevices between boulders. The dominant soils are Inceptisols with scattered occurrences of Spodosols at the highest elevations (White et al. 1993). Generally, soils can be described as rocky, with well-developed organic and A horizons. All soils in these high-elevation forests are low in base saturation, high in organic matter, and are acidic in reaction (pH 3-5), with a high aluminum content. The moisture regimes of these areas are mesic to wet due to high rainfall, abundant cloud cover, fog deposition, and low temperatures. The climate has been classified as perhumid, with the temperature varying elevationally from mesothermal to microthermal. The regional geology is dominated by complexly folded metamorphic, sedimentary, and igneous rocks of the Precambrian and early Paleozoic age, including phyllites, slates, schists, sandstones, quartzites, granites, and gneisses.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The evergreen tree canopy (at least 75% cover by evergreen needle-leaved trees) is dominated by *Abies fraseri* and/or *Picea rubens*. The evergreen shrub layer (at least 75% cover) is typically dominated by *Rhododendron catawbiense* and *Rhododendron maximum*, along with *Abies fraseri* regeneration. Additional shrubs may include *Sorbus americana, Ilex montana*, and *Vaccinium simulatum*. Herbs are typically sparse, but there may be significant cover (up to 50%) by mosses, including *Dicranum scoparium* and *Hypnum curvifolium*.
Global Vegetation: This association includes forests of the Southern Appalachians, within the range of *Abies fraseri*, currently dominated by *Picea rubens* but showing some evidence of the historical presence of *Abies fraseri*. Other species may occur in the canopy/subcanopy but with low coverage. The shrub stratum is moderate to dense and dominated by evergreen species such as *Rhododendron catawbiense, Rhododendron maximum*, and *Rhododendron carolinianum*. Shrub coverage is most dense on drier, convex slopes. Other shrub species with minor coverage may include *Vaccinium simulatum, Vaccinium erythrocarpum, Viburnum nudum var. cassinoides, Diervilla sessilifolia*, and *Viburnum lantanoides*. Extensive patches of *Abies fraseri* seedlings and standing dead stems of *Abies fraseri* may be common. Herb coverage is typically low, but moist, north-facing sites may have *Oxalis montana, Athyrium filix-femina ssp. asplenioides, Dryopteris campyloptera*, and mosses (including *Dicranum scoparium* and *Hypnum curvifolium*) dominating beneath the shrub stratum.
Global Dynamics: Natural disturbances in this community include lightning fire, debris avalanches, wind disturbance, and ice storms (White and Pickett 1985, Nicholas and Zedaker 1989). The natural fire regime is estimated at longer than 500-1000 years. Human-initiated disturbances have included logging, slash fires, livestock grazing, and damage by atmospheric pollutants. An exotic insect, the balsam woolly adelgid (*Adelges piceae*), invaded the Southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation. In areas where mature *Abies fraseri* has been lost to woolly adelgid infestation, thickets of *Rubus* spp., *Abies fraseri* seedlings and saplings, *Betula alleghaniensis*, and *Sorbus americana* are dominant. Over time, *Picea rubens, Betula alleghaniensis, Abies fraseri, Acer spicatum*, and *Sorbus americana* increase in the tree layer, while *Abies fraseri, Menziesia pilosa, Rubus idaeus ssp. strigosus*, and *Sambucus racemosa var. pubens* increase in the shrub layer (White et al. 1993). Succession is especially slow after severe disturbance such as logging and slash fires. The most severely disturbed sites are predominately *Prunus pensylvanica* and *Rubus* spp. and may remain in a non-forested stage of succession for 60 years or more.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies fraseri*, *Picea rubens*
Tall shrub/sapling	Needle-leaved tree	*Abies fraseri*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron catawbiense*, *Rhododendron maximum*
Nonvascular	Moss	*Dicranum scoparium*, *Hypnum curvifolium*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies fraseri*, *Picea rubens*
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron catawbiense*, *Rhododendron maximum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron carolinianum*
Nonvascular	Moss	*Hylocomium splendens*, *Polytrichum ohioense*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Abies fraseri*, *Picea rubens*, *Rhododendron catawbiense*
Global: *Abies fraseri*, *Picea rubens*, *Rhododendron catawbiense*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Abies fraseri* (G2, globally imperiled & TN-state critically imperiled), *Clintonia borealis* (G5, TN state-imperiled)
Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Bazzania nudicaulis* (G2G3), *Brachydontium trichodes* (G2G4), *Cardamine clematitis* (G3), *Carex ruthii* (G3), *Geum geniculatum* (G2), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Gymnoderma lineare* (G3), *Hypericum graveolens* (G3), *Krigia montana* (G3), *Leptodontium excelsum* (G2), *Penstemon smallii* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Pseudevernia cladonia* (G2G4), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Sphenolobopsis pearsonii* (G2?), *Stachys clingmanii* (G2); **Other Plants**: *Betula papyrifera* var. *cordifolia* (G5T5), *Botrychium oneidense* (G4), *Calamagrostis canadensis* (G5), *Carex projecta* (G5), *Chelone lyonii* (G4), *Metzgeria temperata* (G4), *Nardia scalaris* (G5), *Phegopteris connectilis* (G5), *Plagiochila corniculata* (G4?), *Poa palustris* (G5), *Stellaria corei* (G4), *Streptopus amplexifolius* (G5), *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (23-Feb-1999). This community has a naturally restricted distribution and has been subject to major acreage reduction during the early part of the 20th century and rapid condition decline in the past 30 years. Modern threats include atmospheric pollution deposition and damage by the exotic balsam woolly adelgid (*Adelges piceae*). Well-developed, undisturbed examples of this community are extremely rare.

RELATED CONCEPTS

Global Similar Types:
- *Abies fraseri / (Rhododendron catawbiense, Rhododendron carolinianum)* Forest (CEGL006308)
- *Abies fraseri / Viburnum lantanoides / Dryopteris campyloptera - Oxalis montana / Hylocomium splendens* Forest (CEGL006049)
- *Picea rubens - (Abies fraseri) / Vaccinium erythrocarpum / Dryopteris campyloptera / Hylocomium splendens* Forest (CEGL007131) is a similar forest that has an understory dominated by deciduous shrubs, herbs, and bryophytes and occurs on more mesic sites than the one described here. Similar forests occur in the Central and Northern Appalachians, but have *Abies balsamea* as the fir component, less dense herb and bryophyte cover, and lack a *Rhododendron*-dominated understory (Oosting and Billings 1951, Whittaker 1956, Crandall 1958).
- *Picea rubens - (Tsuga canadensis) / Rhododendron maximum* Forest (CEGL006152)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: The group of plots for this association along the AT are characterized by very low species richness and a dense evergreen shrub layer under *Picea rubens* overstory. *Abies fraseri* dominates one plot, *Betula alleghaniensis* codominates another; tree canopy is thin in two plots. Stands that may represent this type have been seen on both Mount Rogers and Whitetop Mountain in Virginia, but have not been carefully inventoried or sampled.
Global Classification Comments: This community includes forest vegetation where *Picea rubens* and *Abies fraseri* make up 75% of the canopy cover, each contributing 25-75% to the total canopy cover and occurring over a shrub stratum dominated by evergreen species. Other species total less than 25% of the canopy.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community appears to be rare along the AT in the highest section from the Great Smoky Mountains to Roan Mountain, Pisgah National Forest in North Carolina and in eastern Tennessee.
Global Range: This community is restricted to the highest mountain systems of the Southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia.
Nations: US
States/Provinces: NC:S1S2, TN, VA:S1
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FSFE
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (3 plots; 22 accuracy assessment points): APPA.0113, APPA.0591, APPA.0596, APPA_AA_0115, APPA_AA_0363, APPA_AA_0412, APPA_AA_0484, APPA_AA_0496, APPA_AA_0566, APPA_AA_0620, APPA_AA_0752, APPA_AA_0901, APPA_AA_0922, APPA_AA_0929, APPA_AA_1042, APPA_AA_1048, APPA_AA_1095, APPA_AA_1108, APPA_AA_1271, APPA_AA_1332, APPA_AA_1482, APPA_AA_1565, APPA_AA_1602, APPA_AA_1603, APPA_AA_1622.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson and T. Govus
References: Allard 1990, Anderson et al. 1990, Brown 1941, Bruck 1988, Busing et al. 1988, Cogbill and White 1991, Crandall 1958, Crandall 1960, Davis 1930, Dull et al. 1988b, Eagar and Adams 1992, Eyre 1980, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Korstian 1937, McLeod 1988, NCNHP 1993, NatureServe Ecology - Southeastern U.S. unpubl. data, Nicholas and Zedaker 1989, Nicholas et al. 1992, Oosting and Billings 1951, Peet et al. unpubl. data, Pyne 1994, Ramseur 1960, Rawinski 1992, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schofield 1960, Southeastern Ecology Working Group n.d.*, Stephenson and Adams 1984, Stephenson and Clovis 1983, Stotler and Crandall-Stotler 1977, TDNH unpubl. data, USFS 1988, Wentworth et al. 1988a, White 1984a, White 1984b, White and Cogbill 1992, White and Pickett 1985, White et al. 1993, Whittaker 1956, Zedaker et al. 1988

[CEGL007131] *Picea rubens - (Abies fraseri) / Vaccinium erythrocarpum / Dryopteris campyloptera / Hylocomium splendens* Forest

Translated Name: **Red Spruce - (Fraser Fir) / Southern Mountain Cranberry / Mountain Woodfern / Splendid Feathermoss**
Forest
Common Name: **Red Spruce - Fraser Fir Forest (Deciduous Shrub Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	*Picea rubens - Abies fraseri* Forest Alliance (A0136)

ELEMENT CONCEPT

Global Summary: This community is restricted to the highest mountain systems of the Southern and Central Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia, with disjunct northern outliers on the summits of the Allegheny Mountains of West Virginia. It is found on all topographic positions and is best developed between 1680 and 1990 m (5500-6200 feet) elevation. In West Virginia, it occurs on ridgetops at elevations above 1350 m (4400 feet). This association includes forests of the Southern and Central Appalachians, primarily within the range of *Abies fraseri*, dominated by *Picea rubens*, with or without *Abies fraseri*, occurring over deciduous shrubs, herbs and bryophytes. This community has a characteristic understory of Southern Appalachian endemic species and a conspicuous bryophyte layer. The tree canopy may have standing dead stems of *Abies fraseri* and extensive patches of *Abies fraseri* seedlings in canopy gaps. Characteristic species include *Sorbus*

americana, Acer spicatum, Viburnum lantanoides, Athyrium filix-femina ssp. asplenioides, Eurybia chlorolepis (= Aster chlorolepis), Rugelia nudicaulis, Houstonia serpyllifolia, Solidago glomerata, Ptilium crista-castrensis, and *Bazzania trilobata*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This community occurs at lower elevations within the spruce-fir zone (1,675-1,890 m [5,500-6,200 feet]), usually on slightly more sheltered sites, and is strongly dominated by *Picea rubens*. It was sampled at four locations in the park. The sites range from gentle to somewhat steep low and mid slopes and ridgetops with north, northeast, east, and southwest aspects. Soils are well-drained. The unvegetated surface is typically dominated by leaf litter but may include significant amounts of exposed bedrock and large rocks. Evidence of disturbance includes past catastrophic fire, trails, wind/ice damage, and possible impacts from ozone and nitrogen deposition.

Global Environment: Over much of its range, this forest community reaches its best development between 1680 and 1990 m (5500-6200 feet) elevation, but it is also found at somewhat lower elevations. Stands occur on all topographic positions. Soils are highly variable, from deep mineral soils to well-developed boulderfields, where a thin organic layer and moss mat overlie the rocks, and there are pockets of mineral soil in deep crevices between boulders. The dominant soils are Inceptisols with scattered occurrences of Spodosols at the highest elevations. Generally, soils are shallow and rocky, with well-developed organic and A horizons. All soils in these high-elevation forests are low in base saturation, high in organic matter, and are acidic in reaction (pH 3.0-5.0), with high aluminum content. The moisture regimes of these areas are mesic to wet due to high rainfall, abundant cloud cover, fog deposition, and low temperatures. The climate has been classified as perhumid, with the temperature varying elevationally from mesothermal to microthermal. The regional geology is dominated by complexly folded metamorphic, sedimentary, and igneous rocks of Precambrian and early Paleozoic age, including phyllites, slates, schists, sandstones, quartzites, granites, and gneisses. The disjunct, outlier stands in the Allegheny Mountains occur only at the very highest elevations in the coldest climate niche in the state, on Pennsylvanian sandstone.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This community is more strongly dominated by *Picea rubens* than other communities in the spruce-fir zone. Additional canopy species may include *Abies fraseri, Acer pensylvanicum*, and *Betula alleghaniensis*. The deciduous shrub layer includes *Vaccinium erythrocarpum, Rubus canadensis*, and *Viburnum lantanoides*. The diverse and often dense herb layer includes ferns *Dryopteris campyloptera, Athyrium filix-femina ssp. asplenioides, Dennstaedtia punctilobula, Dryopteris intermedia, Huperzia lucidula, Polypodium appalachianum*, and *Thelypteris noveboracensis*, and forbs *Oxalis montana, Clintonia borealis*, and *Maianthemum canadense*.

Global Vegetation: These forests are dominated by needle-leaved evergreen trees and have a characteristic understory of Southern Appalachian endemic species and a conspicuous bryophyte layer. Canopies are dominated by *Picea rubens*, with or without *Abies fraseri*, sometimes with lesser amounts of *Betula alleghaniensis* and *Sorbus americana*. The subcanopy contains canopy species as well as *Acer spicatum* and *Amelanchier laevis*. The shrub strata are dominated by deciduous species and can be sparse to dense. Typical shrub species include *Viburnum lantanoides, Vaccinium erythrocarpum, Vaccinium simulatum, Sambucus racemosa var. racemosa (= Sambucus racemosa var. pubens), Rubus allegheniensis, Ilex montana, Rhododendron catawbiense*, and *Rubus canadensis*. Extensive patches of *Abies fraseri* seedlings and standing dead stems of *Abies fraseri* are common. Herb density can be high but is inversely related to the density of the shrub layer. Common herbaceous species include *Oxalis montana, Athyrium filix-femina ssp. asplenioides, Dryopteris campyloptera*, and *Clintonia borealis*. Other herbs include *Oclemena acuminata (= Aster acuminatus), Eurybia chlorolepis (= Aster chlorolepis), Carex gynandra, Carex pensylvanica, Chelone lyonii, Circaea alpina ssp. alpina, Houstonia serpyllifolia, Huperzia lucidula, Maianthemum canadense, Rugelia nudicaulis, Solidago glomerata, Streptopus lanceolatus var. roseus (= Streptopus roseus var. roseus)*, and *Viola macloskeyi ssp. pallens*. Bryophytes and lichens make up a considerable percent of the vegetative coverage in this community, occurring on the surface of the soil, trees, and fallen logs. Characteristic nonvascular species include *Hylocomium splendens, Ptilium crista-castrensis, Leptodontium excelsum, Bazzania trilobata, Bazzania nudicaulis, Alectoria fallacina, Hypotrachyna virginica, Dicranum scoparium*, and *Dicranum fuscescens*. Disjunct, outlier stands on summits in the Allegheny Mountains of West Virginia lack *Abies* and exhibit a dense canopy of *Picea rubens*, with a sparse to dense understory of *Vaccinium erythrocarpum*, on a luxuriant carpet of *Bazzania trilobata* and mosses. In Virginia, the rare plants *Abies fraseri, Cardamine clematitis*, and *Prenanthes roanensis* are minor components of this community.

Canopy structure and composition are fairly uniform, but understory composition changes continuously along a moisture gradient. Whittaker (1956) described five variations of the understory of Red Spruce - Fraser Fir Forests:

(1) Valley subtype: moss, *Oxalis*, and low shrub cover <5%, high herb cover 30% and high shrub cover 20%; (2) North slopes and flats: moss and *Oxalis* cover 25-55%, low and high shrub cover 5-20%, high herb strata is dominated by *Dryopteris* with other mesic herbs; (3) Intermediate east- and west-facing slopes: moss, *Oxalis* and fern cover 15-30%, low and high shrub cover 5-10%; (4) South slope subtype: all five strata are <10% cover; and (5) Ridge and steep upper slope: rhododendron heath approaches full coverage of understory.

Global Dynamics: Natural disturbances in this community include lightning fire, debris avalanches, wind disturbance, and ice storms (White and Pickett 1985, Nicholas and Zedaker 1989). The natural fire regime is estimated at longer than 500-1000 years. Stand-replacing fires may affect large-patch sizes but occur rarely, at 300- to 1000-year intervals; wind events are likely at more frequent intervals of 100 to 200 years (Gorman 2007). Human-initiated disturbances have included logging, slash fires, livestock grazing, and atmospheric pollutants. An exotic insect, the balsam woolly adelgid (*Adelges piceae*), invaded the Southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation. In areas where mature *Abies fraseri* has been lost to woolly adelgid infestation, thickets of *Rubus* spp., *Abies fraseri* seedlings and saplings, *Betula alleghaniensis*, and *Sorbus americana* are dominant. Over time, *Picea rubens, Betula alleghaniensis, Abies fraseri, Acer spicatum*, and *Sorbus americana* increase in the tree layer, while *Abies fraseri, Menziesia pilosa, Rubus idaeus ssp. strigosus*, and *Sambucus racemosa var. pubens* increase in the shrub layer (White et al. 1993). Succession is especially slow after severe disturbance such as logging and slash fires. The most severely disturbed sites are predominately *Prunus pensylvanica* and *Rubus* spp. and may remain in a non-forested stage of succession for 60 years or more.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Betula alleghaniensis*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium erythrocarpum*, *Viburnum lantanoides*
Herb (field)	Flowering forb	*Oxalis montana*
Herb (field)	Fern (Spore-bearing forb)	*Athyrium filix-femina* ssp. *asplenioides*, *Dryopteris campyloptera*, *Polypodium appalachianum*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Abies fraseri*
Tree canopy	Needle-leaved tree	*Picea rubens*
Tree subcanopy	Broad-leaved deciduous tree	*Acer spicatum*, *Amelanchier laevis*, *Betula alleghaniensis*, *Sorbus americana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Vaccinium erythrocarpum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Viburnum lantanoides*
Herb (field)	Flowering forb	*Oxalis montana*
Herb (field)	Fern (Spore-bearing forb)	*Athyrium filix-femina* ssp. *asplenioides*, *Dryopteris campyloptera*
Nonvascular	Moss	*Hylocomium splendens*, *Ptilium crista-castrensis*
Nonvascular	Liverwort/hornwort	*Bazzania trilobata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Dryopteris campyloptera*, *Huperzia lucidula*, *Maianthemum canadense*, *Oxalis montana*, *Picea rubens*, *Polypodium appalachianum*, *Vaccinium erythrocarpum*, *Viburnum lantanoides*

Global: *Abies fraseri*, *Angelica triquinata*, *Bazzania trilobata*, *Clintonia borealis*, *Dryopteris campyloptera*, *Eurybia chlorolepis*, *Houstonia serpyllifolia*, *Huperzia lucidula*, *Hylocomium splendens*, *Oxalis montana*, *Picea rubens*, *Ptilium crista-castrensis*, *Ribes rotundifolium*, *Rugelia nudicaulis*, *Solidago glomerata*, *Vaccinium erythrocarpum*, *Viburnum lantanoides*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Alectoria fallacina* (G2), *Bazzania nudicaulis* (G2G3), *Brachydontium trichodes* (G2G4), *Cardamine clematitis* (G3), *Carex ruthii* (G3), *Geum geniculatum* (G2), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Gymnoderma lineare* (G3), *Hypericum graveolens* (G3), *Hypotrachyna virginica* (G1G2), *Leptodontium excelsum* (G2), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Pseudevernia cladonia* (G2G4), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Sphenolobopsis pearsonii* (G2?), *Stachys clingmanii* (G2); **Other Plants**: *Betula papyrifera* var. *cordifolia* (G5T5), *Botrychium oneidense* (G4), *Calamagrostis canadensis* (G5), *Carex projecta* (G5), *Chelone lyonii* (G4), *Metzgeria temperata* (G4), *Nardia scalaris* (G5), *Phegopteris connectilis* (G5), *Plagiochila corniculata* (G4?), *Poa palustris* (G5), *Stellaria corei* (G4), *Streptopus amplexifolius* (G5), *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (1-Jun-2009). This community is restricted to the highest mountain systems of the Southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia, with outliers in the highest elevations in the Allegheny Mountains of West Virginia. It has a naturally restricted distribution and has been subject to major acreage reduction during the early part of the 20th century and rapid condition decline in the past 30 years. Modern threats include atmospheric pollution deposition and damage by the exotic balsam woolly adelgid (*Adelges piceae*). Well-developed, undisturbed examples of this community are extremely rare.

RELATED CONCEPTS

Global Similar Types:

- *Abies fraseri / (Rhododendron catawbiense, Rhododendron carolinianum)* Forest (CEGL006308)
- *Abies fraseri / Viburnum lantanoides / Dryopteris campyloptera - Oxalis montana / Hylocomium splendens* Forest (CEGL006049)
- *Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum)* Forest (CEGL007130) is a similar forest that has a shrub stratum dominated by evergreen species and occurs on less mesic sites than the one described here. Similar forests occur in the Central and Northern Appalachians, but have *Abies balsamea* as the fir component and less dense herb and bryophyte cover (Oosting and Billings 1951, Whittaker 1956, Crandall 1958).
- *Picea rubens - (Tsuga canadensis) / Rhododendron maximum* Forest (CEGL006152)
- *Picea rubens / Betula alleghaniensis / Bazzania trilobata* Forest (CEGL008501) is the dominant red spruce forest type within West Virginia; stands interfinger at the highest elevations in West Virginia.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Locally common along and near the AT at Great Smoky Mountains National Park, on Roan Mountain, and on Mount Rogers.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: This group represents forests dominated or codominated by *Picea rubens*; *Abies fraseri* and *Betula alleghaniensis* are each important associates in about half the plots.
Global Classification Comments: West Virginia stands assigned here (2009) differ from *Picea rubens / Betula alleghaniensis / Bazzania trilobata* Forest (CEGL008501) (the "core" red spruce in WV) in their position at the highest elevations and thereby experiencing the coldest temperatures. Significant indicators that differentiate this type from WV's "core" red spruce are *Vaccinium erythrocarpum* and *Dryopteris campyloptera*. Thirteen plots in three counties represent this type in West Virginia. An occurrence on the edge of the Ridge and Valley Province in southwestern Virginia occurs over sandstone on Clinch Mountain.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is restricted to the highest mountain systems of the Southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia, with northern outliers on the summits of West Virginia. It was sampled in Tennessee and at Whitetop Mountain in Virginia but also occurs near the AT in Great Smoky Mountains National Park, on Roan Mountain, and on Mount Rogers.

Global Range: This community is restricted to the highest mountain systems of the Southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia, with northern outliers on the summits of West Virginia.
Nations: US
States/Provinces: NC:S2, TN, VA:S1, WV:S2
TNC Ecoregions: 51:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ba:CCC, M221Bc:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Monongahela, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FSFD
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (4 plots; 36 accuracy assessment points): APPA.0364, APPA.0367, APPA.0375, APPA.0587, APPA_AA_0006, APPA_AA_0070, APPA_AA_0143, APPA_AA_0173, APPA_AA_0205, APPA_AA_0313, APPA_AA_0349, APPA_AA_0466, APPA_AA_0473, APPA_AA_0519, APPA_AA_0596, APPA_AA_0690, APPA_AA_0841, APPA_AA_0927, APPA_AA_1036, APPA_AA_1051, APPA_AA_1113, APPA_AA_1184, APPA_AA_1202, APPA_AA_1245, APPA_AA_1272, APPA_AA_1283, APPA_AA_1304, APPA_AA_1309, APPA_AA_1325, APPA_AA_1353, APPA_AA_1389, APPA_AA_1402, APPA_AA_1431, APPA_AA_1560, APPA_AA_1619, APPA_AA_1620, APPA_AA_1626, APPA_AA_1628, APPA_AA_1629, APPA_AA_1630.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson, M. Pyne and E.A. Byers
References: Adams and Stephenson 1991, Allard 1990, Anderson et al. 1990, Belden et al. 1994, Brown 1941, Bruck 1988, Busing et al. 1988, Byers et al. 2010, Cogbill and White 1991, Crandall 1958, Crandall 1960, Davis 1930, Dull et al. 1988b, Eagar and Adams 1992, Eyre 1980, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Golden 1974, Gorman 2007, Korstian 1937, McLaughlin et al. 1987, McLeod 1988, NCNHP 1993, NatureServe Ecology - Southeastern U.S. unpubl. data, Nicholas and Zedaker 1989, Nicholas et al. 1992, Oosting and Billings 1951, Peet et al. unpubl. data, Pyne 1994, Ramseur 1960, Rawinski 1992, Rheinhardt and Ware 1984, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schofield 1960, Southeastern Ecology Working Group n.d.*, Stephenson and Adams 1984, Stephenson and Clovis 1983, TDNH unpubl. data, USFS 1988, VDNH 2003, Wentworth et al. 1988a, White 1984a, White 1984b, White and Cogbill 1992, White and Pickett 1985, White et al. 1993, Whittaker 1956, Zedaker et al. 1988

A0138 *Picea rubens - Betula alleghaniensis - Aesculus flava* Forest Alliance

Alliance Summary Description: These are evergreen or mixed forests and woodlands dominated by *Picea rubens* with or without some combination of *Aesculus flava, Betula alleghaniensis*, and *Tsuga canadensis*. Other species that may occur with low coverage in the canopy or subcanopy are *Acer pensylvanicum, Acer spicatum, Amelanchier laevis, Halesia tetraptera var. monticola, Prunus pensylvanica*, and *Sorbus americana*. Density and composition of shrub and herbaceous strata vary with association and geographic location. Exposed, drier sites, such as upper convex slopes or slopes with a southerly aspect, will often have high coverage of evergreen shrub species. Typical shrubs include *Crataegus* spp., *Ilex montana, Kalmia latifolia, Leucothoe fontanesiana, Photinia melanocarpa (= Aronia melanocarpa), Rhododendron carolinianum, Rhododendron catawbiense, Rhododendron maximum, Smilax rotundifolia, Vaccinium angustifolium, Vaccinium erythrocarpum, Vaccinium simulatum, Viburnum lantanoides*, and *Viburnum nudum var. cassinoides*. Herbaceous cover is typically sparse, but where the shrub stratum is more open, a moderate herb stratum may develop. Characteristic herbaceous species include *Athyrium filix-femina, Clintonia borealis, Dryopteris campyloptera, Galax urceolata, Huperzia lucidula, Lycopodium clavatum, Lycopodium dendroideum, Lycopodium obscurum, Medeola virginiana, Mitchella repens, Oxalis montana, Rugelia nudicaulis, Schizachne purpurascens*, and *Trillium undulatum*. Nonvascular plants are common and often abundant, especially on moister sites, where they grow on branches and around the base of trees and shrubs. Bryophyte species include *Bazzania trilobata, Hylocomium splendens, Polytrichum ohioense, Ptilium crista-castrensis*, and *Sphagnum* spp. These forests occur in the Central Appalachians and Southern Blue Ridge, from West Virginia south to western North Carolina and eastern Tennessee, on steep, seepy boulderfields, and on ridges and steep slopes with northeast to southwest exposures, above 1370 m (4500 feet) elevation. It descends to 1000 m (3100 feet) in the Central

Appalachians. In local landscapes of the Southern Blue Ridge and Central Appalachians, this vegetation tends to occur bimodally, on high ridges and summits and steep, rocky upper slopes, and at lower elevations in frost pocket situations, where *Picea rubens* apparently has a competitive advantage because of moist, acidic, organic soils and/or cold-air drainage.

[CEGL004983] *Picea rubens - (Betula alleghaniensis, Aesculus flava) / Rhododendron (maximum, catawbiense)* Forest

Translated Name: **Red Spruce - (Yellow Birch, Yellow Buckeye) / (Great Laurel, Catawba Rosebay) Forest**
Common Name: **Red Spruce - Northern Hardwood Forest (Shrub Type)**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	*Picea rubens - Betula alleghaniensis - Aesculus flava* Forest Alliance (A0138)

Element Concept

Global Summary: This association occurs in the broad elevational transition zone between spruce-fir and northern hardwoods in the Southern Blue Ridge (approx. 1400-1550 m [4600-5100 feet]). Sites are steep to very steep, slopes often associated with cliff faces, rock outcroppings, or bouldery situations, and subject to disturbance by wind, ice, and landslides. The canopy is composed of *Picea rubens* codominating with deciduous species *Betula alleghaniensis, Fagus grandifolia*, and *Aesculus flava*, occurring singly or in combination. At higher elevations, *Abies fraseri* may be a minor canopy component. The shrub layer is well-developed and dominated by *Rhododendron maximum* or *Rhododendron catawbiense*. In the Great Smoky Mountains, *Leucothoe fontanesiana* can be the dominant shrub. Other minor shrubs include *Ilex montana, Viburnum lantanoides, Vaccinium erythrocarpum*, and *Rubus allegheniensis*. The thick, evergreen shrub layer precludes the establishment of seedlings or herbaceous plants and creates a heavy, slowly decomposing litter layer. Bryophyte cover can be high (over 50%), and the ground is covered with downed and decaying logs.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This association occurs in the broad elevational transition zone between spruce-fir and northern hardwoods in the Southern Blue Ridge (approx. 1,400-1,550 m [4,600-5,100 feet]). Sites are steep to very steep, slopes often associated with cliff faces, rock outcroppings, or bouldery situations, and subject to disturbance by wind, ice, and landslides.
Global Environment: In southwestern Virginia, the type occurs at the highest elevations (1340-1433 m [4400-4700 feet]) of the Ridge and Valley on summits and upper slopes of Clinch Mountain. Soils are organic and shallow to bedrock.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The mixed evergreen-deciduous tree canopy is composed of 25-50% cover by evergreen needle-leaved *Picea rubens* with 25-50% cover by deciduous broad-leaved *Betula alleghaniensis, Fagus grandifolia*, and *Aesculus flava*. The shrub layer is well-developed and dominated by *Rhododendron maximum* or *Rhododendron catawbiense*. In the Great Smoky Mountains, *Leucothoe fontanesiana* can be dominant.
Global Vegetation: Virginia stands on Clinch Mountain are codominated by *Picea rubens* (most abundant), with variable codominance by *Betula alleghaniensis* and *Fagus grandifolia*. In some areas, *Picea rubens* dominates the canopy and hardwoods dominate a lower, subcanopy layer. *Sorbus americana* is a minor understory tree. The shrub layer is dense with *Rhododendron maximum* generally dominant and *Rhododendron catawbiense* codominant in many areas. Other shrubs occurring at low cover include *Acer pensylvanicum, Kalmia latifolia*, and *Vaccinium simulatum*. The ground is thickly covered by coarse woody debris and bryophytes, with few herbaceous species present.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron catawbiense*, *Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia*
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron catawbiense*, *Rhododendron maximum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia*, *Picea rubens*, *Rhododendron catawbiense*, *Rhododendron maximum*
Global: *Betula alleghaniensis*, *Picea rubens*, *Rhododendron maximum*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3); **Other Plants**: *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1? (2-Jan-2013). The community is geographically and environmentally restricted to the highest elevations of the Southern Blue Ridge and, in southwestern Virginia, to the highest elevations of Clinch Mountain in the Ridge and Valley province. Very few occurrences are known to exist, and it has only been described from the Great Smoky Mountains and the Beartown Wilderness in southwestern Virginia.

RELATED CONCEPTS

Global Similar Types:

- *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861)
- *Picea rubens - (Betula alleghaniensis, Aesculus flava) / Viburnum lantanoides / Solidago glomerata* Forest (CEGL006256)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This association is known from the Great Smoky Mountains of Tennessee.
Global Classification Comments: This association should be compared with other vegetation farther north in the Appalachians. Examples of this community on more exposed, rocky sites may transition to heath shrublands. At high elevations, this community grades into *Picea rubens*-dominated forests. Similar vegetation has been observed and sampled on Beartown, Clinch Mountain in Tazewell County, Virginia (1433 m [4700 feet] elevation), and this association was added to the Virginia State Classification (Fleming and Patterson 2012) based on that observation. Data collected by Steve Adams and Steve Stephenson in the 1980s from spruce forests with a *Rhododendron catawbiense* shrub layer on Beartown, Clinch Mountain in Russell County, Virginia (1403 m [4600 feet] elevation) also seem to match this type and will be targeted for inventory by Virginia DNH ecologists. These sites are out of the range of *Abies fraseri* and have considerable hardwood codominance in places, so *Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum)* Forest (CEGL007130) was not applicable, though it has been documented on Whitetop Mountain, Virginia.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This association is known from the Great Smoky Mountains of Tennessee.
Global Range: This association is known from the Great Smoky Mountains of Tennessee, Clinch Mountain in southwestern Virginia, and the Blue Ridge of North Carolina.
Nations: US
States/Provinces: NC:S1, TN, VA:S1
TNC Ecoregions: 50:C, 51:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains); USFS (Jefferson, Pisgah?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FSHS
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: This community was mapped within the corridor south of Carvers Gap along the TN/NC border, and was observed during accuracy assessment.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (19 accuracy assessment points): APPA_AA_0224, APPA_AA_0535, APPA_AA_0595, APPA_AA_0693, APPA_AA_0733, APPA_AA_0884, APPA_AA_0924, APPA_AA_0951, APPA_AA_0965, APPA_AA_0966, APPA_AA_1029, APPA_AA_1067, APPA_AA_1097, APPA_AA_1159, APPA_AA_1253, APPA_AA_1291, APPA_AA_1347, APPA_AA_1395, APPA_AA_1583.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay
Global Description Author(s): K.D. Patterson and G.P. Fleming
References: Fleming and Patterson 2012, Golden 1974, Golden 1981, Livingston and Mitchell 1976, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

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[CEGL006256] *Picea rubens - (Betula alleghaniensis, Aesculus flava) / Viburnum lantanoides / Solidago glomerata* Forest

Translated Name: **Red Spruce - (Yellow Birch, Yellow Buckeye) / Hobblebush / Clustered Goldenrod Forest**
Common Name: **Red Spruce - Northern Hardwood Forest (Herb Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	*Picea rubens - Betula alleghaniensis - Aesculus flava* Forest Alliance (A0138)

ELEMENT CONCEPT

Global Summary: This association occurs in the broad elevational transition zone between spruce-fir and northern hardwoods in the Southern Blue Ridge at approximately 1400 to 1555 m (4600-5100 feet) elevation. This association occurs on steep slopes and protected ridges, over shallow, stony soils. The canopy is composed of *Picea rubens* codominating with the deciduous species *Betula alleghaniensis, Fagus grandifolia*, and *Aesculus flava*, occurring singly or in combination. At higher elevations, *Abies fraseri* may be a minor canopy component. The shrub stratum is open to absent. *Viburnum lantanoides* is a common shrub, and *Acer pensylvanicum* and *Amelanchier laevis* often occur as small trees. The herbaceous stratum is lush and diverse. Typical herbs include *Oclemena acuminata (= Aster acuminatus), Carex pensylvanica, Dryopteris campyloptera, Dryopteris intermedia, Maianthemum canadense, Oxalis montana, Solidago glomerata*, and *Rugelia nudicaulis* (in the Great Smoky Mountains).

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This red spruce - northern hardwood forest occurs on steep slopes and protected ridges in the transition zone between spruce-fir and northern hardwoods in the Southern Blue Ridge at approximately 1,400 to 1,555 m (4,600-5,100 feet) elevation.

Global Environment: This association occurs in the broad elevational transition zone between spruce-fir and northern hardwoods in the Southern Blue Ridge at approximately 1400 to 1555 m (4600-5100 feet) elevation. This association occurs on steep slopes and protected ridges, over shallow, stony soils.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy of this mixed evergreen-deciduous forest is composed of 25-50% cover by evergreen needle-leaved *Picea rubens* with 25-50% cover by deciduous broad-leaved *Betula alleghaniensis, Fagus grandifolia*, and *Aesculus flava*. The shrub stratum is open to absent, while the herbaceous stratum is well-developed and may be lush and diverse. Typical herbs include *Oclemena acuminata, Carex pensylvanica, Dryopteris campyloptera, Dryopteris intermedia, Maianthemum canadense, Oxalis montana*, and others.

Global Vegetation: The canopy is composed of *Picea rubens* codominating with the deciduous species *Betula alleghaniensis, Fagus grandifolia*, and *Aesculus flava*, occurring singly or in combination. At higher elevations, *Abies fraseri* may be a minor canopy component. The shrub stratum is open to absent. *Viburnum lantanoides* is a common shrub, and *Acer pensylvanicum* and *Amelanchier laevis* often occur as small trees. The herbaceous stratum is lush and diverse. Typical herbs include *Oclemena acuminata (= Aster acuminatus), Carex pensylvanica, Dryopteris campyloptera, Dryopteris intermedia, Maianthemum canadense, Oxalis montana, Solidago glomerata*, and *Rugelia nudicaulis* (in the Great Smoky Mountains).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Viburnum lantanoides*
Herb (field)	Flowering forb	*Oxalis montana*, *Solidago glomerata*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris campyloptera*, *Dryopteris intermedia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Aesculus flava*, *Betula alleghaniensis*, *Dryopteris campyloptera*, *Fagus grandifolia*, *Oclemena acuminata*, *Oxalis montana*, *Picea rubens*
Global: *Abies fraseri*, *Aesculus flava*, *Betula alleghaniensis*, *Dryopteris campyloptera*, *Fagus grandifolia*, *Picea rubens*, *Solidago glomerata*, *Viburnum lantanoides*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Other Plants: *Dryopteris intermedia* (G5)
Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Carex ruthii* (G3), *Hypericum graveolens* (G3), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3); **Other Plants**: *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (4-Jan-2000). The community is geographically and environmentally restricted to the highest elevations of the Southern Blue Ridge. Very few occurrences are known to exist.

RELATED CONCEPTS

Global Similar Types:
- *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861)
- *Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest (CEGL006267)
- *Picea rubens - (Betula alleghaniensis, Aesculus flava) / Rhododendron (maximum, catawbiense)* Forest (CEGL004983)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This community was observed during mapping reconnaissance by UMESC during the summer of 2010 at Unaka Mountain, TN/NC; Carvers Gap, TN/NC; and in the Whitetop Mountain complex area, VA.
Global Classification Comments: Original type was split into two forest associations [see also *Picea rubens - (Betula alleghaniensis, Aesculus flava) / Rhododendron (maximum, catawbiense)* Forest (CEGL004983)].

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is restricted to the Southern Blue Ridge of North Carolina and Tennessee.
Global Range: This community is restricted to the Southern Blue Ridge of North Carolina and Tennessee. It may occur at high elevations (above 1220 m [4000 feet]) in Virginia and Georgia.
Nations: US
States/Provinces: NC:S2, TN
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221A:CP, M221B:CP, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee?, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FSHH
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: This community was observed during mapping reconnaissance by UMESC during the summer of 2010 at Unaka Mountain, TN/NC, Carvers Gap, TN/NC, in the Whitetop Mountain complex area, VA, and during accuracy assessment.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (29 accuracy assessment points): APPA_AA_0054, APPA_AA_0103, APPA_AA_0208, APPA_AA_0234, APPA_AA_0369, APPA_AA_0386, APPA_AA_0390, APPA_AA_0394, APPA_AA_0395, APPA_AA_0403, APPA_AA_0458, APPA_AA_0649, APPA_AA_0704, APPA_AA_0784, APPA_AA_0829, APPA_AA_1085, APPA_AA_1270, APPA_AA_1290, APPA_AA_1295, APPA_AA_1357, APPA_AA_1453, APPA_AA_1457, APPA_AA_1470, APPA_AA_1518, APPA_AA_1567, APPA_AA_1625, APPA_AA_3358, APPA_AA_3359, APPA_AA_3360.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay
Global Description Author(s): D.J. Allard and K.D. Patterson
References: Allard 1990, Golden 1974, Golden 1981, Livingston and Mitchell 1976, McLeod pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

[CEGL006152] *Picea rubens - (Tsuga canadensis) / Rhododendron maximum* Forest

Translated Name: **Red Spruce - (Eastern Hemlock) / Great Laurel Forest**
Common Name: **Red Spruce Forest (Protected Slope Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	*Picea rubens - Betula alleghaniensis - Aesculus flava* Forest Alliance (A0138)

ELEMENT CONCEPT

Global Summary: This association includes moist slope forests of the Central and Southern Appalachians. *Abies fraseri* is a minor component or entirely absent. These communities can occur on high-elevation boulderfields, ridges and steep slopes, as well as sheltered lower slopes above 945 m (3100 feet). This association occurs in the lower elevations of the range of *Picea rubens*, primarily on protected landforms such as steep to gentle slopes but also on ridges at least in parts of its range. In the Southern and Central Appalachians these are closed-canopy conifer forests dominated by *Picea rubens*, with associates *Tsuga canadensis, Acer pensylvanicum, Amelanchier* spp., *Betula alleghaniensis*, and *Sorbus americana*. This concept includes protected slope forests in the Great Smoky Mountains, as well as in West Virginia in which *Tsuga canadensis* is codominant. The shrub layer is dominated by

Rhododendron maximum, with associates of *Ilex montana, Kalmia latifolia, Viburnum lantanoides*, and *Viburnum nudum var. cassinoides*. In some examples, the shrub layer can include a mixture of *Rhododendron catawbiense* and *Rhododendron maximum*. Other minor shrub components can include *Vaccinium simulatum, Vaccinium erythrocarpum*, and *Photinia melanocarpa (= Aronia melanocarpa)*. Herbaceous cover is typically sparse, but where the shrub stratum is more open, a moderate herb stratum may be developed. This can include *Clintonia borealis, Dryopteris campyloptera, Huperzia lucidula, Lycopodium* spp., *Medeola virginiana, Mitchella repens, Oxalis montana*, and *Rugelia nudicaulis* (in the Great Smoky Mountains).

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This forest is found on moist protected slopes.

Global Environment: This association occurs on steep to gentle, middle to high slopes between 945 and 1524 m (3100-5000 feet) elevation. Sites range from those that are relatively exposed, rocky and subjected to disturbance by wind and ice, to more sheltered lower slopes. Some stands also occur on nearly flat ridgetops (J. Vanderhorst pers. comm.) Soils are well-drained and high in organic matter. In the vicinity of Mount LeConte in the Great Smoky Mountains, this association occurs on long protected slopes that extend from low to very high elevations. In these sheltered situations *Tsuga canadensis* is a codominant, and the evergreen shrub layer is nearly closed, producing an "ericad desert" with few to no herbaceous species. On more-exposed sites the shrub layer may be more open, and a sparse to moderate herb layer may be present. It descends to 945 m (3100 feet) in the Central Appalachians. In local landscapes of the Southern Blue Ridge and Central Appalachians, this association tends to occur bimodally, on high ridges and summits and steep, rocky upper slopes, and at lower elevations in sheltered frost-pocket situations, where *Picea rubens* apparently has a competitive advantage because of moist, acidic, organic soils and/or cold-air drainage.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This forest is dominated by *Picea rubens* sometimes along with *Tsuga canadensis*. The shrub layer is dominated by *Rhododendron maximum*.

Global Vegetation: In the Southern and Central Appalachians these are closed to partially open conifer forests dominated by *Picea rubens*, with associates *Tsuga canadensis, Acer pensylvanicum, Acer rubrum, Amelanchier* spp., *Betula alleghaniensis*, and *Sorbus americana*. In stands of this type *Abies fraseri* is a minor component or entirely absent. In the vicinity of Mount LeConte in the Great Smoky Mountains, this association occurs on long protected slopes that extend from low to very high elevations. In these sheltered situations *Tsuga canadensis* may be a codominant, and the evergreen shrub layer (primarily *Rhododendron maximum*) is nearly closed, producing stands whose understory is dominated by ericaceous shrubs with few to no herbaceous species (a so-called "ericad desert"). On more-exposed sites the variable shrub layer is dominated by *Rhododendron maximum*, with associates of *Ilex montana, Kalmia latifolia, Viburnum lantanoides*, and *Viburnum nudum var. cassinoides*. In some examples, the shrub layer can include a mixture of *Rhododendron catawbiense* and *Rhododendron maximum*. Other minor shrub components can include *Vaccinium simulatum, Vaccinium erythrocarpum*, and *Photinia melanocarpa (= Aronia melanocarpa)*. The sparse herbaceous layer for more open situations can include *Clintonia borealis, Dennstaedtia punctilobula, Dryopteris campyloptera, Dryopteris intermedia, Huperzia lucidula, Lycopodium clavatum, Lycopodium obscurum, Lycopodium dendroideum, Lycopodium hickeyi (= Lycopodium obscurum var. isophyllum), Medeola virginiana, Mitchella repens, Oxalis montana, Trillium undulatum*, and *Rugelia nudicaulis* (in the Great Smoky Mountains). Nonvascular plants are common, especially on moister sites, where they grow on branches and rocks and around the bases of trees and shrubs. Bryophyte species include *Bazzania trilobata, Hylocomium splendens, Polytrichum* sp., *Brotherella recurvans*, and *Dicranum* sp.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*, *Tsuga canadensis*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Picea rubens*, *Rhododendron maximum*
Global: *Picea rubens*, *Rhododendron catawbiense*, *Rhododendron maximum*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3); **Other Plants**: *Bazzania trilobata* (G5), *Streptopus lanceolatus var. roseus* (G5T4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (15-Mar-2005). This and related vegetation types are environmentally restricted within a somewhat geographically restricted range. Their former extent has been reduced to more-or-less isolated, small patches by logging and subsequent fires (Allard and Leonard 1952, Clarkson 1964, Pielke 1981, Stephenson and Clovis 1983). Grank changed to G2G3 from G2? with merging in of two related associations (March 2005). The range of the combined type is from West Virginia south to North Carolina and Tennessee.

RELATED CONCEPTS

Global Similar Types:

- *Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum)* Forest (CEGL007130)
- *Picea rubens - (Abies fraseri) / Vaccinium erythrocarpum / Dryopteris campyloptera / Hylocomium splendens* Forest (CEGL007131)
- *Picea rubens - Tsuga canadensis - Fagus grandifolia / Dryopteris intermedia* Forest (CEGL006029)
- *Picea rubens / Betula alleghaniensis / Bazzania trilobata* Forest (CEGL008501) dominant matrix red spruce forest type within West Virginia; lacks dense evergreen rhododendron shrub layer

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Great Smoky Mountains National Park only, known from a few locations where higher elevation hemlock - spruce forests persist. May be high and cold enough to persist for a few years more and a good location for park intervention.
Global Classification Comments: Classification of this unit is supported by 15 plots in Pocahontas, Randolph, and Tucker counties in West Virginia. This association was determined not to be distinct from former *Picea rubens - Tsuga canadensis / Rhododendron maximum* Forest (CEGL006272) which was merged into this concept. Likewise, former *Picea rubens / Rhododendron catawbiense* Forest (CEGL006163) of West Virginia also was considered floristically indistinct and is now also included in the concept of CEGL006152.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: No data are available.
Global Range: This association ranges sporadically at appropriate elevations from the Great Smoky Mountains in the Southern Blue Ridge of North Carolina and Tennessee, north to the Central Appalachians in West Virginia. It is not known from Pennsylvania.
Nations: US
States/Provinces: NC:S1, TN, VA?, WV:S2
TNC Ecoregions: 51:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ba:CCC, M221Bb:CCP, M221Bc:CCC, M221Bd:CCP, M221Be:CCP, M221C:CC, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Monongahela, Nantahala, Pisgah); USFWS (Canaan Valley)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FSHS
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay and M. Russo
Global Description Author(s): M. Pyne
References: Adams and Stephenson 1989, Allard 1990, Allard and Leonard 1952, Byers et al. 2010, CAP pers. comm. 1998, Clarkson 1964, Cogbill and White 1991, Crandall 1958, Eyre 1980, Golden 1974, Nicholas et al. 1992, Peet et al. unpubl. data, Pielke 1981, Pyne 1994, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990,

Southeastern Ecology Working Group n.d.*, Stephenson and Adams 1984, Stephenson and Clovis 1983, TDNH unpubl. data, White and Pickett 1985, White et al. 1985, Whittaker 1956

G743. LAURENTIAN-ACADIAN HARDWOOD FOREST

Group Summary Description: This group covers forests around the northern Great Lakes, New England, and adjacent Canada dominated by some combination of northern hardwoods *Acer saccharum, Betula alleghaniensis, Fagus grandifolia, Fraxinus americana, Prunus serotina*, and *Tilia americana*, with presence of conifers, including *Tsuga canadensis* and *Pinus strobus*, or in the eastern part of the range, *Picea rubens* and minor but frequent *Abies balsamea*. They are characteristic of mesic soils, ranging from dry-mesic to wet-mesic settings. Conifers contain <25% cover, and typically include *Tsuga canadensis* and *Pinus strobus*. Early-successional stages may be dominated by *Abies balsamea, Acer rubrum, Betula papyrifera*, or *Populus tremuloides*, often with *Pinus strobus*. With the exception of *Quercus rubra*, oaks are generally unimportant, and then usually on somewhat drier sites or sites with a relatively recent fire history.

A3224 *Acer saccharum - Fagus grandifolia - Betula alleghaniensis* Forest Alliance

Alliance Summary Description: This alliance is composed of rich mesic forests. Stands typically have a closed canopy. Most of the trees are deciduous, but conifers are often scattered throughout the stands. *Acer saccharum* is dominant in the overstory and sapling layer. *Betula alleghaniensis, Fagus grandifolia* (in the eastern two-thirds of this alliance's range), and *Tilia americana* may be codominants. Other common trees include *Abies balsamea, Acer rubrum, Fraxinus americana, Ostrya virginiana, Picea glauca, Pinus strobus, Quercus rubra*, and *Tsuga canadensis*. *Picea rubens* can be found in high-elevation stands in the East. The dense overstory inhibits the growth of an abundant shrub layer. *Acer pensylvanicum* (in the East), *Corylus cornuta, Hamamelis virginiana, Lonicera canadensis, Taxus canadensis*, and *Viburnum acerifolium* are typical shrubs. Many of the common herbaceous species are typical of sub-boreal communities. These include *Aralia nudicaulis, Chimaphila maculata, Clintonia borealis, Lycopodium* spp., *Maianthemum canadense, Osmorhiza claytonii, Oxalis montana, Pteridium aquilinum*, and *Streptopus lanceolatus var. longipes (= Streptopus roseus)*. This alliance is found in the north-central and northeastern United States and adjacent southern Canada. Stands of this alliance are found on moderate to deep (60-150 cm) sandy loam, clay loam, or loamy sand soils that are typically slightly acidic to circumneutral, mesic to wet-mesic and nutrient-rich. Most stands develop on flat to moderate slopes over glacial till. A relatively thick layer of fallen leaves covers the forest floor. Sites that support this alliance are on flat to moderately sloping terrain on glacial features, such as till or moraines, or on calcareous rocks, sandstone, or shale outside the glaciated region.

[CEGL006631] *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest

Translated Name: **Sugar Maple - Yellow Birch - American Beech / Hobblebush Forest**
Common Name: **Northern Hardwood Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Laurentian-Acadian Hardwood Forest (G743)
Alliance	*Acer saccharum - Fagus grandifolia - Betula alleghaniensis* Forest Alliance (A3224)

ELEMENT CONCEPT

Global Summary: This association, known commonly as "northern hardwood forest," is a widespread matrix forest in central New England and at lower elevations in northern New England, and the montane regions of New York. This forest occurs most commonly on acidic (pH 5-6), moderate to well-drained tills at elevations generally below 762 m (2500 feet). In northern New England, they cover extensive mid-elevation ridges; elsewhere, slope settings are common. The closed-canopy forest has sparse to moderate shrub and herb cover and may have local carpets of tree seedlings in the ground vegetation. Bryoids are a minor component of the forest floor. The closed-canopy forest has sparse to moderate shrub and herb cover and may have local carpets of tree seedlings in the ground vegetation. Bryoids are a minor component of the forest floor. On some rocky, higher-elevation sites, dense ferns and other herbs may form a lush understory (the "fern-glade variant"). The canopy is dominated by *Acer saccharum* mixed with variable amounts of *Fagus grandifolia* and/or *Betula alleghaniensis*. Associated hardwood species include *Acer rubrum, Betula papyrifera*, and *Fraxinus americana*. At the southern end of this type's range, especially in mid-

successional stands, *Betula lenta* may be present. Conifers are usually present at low abundance. Characteristic species include *Pinus strobus, Tsuga canadensis*, and *Picea rubens*. Oaks are generally not present, although *Quercus rubra* is sometimes present in low numbers. The shrub layer is often dominated by saplings of canopy tree species Characteristic understory shrubs or small trees include *Acer pensylvanicum, Ostrya virginiana, Viburnum lantanoides*, and *Acer spicatum*. The patchy herbaceous layer is a mix of ferns, rhizomatous herbs and clubmosses. Characteristic species include *Dryopteris intermedia, Dryopteris carthusiana, Polystichum acrostichoides, Huperzia lucidula, Maianthemum canadense, Clintonia borealis, Trientalis borealis, Oclemena acuminata (= Aster acuminatus)*, and *Uvularia sessilifolia*. Occasional species include *Aralia nudicaulis, Trillium erectum, Trillium undulatum, Dryopteris campyloptera, Streptopus lanceolatus (= Streptopus roseus), Cinna latifolia, Thelypteris noveboracensis, Mitchella repens, Solidago macrophylla*, and *Medeola virginiana*. The bryophyte layer may include *Dicranum* spp. and *Leucobryum glaucum*. Sugar maple leaf litter is high in nitrogen relative to lignin and thus decomposes rapidly, increasing the nutrient pool in the soil organic layer. Structure and composition of the forest are maintained primarily by single small tree-fall gaps. Yellow birch is maintained in the system by mineral soils on "tip-up mounds."

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This widespread matrix forest association is found throughout the Northern Appalachian project area at low to mid elevations ranging from 150 to 700 m (490-2,300 feet) on gentle to steep low to high slopes on all aspects. Soils are typically mesic and composed of sandy loam, loam, and silt loam with abundant litter and duff.

Global Environment: This association, known commonly as "northern hardwood forest," is a widespread matrix forest in central New England, lower elevations in northern New England and montane regions of New York. This forest occurs most commonly on acidic (pH 5-6), moderate to well-drained tills at elevations generally below 760 m (2500 feet). In northern New England, they cover extensive mid-elevation ridges; elsewhere, slope settings are common.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by closed-canopy deciduous forests. Canopies are highly variable and dominated or codominated by *Acer saccharum, Fagus grandifolia*, and/or *Betula alleghaniensis* with *Acer pensylvanicum* often forming an open subcanopy. The conifers *Abies balsamea* and *Picea rubens* are common associates. Early-successional species such as *Betula papyrifera, Populus grandidentata*, and *Prunus serotina* often occur in younger stands at low cover. *Viburnum lantanoides* is the most consistent dominant shrub in stands. However, many sites have a tall-shrub layer heavily dominated by saplings of canopy species. No other shrub species occur with notable frequency. The herbaceous layer is diverse and most frequently dominated by the ferns *Dennstaedtia punctilobula, Dryopteris campyloptera*, and *Dryopteris intermedia*. Numerous forbs and graminoids occur in association and may include *Aralia nudicaulis, Arisaema triphyllum, Brachyelytrum erectum, Carex debilis, Carex intumescens, Clintonia borealis, Maianthemum canadense, Maianthemum racemosum, Medeola virginiana, Oclemena acuminata, Oxalis montana, Streptopus lanceolatus, Trientalis borealis, Trillium erectum, Trillium undulatum*, and *Uvularia sessilifolia*.

Global Vegetation: The closed-canopy forest has sparse to moderate shrub and herb cover and may have local carpets of tree seedlings in the ground vegetation. Bryoids are a minor component of the forest floor. On some rocky, higher-elevation sites, dense ferns and other herbs may form a lush understory (the "fern-glade variant"). The canopy is dominated by *Acer saccharum* mixed with variable amounts of *Fagus grandifolia* and/or *Betula alleghaniensis*. Associated hardwood species include *Acer rubrum, Betula papyrifera*, and *Fraxinus americana*. Conifers are usually present at low abundance. Characteristic species include *Pinus strobus, Tsuga canadensis*, and *Picea rubens*. Oaks are generally not present, although *Quercus rubra* is sometimes present in low numbers. The shrub layer is often dominated by saplings of canopy tree species. Characteristic understory shrubs or small trees include *Acer pensylvanicum, Ostrya virginiana, Viburnum lantanoides*, and *Acer spicatum*. The patchy herbaceous layer is a mix of ferns, rhizomatous herbs and clubmosses. Characteristic species include *Dryopteris intermedia, Dryopteris carthusiana, Polystichum acrostichoides, Huperzia lucidula, Maianthemum canadense, Clintonia borealis, Trientalis borealis, Oclemena acuminata (= Aster acuminatus)*, and *Uvularia sessilifolia*. Occasional species include *Aralia nudicaulis, Trillium erectum, Trillium undulatum, Dryopteris campyloptera, Streptopus lanceolatus (= Streptopus roseus), Cinna latifolia, Thelypteris noveboracensis, Mitchella repens, Solidago macrophylla*, and *Medeola virginiana*. The bryophyte layer may include *Dicranum* spp. and *Leucobryum glaucum*. At higher elevations any of the understory herbs characteristic of montane spruce-fir forests may be locally abundant.

Global Dynamics: Sugar maple leaf litter is high in nitrogen relative to lignin and thus decomposes rapidly, increasing the nutrient pool in the soil organic layer. Structure and composition of the forest are maintained primarily by single small tree-fall gaps. Yellow birch is maintained in the system by mineral soils on "tip up mounds."

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Betula alleghaniensis*, *Fagus grandifolia*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum lantanoides*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Dryopteris campyloptera*, *Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fagus grandifolia*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Tall shrub/sapling	Broad-leaved deciduous tree	*Ostrya virginiana*
Short shrub/sapling	Broad-leaved deciduous tree	*Acer saccharum*, *Fagus grandifolia*
Herb (field)	Fern (Spore-bearing forb)	*Polystichum acrostichoides*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer saccharum*, *Betula alleghaniensis*, *Dryopteris intermedia*, *Fagus grandifolia*, *Huperzia lucidula*, *Viburnum lantanoides*
Global: *Acer pensylvanicum*, *Acer saccharum*, *Betula alleghaniensis*, *Dryopteris intermedia*, *Fagus grandifolia*, *Ostrya virginiana*, *Pinus strobus*, *Polystichum acrostichoides*, *Tsuga canadensis*, *Viburnum lantanoides*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium), *Microstegium vimineum* (High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (2-Dec-2014). This association is a widespread matrix forest in central and northern New England, upstate New York, and adjacent Canada.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - (Fraxinus americana) / Arisaema triphyllum* Forest (CEGL006211)
- *Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest (CEGL006628)
- *Acer saccharum - Fagus grandifolia - Betula* spp. / *Maianthemum canadense* Forest (CEGL005004)
- *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632)
- *Acer saccharum - Fraxinus americana / Acer spicatum / Caulophyllum thalictroides* Forest (CEGL006636)
- *Acer saccharum - Pinus strobus / Acer pensylvanicum* Forest (CEGL005005)
- *Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest (CEGL006267)
- *Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest (CEGL006129)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: This type is separated from *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632) by the stronger dominance and more consistent presence of *Betula alleghaniensis*, and the occasional presence of *Picea rubens* and *Abies balsamea*. Distinctions in shrub and ground layer species needs further review.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is the matrix-forming vegetation throughout the Northern Appalachian project area at low to mid elevations.
Global Range: This association is a widespread matrix forest from southern Quebec and the Maritime Provinces of Canada south through northern and central New England and montane regions of New York.

Nations: CA, US
States/Provinces: CT?, MA, ME, NB, NH:S5, NY, QC?, VT
TNC Ecoregions: 48:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 222:C, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Ca:CCC, M212Cb:CCC, M212Cc:CCC, M212Cd:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212Ea:CCC, M212Eb:CCC, M212Fa:CCC, M212Fb:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians], Marsh-Billings-Rockefeller); USFWS (Aroostook, Moosehorn, Nulhegan Basin, Pondicherry, Rachel Carson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FNAH
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (18 plots; 19 observation points; 23 accuracy assessment points): APPA.0476, APPA.0711, APPA.0715, APPA.0722, APPA.0725, APPA.0726, APPA.0734, APPA.0740, APPA.0759, APPA.0760, APPA.0764, APPA.0774, APPA.0778, APPA.0786, APPA.0787, APPA.0861, APPA.0983, APPA.0987, APPA.1531, APPA.1532, APPA.1554, APPA.1575, APPA.1585, APPA.1587, APPA.1589, APPA.1592, APPA.1601, APPA.1602, APPA.1648, APPA.1651, APPA.1666, APPA.1750, APPA.1751, APPA.1752, APPA.1753, APPA.1754, APPA.1757, APPA_AA_1696, APPA_AA_1890, APPA_AA_1903, APPA_AA_1959, APPA_AA_2013, APPA_AA_2058, APPA_AA_2259, APPA_AA_2264, APPA_AA_2321, APPA_AA_2326, APPA_AA_2377, APPA_AA_2567, APPA_AA_2590, APPA_AA_2607, APPA_AA_2611, APPA_AA_2716, APPA_AA_2778, APPA_AA_2871, APPA_AA_2946, APPA_AA_3055, APPA_AA_3073, APPA_AA_3114, APPA_AA_3231.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler and D. Faber-Langendoen
References: Adamus 1978, Baldwin 1977, Bormann et al. 1970, Campbell and Eastman 1978, Eastern Ecology Working Group n.d., Edinger et al. 2002, Eyre 1980, Flaccus 1972, Gawler 2002, Gawler and Cutko 2010, Gordon 1937b, Kern 1985, Küchler 1956, Küchler 1964, Little 1974, Lubinski et al. 2003, McIntosh 1972, Metzler and Barrett 1996, Metzler and Barrett 2001, Metzler and Barrett 2006, Moore and Taylor 1927, NAP pers. comm. 1998, NatureServe n.d.*, Niering 1953, Ohmann and Buell 1968, Perles et al. 2007, Perles et al. 2008, Rawinski 1984a, Simko 1987, Sperduto 1996, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Woods 1987

A3240 *Acer saccharum - Tilia americana - Fraxinus americana* Forest Alliance

Alliance Summary Description: These are generally known as "rich forests" and "rich northern hardwood forests." The tree canopy of these forests is variable, but *Acer saccharum, Betula alleghaniensis, Fraxinus americana, Populus tremuloides* (in the Great Lakes), and *Tilia americana* are almost always present. Associated canopy trees often include *Acer spicatum, Betula lenta, Fagus grandifolia, Ostrya virginiana*, and *Prunus serotina var. serotina*. The shrub layer is variable in cover depending on site characteristics and canopy density. Common species include *Cornus alternifolia, Corylus americana, Dirca palustris, Hamamelis virginiana, Lonicera canadensis, Sambucus racemosa (= Sambucus pubens), Viburnum acerifolium*, and *Viburnum lantanoides (= Viburnum alnifolium)*. Typical herbs include *Adiantum pedatum, Arisaema triphyllum, Asarum canadense, Cardamine* spp., *Carex platyphylla, Caulophyllum thalictroides, Osmorhiza* spp., *Sanguinaria canadensis, Solidago flexicaulis, Trillium grandiflorum*, and *Viola* spp. This alliance is found in the northern Great Lakes, northeastern United States and southern Canada. Stands of this alliance occur in a variety of settings, including gentle to steep slopes, boulder talus, or in valleys adjacent to floodplains. Soils are usually deep, moderately to well-drained sands, loams, silt loams, moderately acidic to moderately alkaline, and of high fertility, often derived from calcareous parent materials. Soil moisture-holding and cation-exchange capabilities are high.

[CEGL006211] *Acer saccharum - (Fraxinus americana) / Arisaema triphyllum* Forest

Translated Name: **Sugar Maple - (White Ash) / Jack-in-the-Pulpit Forest**
Common Name: **Semi-rich Northern Hardwood Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Laurentian-Acadian Hardwood Forest (G743)
Alliance	*Acer saccharum - Tilia americana - Fraxinus americana* Forest Alliance (A3240)

ELEMENT CONCEPT

Global Summary: These are northern hardwood forests of slightly enriched soils in the northern Appalachian Mountains and adjacent northeastern United States and Canada. They occur at moderate elevations of 245 to 610 m (800-2000 feet) on slightly enriched soils, often silt loams derived from pelite or other subacidic bedrock. Ridgetops and slight concavities on hillslopes are both typical settings. They may occur as inclusions within typical northern hardwood forests or may occur over larger areas and be the locally dominant northern hardwood forest. The closed-canopy forest has sparse to moderate shrub cover, moderate herb cover, and may have local carpets of *Acer saccharum* seedlings in the ground vegetation. Bryoids are a minor component of the forest floor. The canopy is dominated by *Acer saccharum*, frequently with *Fraxinus americana* as an associate or even canopy codominant. Other associated hardwood species include *Betula alleghaniensis* and *Betula lenta*. *Fagus grandifolia* is often present but less abundant than in matrix northern hardwood forests. *Liriodendron tulipifera* may occur in southern New England. Conifers are usually sparse. Shrubs can include *Cornus alternifolia, Lindera benzoin, Sambucus racemosa (= Sambucus pubens), Acer pensylvanicum*, and *Ostrya virginiana*. Typical herbs of this semi-rich type, which are scarce or absent from standard beech-birch-maple forests, include *Arisaema triphyllum, Viola rotundifolia, Tiarella cordifolia, Actaea pachypoda, Osmunda claytoniana, Osmunda cinnamomea, Carex laxiculmis, Carex platyphylla, Carex pedunculata, Eurybia divaricata, Botrychium* spp., and *Solidago flexicaulis*. These forests are intermediate in nutrient regime and composition between *Acer saccharum - Fraxinus americana / Acer spicatum / Caulophyllum thalictroides* Forest (CEGL006636), *Acer saccharum - Tilia americana / Acer pensylvanicum / Caulophyllum thalictroides* Forest (CEGL006637), *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631), and *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632). They are more depauperate than other communities of this alliance, for example lacking rich-soil indicators such as *Adiantum pedatum, Caulophyllum thalictroides*, and *Tilia americana* that are typical of CEGL006636 and/or CEGL006637.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This sugar maple - ash forest occurs globally at moderate elevations of 245-610 m (800-2,000 feet) on slightly enriched soils often in cove and toeslope settings, from Pennsylvania north to Maine. Sites range from moderate to steep low to midslopes and toeslopes with mostly southern, western, and northern aspects. Soils are typically mesic well-drained loam and sandy loam. The unvegetated surface consists of leaf litter, with lesser amounts of large rocks and downed wood and occasional exposed bedrock, small rocks, and bare soil. Evidence of disturbance includes trails, past clearing, erosion, fire, wind damage, grazing/browsing, and the presence of many exotic plant species.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This forest association is found scattered throughout the Northern Appalachian project area at low to mid elevations ranging from 200 to 800 m (655-2,625 feet) on gentle to steep low to mid slopes on all aspects. Soils are slightly enriched and composed of mesic sandy clay, sandy loam, loam and silt loam with abundant litter and duff.

Global Environment: These are northern hardwood forests of slightly enriched soils in the northern Appalachian Mountains and adjacent northeastern United States and Canada. They occur at moderate elevations of 245 to 610 m (800-2000 feet) on slightly enriched soils, often silt loams derived from pelite or other subacidic bedrock. Ridgetops and slight concavities on hillslopes are both typical settings.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy is dominated by a combination of *Acer saccharum, Betula alleghaniensis, Fraxinus americana*, and/or less commonly *Fagus grandifolia*. *Acer pensylvanicum* and *Acer spicatum* are common in the understory. Herbs are semi-rich, including *Viola rotundifolia, Athyrium filix-femina, Arisaema triphyllum, Maianthemum racemosum, Tiarella cordifolia, Actaea pachypoda, Medeola virginiana, Carex laxiculmis, Carex platyphylla, Botrychium* spp., *Solidago flexicaulis, Osmunda claytoniana*, and *Osmunda cinnamomea*. This community lacks strong-enrichment indicator species such as *Caulophyllum thalictroides, Adiantum pedatum, Asarum canadense*, and *Panax quinquefolius*. In addition, this community supports NJ state-critically imperiled *Viburnum lantanoides*, MA and VT state-imperiled *Carex*

aestivalis and *Carex laxiculmis*. However, this community has also been heavily invaded by exotic species; a total of 13 taxa were report from the sampled plots.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by deciduous forest vegetation dominated by *Acer saccharum* in association with or codominated by *Fraxinus americana* and/or *Betula alleghaniensis*. Shrub species are not prevalent and *Corylus cornuta* and *Viburnum lantanoides* are the most frequent. A rich herbaceous layer is characteristic of this association and numerous species may occur. Stands can be fern-, graminoid- or forb-dominated. The most common species include *Ageratina altissima, Arisaema triphyllum, Aralia nudicaulis, Athyrium filix-femina, Brachyelytrum erectum, Carex gracillima, Carex intumescens, Carex pedunculata, Dryopteris intermedia, Dryopteris marginalis, Onoclea sensibilis, Osmunda claytoniana, Solidago flexicaulis*, and *Thelypteris noveboracensis*.

Global Vegetation: The closed-canopy forest has sparse to moderate shrub cover, moderate herb cover, and may have local carpets of *Acer saccharum* seedlings in the ground vegetation. Bryoids are a minor component of the forest floor. The canopy is dominated by *Acer saccharum*, with associated hardwood species including *Betula alleghaniensis* and *Fraxinus americana*. *Fraxinus* may be a canopy codominant in some areas. *Fagus grandifolia* is often present but less abundant than in matrix northern hardwood forests. Conifers are usually sparse. Shrubs can include *Cornus alternifolia, Sambucus racemosa (= Sambucus pubens), Acer pensylvanicum*, and *Ostrya virginiana*. Typical herbs of this semi-rich type, which are scarce or absent from standard beech-birch-maple forests, include *Arisaema triphyllum, Viola rotundifolia, Tiarella cordifolia, Actaea pachypoda, Botrychium* spp., and *Solidago flexicaulis*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*, *Fraxinus americana*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Ostrya virginiana*
Herb (field)	Flowering forb	*Arisaema triphyllum*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*, *Betula alleghaniensis*, *Fraxinus americana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum lantanoides*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Corylus cornuta*
Herb (field)	Fern (Spore-bearing forb)	*Athyrium filix-femina*, *Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Ostrya virginiana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Cornus alternifolia*, *Sambucus racemosa*
Herb (field)	Flowering forb	*Arisaema triphyllum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer pensylvanicum*, *Acer saccharum*, *Arisaema triphyllum*, *Dryopteris intermedia*, *Fraxinus americana*, *Ostrya virginiana*, *Polystichum acrostichoides*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer saccharum*, *Arisaema triphyllum*
Global: *Acer saccharum*, *Arisaema triphyllum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Carex aestivalis* (G4, VT state-imperiled), *Carex laxiculmis* (G5, VT state-imperiled), *Viburnum lantanoides* (G5, NJ state-critically imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Arctium minus* (Medium/Insignificant), *Berberis thunbergii* (High/Medium), *Duchesnea indica* (Low/Insignificant), *Euonymus alatus* (Low), *Frangula alnus* (High/Medium), *Leonurus cardiaca*, *Lonicera morrowii* (High/Medium), *Lysimachia nummularia* (Medium/Low), *Rhamnus cathartica* (High/Medium), *Rosa multiflora* (Medium/Low)

Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Epipactis helleborine* (Medium/Low, exotic/invasive), *Galeopsis tetrahit* (exotic/invasive)
Global: Vulnerable Plants: *Panax quinquefolius* (G3G4, under collection pressure)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (7-Dec-2005). This association is fairly well-distributed in northern New England and adjacent Canada.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631)
- *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632)
- *Acer saccharum - Fraxinus americana / Acer spicatum / Caulophyllum thalictroides* Forest (CEGL006636)
- *Acer saccharum - Tilia americana / Acer pensylvanicum / Caulophyllum thalictroides* Forest (CEGL006637)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This is a semi-rich northern hardwood forest community. It has a few enrichment indicators such as *Carex deweyana, Arisaema triphyllum*, and *Carex laxiflora* in the herbaceous layer and trees such as *Fraxinus americana* and *Acer saccharum* in the canopy. It includes diffuse seepage runs and rivulet drainages under the canopy. New Jersey examples lack *Ostrya virginiana* and *Tilia americana*. In Shrewsbury in Rutland County, Vermont, *Carex laxiculmis* is a moist and fertile indicator along with high upland sedge diversity (*Carex debilis, Carex gracillima, Carex pedunculata, Carex communis, Carex digitalis, Carex deweyana*).
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type is conceptually well understood, but not well documented in published sources. Additional characterization would be helpful.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Massachusetts (Day Mountain, Tully Mountain, Warner Hill), New Jersey (Pochuck Creek, Wawayanda State Park), New York (Sterling Forest), and Vermont (Bear Mountain, Prosper NW Hills, Shrewsbury, Stratton Pond vicinity Wallingford Pond West, Winhall).
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is found throughout the Northern Appalachian project area at low to mid elevations. Known locations include Lambert Ridge, east of Quintown, east of Mount Cube, Moose Mountain, Franconia Notch, Wildcat Ridge and Old Jackson Road in New Hampshire and Little Wilson Stream, Pleasant River and Nahmakanta Lake in Maine.
Global Range: This forest association occurs in New England west to New York and Ontario and south to Pennsylvania and New Jersey.
Nations: CA, US
States/Provinces: CT?, MA, ME, NB, NH:S3S4, NJ, NY, ON, QC?, VT:S4
TNC Ecoregions: 60:C, 61:C, 63:C
USFS Ecoregions (1994/95): 212A:CP, 212B:CP, 212C:CP, 212D:CP, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Bc:CCC, 221Bd:CCP, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ba:CCC, M212Bb:CCC, M212Bc:CCC, M212Ca:CCC, M212Cd:CCC, M212Da:CCC, M212Dc:CCC, M212De:CCC, M212Ea:CCP, M212Eb:CCP
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Marsh-Billings-Rockefeller, Saint-Gaudens, Saratoga, Upper Delaware, Weir Farm)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FNAH
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 plots; 10 observation points; 19 accuracy assessment points): APPA.0565, APPA.0812, APPA.0822, APPA.0825, APPA.1367, APPA.1486, APPA.1489, APPA.1490, APPA.1491, APPA.1492, APPA.1559, APPA.1708, APPA.1722, APPA.1732, APPA_AA_1833, APPA_AA_1853, APPA_AA_2094, APPA_AA_2165, APPA_AA_2272, APPA_AA_2280, APPA_AA_2289, APPA_AA_2705, APPA_AA_2802, APPA_AA_2840, APPA_AA_2841, APPA_AA_2847,

APPA_AA_2853, APPA_AA_2964, APPA_AA_3074, APPA_AA_3082, APPA_AA_3263, APPA_AA_3287, APPA_AA_3356.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (5 plots; 5 observation points; 3 accuracy assessment points): APPA.0736, APPA.0745, APPA.0753, APPA.0766, APPA.0771, APPA.1530, APPA.1672, APPA.1755, APPA.1764, APPA.1769, APPA_AA_1824, APPA_AA_1851, APPA_AA_2758.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler and L.A. Sneddon
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Eyre 1980, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Lee et al. 1998, Metzler and Barrett 2001, Metzler and Barrett 2004, Metzler and Barrett 2006, Metzler et al. 2009, NAP pers. comm. 1998, NRCS 2004a, Perles et al. 2008, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006636] *Acer saccharum - Fraxinus americana / Acer spicatum / Caulophyllum thalictroides* Forest

Translated Name: **Sugar Maple - White Ash / Mountain Maple / Blue Cohosh Forest**
Common Name: **Northern Sugar Maple - Ash Rich Mesic Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Laurentian-Acadian Hardwood Forest (G743)
Alliance	*Acer saccharum - Tilia americana - Fraxinus americana* Forest Alliance (A3240)

Element Concept

Global Summary: This rich sugar maple - white ash forest is found from the northern regions of the northeastern United States and maritime Canada west to Ontario and Michigan in the central Great Lakes region. Stands occur on nutrient-rich, mesic or wet-mesic settings on sloped to rolling terrain. Slope bottoms, where colluvium collects, are a common landscape position. The surface soils are deep sand, loamy sand, or loam and may be underlain by sandy clay loam to clay loam. The sites are somewhat poorly drained to well-drained and can have a water table 0.4-2 m below the surface. Small (<1 ha) seep areas that may occur within these forests have soils that are usually saturated. This forest community has a well-developed tree canopy composed of deciduous species. Shrubs are scattered, but the herbaceous stratum is generally extensive. Bryoids are only a minor component of the ground layer, which is predominantly nitrogen-rich sugar maple leaves. *Acer saccharum* and *Fraxinus americana* are the dominant trees; *Tilia americana* is frequent but not necessarily abundant. *Ostrya virginiana* is very common as a small tree. *Acer rubrum, Betula alleghaniensis, Fagus grandifolia*, and *Prunus serotina* are typical associates, in small amounts. *Ulmus rubra* and *Juglans cinerea* are occasional. Shrubs that may be found in this community include *Cornus alternifolia, Viburnum lantanoides (= Viburnum alnifolium), Hamamelis virginiana, Dirca palustris*, and *Lonicera canadensis*. The ground flora, including many spring ephemerals, is diverse and consists primarily of nutrient- and light-requiring species. Many of these flower and fruit early in the spring before the tree canopy has fully leafed out. Fern richness is often high. Various sedges are present (particularly the Laxiflorae). These forests are differentiated from less-rich northern hardwood forests, e.g., *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631), primarily by their abundant and diverse herbaceous layer, as well as by the greater prominence of sugar maple and ash in the canopy and reduced importance of beech.

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This uncommon forest association is only known from two locations in Vermont at 520 to 560 m (1,705-1,840 feet) in elevation on moderate to steep mid to high slopes on eastern aspects. Soils are mesic sandy loams with abundant litter and duff.
Global Environment: In the Northern Appalachian region, sites occur in enriched cove and concave slopes within northern hardwood forests. The elevation of known examples ranges from 115-830 m (380-2700 feet). Ground cover is deciduous litter, predominantly of nitrogen-rich sugar maple leaves.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by closed-canopy deciduous forests dominated by *Acer saccharum* and codominated by or in association with *Fraxinus americana*. *Tilia americana, Fagus grandifolia, Betula alleghaniensis*, and *Ostrya virginiana* are common associates at low cover. *Acer pensylvanicum* commonly forms an open subcanopy. Shrub species have low consistency and cover, and the shrub layer is typically dominated by saplings of canopy species. Shrub species at low cover may include *Cornus alternifolia, Ribes glandulosum, Sambucus racemosa, Viburnum lantanoides*, and *Zanthoxylum americanum*. The herbaceous layer is lush, diverse and forb-dominated, most often by *Laportea canadensis*. Other herbaceous associates may include *Adiantum pedatum, Arisaema triphyllum, Athyrium filix-femina, Carex plantaginea, Caulophyllum thalictroides, Deparia acrostichoides, Dryopteris goldiana, Dryopteris intermedia, Hydrophyllum virginianum, Laportea canadensis, Osmorhiza claytonii*, and *Solidago flexicaulis*.

Global Vegetation: This forest community has a well-developed tree canopy composed of deciduous species. Shrubs are scattered, but the herbaceous stratum is well-represented. *Acer saccharum* and *Fraxinus americana* are the dominant trees; *Tilia americana* is frequent but not necessarily abundant. *Ostrya virginiana* is very common as a small tree. *Quercus rubra, Acer rubrum, Betula alleghaniensis, Fagus grandifolia*, and *Prunus serotina* are typical associates. *Ulmus rubra* and *Juglans cinerea* are occasional. Shrubs that may be found in this community include *Cornus alternifolia, Viburnum lantanoides (= Viburnum alnifolium), Hamamelis virginiana, Dirca palustris*, and *Lonicera canadensis*. The ground flora, much of which is spring ephemerals, is diverse and consists primarily of nutrient- and light-requiring species. Many of these flower and fruit early in the spring before the tree canopy has fully leafed out; *Dicentra cucullaria, Dicentra canadensis, Hepatica* spp., *Asarum canadense, Caulophyllum thalictroides, Viola canadensis, Viola rotundifolia, Actaea pachypoda, Osmorhiza claytonii, Panax quinquefolius, Sanguinaria canadensis*, and *Erythronium americanum* are typical. Fern richness is often high, with characteristic species including *Adiantum pedatum, Cystopteris bulbifera, Deparia acrostichoides (= Athyrium thelypterioides), Dryopteris goldiana, Dryopteris filix-mas, Dryopteris marginalis, Botrychium virginianum, Athyrium filix-femina, Phegopteris hexagonoptera (= Thelypteris hexagonoptera)*, and, especially in seepy spots, *Matteuccia struthiopteris*. Various sedges are present (particularly the Laxiflorae group) such as *Carex laxiflora, Carex platyphylla, Carex plantaginea, Carex leptonervia, Carex hitchcockiana, Carex aestivalis, Carex davisii, Carex bebbii*, and others. The herbaceous flora in seeps often contains *Calamagrostis canadensis, Carex scabrata, Ageratina altissima (= Eupatorium rugosum), Glyceria melicaria, Impatiens capensis* (sometimes *Impatiens pallida* as well), and *Solidago flexicaulis*. One state-rare plant species, *Cuscuta rostrata*, is associated with this vegetation type.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*, *Fraxinus americana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Cornus alternifolia*, *Ribes glandulosum*, *Sambucus racemosa*, *Viburnum lantanoides*, *Zanthoxylum americanum*
Herb (field)	Flowering forb	*Caulophyllum thalictroides*, *Laportea canadensis*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*
Tree subcanopy	Broad-leaved deciduous tree	*Ostrya virginiana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Cornus alternifolia*, *Dirca palustris*, *Hamamelis virginiana*, *Lonicera canadensis*, *Viburnum lantanoides*
Herb (field)	Graminoid	*Carex* spp.
Herb (field)	Fern (Spore-bearing forb)	*Adiantum pedatum*, *Botrychium virginianum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer saccharum*, *Caulophyllum thalictroides*, *Fraxinus americana*, *Laportea canadensis*

Global: *Acer saccharum*, *Adiantum pedatum*, *Allium tricoccum*, *Botrychium virginianum*, *Cardamine diphylla*, *Carex* spp., *Caulophyllum thalictroides*, *Claytonia caroliniana*, *Dryopteris goldiana*, *Fraxinus americana*, *Milium effusum*, *Phlox stolonifera*, *Tiarella cordifolia*, *Tilia americana*, *Viola blanda*, *Viola canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Dryopteris goldiana* (G4G5, NH state-imperiled); **Invasive/Exotic Plants**: *Galeopsis tetrahit* (exotic/invasive)
Global: Vulnerable Plants: *Cuscuta rostrata* (G4, VA state-rare), *Panax quinquefolius* (G3G4, under collection pressure)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (3-Dec-2014). This community has a wide geographic distribution, but is locally distributed within its range due to specific requirements for mesic sites with fertile soils. In gentler topographic regions, many examples of this community have probably been destroyed for agriculture, and most remaining examples elsewhere have been altered by past logging. Consequently much of the remaining acreage is of variable quality.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - (Fraxinus americana) / Arisaema triphyllum* Forest (CEGL006211)
- *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631)
- *Acer saccharum - Betula alleghaniensis - Tilia americana* Forest (CEGL002457)
- *Acer saccharum - Fagus grandifolia - Betula* spp. / *Maianthemum canadense* Forest (CEGL005004)
- *Acer saccharum - Tilia americana / Acer pensylvanicum / Caulophyllum thalictroides* Forest (CEGL006637)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from north of Mount Mist and Ore Hill in New Hampshire.
Global Range: This forest association ranges generally from the Canadian Maritimes and northern New England west to Michigan and Ontario.
Nations: CA, US
States/Provinces: MA, ME:S3, MI:S3, NB, NH:S3, NY, ON, QC:S4?, VT:S4
TNC Ecoregions: 47:P, 48:C, 62:P, 64:C
USFS Ecoregions (1994/95): 212B:CC, 212D:CC, 212E:C?, 212Hl:CCP, 212Hn:CCP, 212Ho:CCC, 212Hw:CCC, 212Hx:CCP, 212Hy:CCP, 212Ja:CPP, 212Jb:CPP, 212Jc:CPP, 212Jl:CPP, 212Jn:CPP, 212Jo:CPP, 221:C, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ba:CCC, M212Bb:CCC, M212Bc:CCP, M212Bd:CCP, M212Ca:CCC, M212Cb:CCC, M212Cd:CCC, M212Da:CCC, M212Db:CCP, M212Dc:CCC, M212Dd:CCP, M212De:CCC, M212Df:CCC, M212Ea:CCC, M212Eb:CCC, M212Fa:CPP, M212Fb:CPP, M221:C
Federal Lands: NPS (Appalachian Trail [Northern Appalachians], Marsh-Billings-Rockefeller, Sleeping Bear Dunes); USFS (Huron-Manistee?, Huron?, Manistee?, Ottawa, White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FNAH
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (3 plots): APPA.0190, APPA.0191, APPA.0782.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): D. Faber-Langendoen, L. Sneddon, G. Fleming and S.C. Gawler
References: Breden 1989, CAP pers. comm. 1998, Chapman et al. 1989, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, Lee et al. 1998, NAP pers. comm. 1998, Rawinski 1984a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

A3297 *Acer saccharum - Tilia americana* Limestone Woodland Alliance

Alliance Summary Description: This alliance is composed of mostly rich, mesic deciduous woodlands of limestone pavement or colluvial slopes. *Acer saccharum* is the most constant species, but a variety of deciduous trees may also be present, including *Tilia americana* and *Quercus rubra*. Conifers, such as *Tsuga canadensis, Thuja occidentalis*, and *Abies balsamea*, are also present in some stands. The canopy is variable, ranging from open to closed (40-80% cover). The ground layer may contain a range of mesic herbaceous and shrub indicators.

[CEGL005058] *Acer saccharum - Tilia americana - Fraxinus americana / Ostrya virginiana / Geranium robertianum* Woodland

Translated Name: **Sugar Maple - American Basswood - White Ash / Hophornbeam / Robert's Geranium Talus Woodland**

Common Name: **Rich Northern Hardwood Talus Woodland**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Laurentian-Acadian Hardwood Forest (G743)
Alliance	*Acer saccharum - Tilia americana* Limestone Woodland Alliance (A3297)

Element Concept

Global Summary: These open, circumneutral woodlands range from the Great Lakes to the Northern Appalachians and Lower New England regions. They typically occur on talus and colluvial slopes where soils are derived from circumneutral to calcareous bedrock, and often extend upslope onto ridges and low summits. The elevation range is from about 150 to 610 m (500-2000 feet) with most occurrences below 365 m (1200 feet), and southerly exposure is common. Soils are thin, patchy and dry. The hardwood canopy is very patchy, with open talus interspersed with wooded areas. Even the wooded areas generally have an open canopy, and canopy closure overall is usually less than 50%, often with stunted trees. Shrubs and herbs are scattered where soil is available; vines are unusually well-represented. Herb cover may be locally extensive on stabilized areas. The bryoid layer is very minor and varies from patches of lichens on the open talus to sparse mosses in wooded areas. The ground cover is boulder talus and deciduous litter. Canopy dominants are typically *Acer saccharum* and *Quercus rubra*, with the characteristic but usually subordinate species *Ostrya virginiana, Fraxinus americana*, and *Tilia americana*. Where shrubs are even present, they are scattered and clumped and include *Cornus rugosa, Acer pensylvanicum, Acer spicatum, Rubus odoratus, Corylus cornuta, Viburnum acerifolium, Staphylea trifolia*, and *Ribes* spp. Vines are locally abundant on talus. Rich-site herbs indicative of these talus slopes include *Asplenium platyneuron, Polystichum braunii, Aralia racemosa, Saxifraga virginiensis, Geranium robertianum, Arabis drummondii, Asarum canadense, Carex rosea, Carex sprengelii, Carex platyphylla*, and *Piptatherum racemosum (= Oryzopsis racemosa)*. This association is distinguished from other deciduous talus and low summit woodlands by the presence of enriched-site species such as *Tilia americana* and *Juglans cinerea* in the canopy, and the characteristic rich-site herb species listed above. However, sites do occur that are intermediate between this type and the more acidic oak-birch talus woodlands, *Betula alleghaniensis - Quercus rubra / Polypodium virginianum* Woodland (CEGL006584) and *Quercus rubra - Betula lenta / Polypodium virginianum* Woodland (CEGL006585).

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This enriched, dry-mesic to mesic woodland occurs on talus and ranges from New Brunswick and Vermont south to Connecticut at elevations ranging from 150 to 610 m (500-2,000 feet). Sites are somewhat steep east- and southwest-facing talus slopes, both lower slope and summit. Soils are moderately well-drained silt loam and well-drained loam. The unvegetated surface is a variable mixture of leaf litter, exposed bedrock, large rocks, and downed wood. Evidence of disturbance includes past logging, fallen trees and a minor presence of exotic plants.

Global Environment: Stands occur on talus and colluvial slopes where soils are derived from circumneutral to calcareous bedrock, and often extend upslope onto ridges and low summits. The elevation range is from about 150 to 610 m (500-2000 feet) with most occurrences below 370 m (1200 feet), and southerly exposure is common. Soils are thin, patchy, and dry.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This northern, enriched, dry-mesic forest/woodland is dominated by *Acer saccharum* and *Fraxinus americana* with *Ostrya virginiana* in the subcanopy, and species of non-enriched bedrock such as *Acer pensylvanicum* and *Acer spicatum*. The shrub and herb layers include circumneutral-calcareous indicators such as *Sambucus racemosa, Impatiens pallida, Caulophyllum thalictroides, Geranium robertianum, Arabis drummondii, Asarum canadense*, or the sedges *Carex rosea, Carex sprengelii*, or *Carex platyphylla*. In addition, this community supports VT state-imperiled *Poa saltuensis*.

Global Vegetation: The hardwood canopy is very patchy, with open talus interspersed with wooded areas. Even the wooded areas generally have an open canopy, and canopy closure overall is usually less than 50%. Shrubs and herbs are scattered where soil is available; vines are unusually well represented. Herb cover may be locally extensive on stabilized areas. The bryoid layer is very minor, and varies from patches of lichens on the open talus to sparse mosses in wooded areas. The ground cover is boulder talus and deciduous litter. Canopy dominants are typically *Acer saccharum* and *Quercus rubra*, with the characteristic but usually subordinate species *Ostrya virginiana, Fraxinus americana*, and *Tilia americana*. Other canopy associates include *Acer rubrum, Betula lenta, Betula papyrifera, Betula alleghaniensis, Juglans cinerea*, and *Ulmus rubra*. Where shrubs are even present, they are scattered and clumped and include *Cornus rugosa, Acer pensylvanicum, Acer spicatum, Rubus odoratus, Corylus cornuta, Viburnum acerifolium, Staphylea trifolia*, and *Ribes* spp. Vines are locally abundant on talus and include *Parthenocissus quinquefolia, Parthenocissus vitacea, Toxicodendron radicans, Clematis virginiana, Clematis occidentalis, Adlumia fungosa, Celastrus scandens*, and *Polygonum cilinode*. Rich-site herbs indicative of these talus slopes include *Asplenium platyneuron, Polystichum braunii, Aralia racemosa, Saxifraga virginiensis, Geranium robertianum, Arabis drummondii, Asarum canadense, Carex rosea, Carex sprengelii, Carex platyphylla*, and *Piptatherum racemosum (= Oryzopsis racemosa)*. Also present, and less restricted to circumneutral conditions, are *Cystopteris bulbifera, Carex pensylvanica, Carex communis, Deschampsia flexuosa, Schizachne purpurascens, Hepatica nobilis var. obtusa (= Hepatica americana), Dryopteris marginalis, Polypodium virginianum*, and *Athyrium filix-femina*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*, *Ostrya virginiana*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris marginalis*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*, *Quercus rubra*
Herb (field)	Graminoid	*Carex pensylvanica*, *Deschampsia flexuosa*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris marginalis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer saccharum*, *Fraxinus americana*, *Ostrya virginiana*

Global: *Arabis drummondii*, *Aralia racemosa*, *Asarum canadense*, *Asplenium platyneuron*, *Carex platyphylla*, *Carex rosea*, *Carex sprengelii*, *Fraxinus americana*, *Geranium robertianum*, *Ostrya virginiana*, *Polystichum braunii*, *Saxifraga virginiensis*, *Tilia americana*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Poa saltuensis* (G5, VT state-imperiled); **Invasive/Exotic Plants**: *Epipactis helleborine* (Medium/Low)

Global: Other Plants: *Piptatherum racemosum* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (15-Dec-1994).

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Fraxinus americana - Juglans cinerea / Staphylea trifolia / Adlumia fungosa* Forest (CEGL006577)
- *Betula alleghaniensis - Quercus rubra / Polypodium virginianum* Woodland (CEGL006584)
- *Quercus rubra - Betula lenta / Polypodium virginianum* Woodland (CEGL006585)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Jug End Road Natural Heritage Site in Massachusetts and at Spring Lake-Shrewsbury in Vermont.
Global Range: This woodland ranges from the Great Lakes to the Northern Appalachians and Lower New England regions.
Nations: CA, US
States/Provinces: CT, MA, ME:S3, NB, NH, NJ?, NY, ON, QC, VT
TNC Ecoregions: 48:C, 60:C, 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Dc:CCC, 212E:C?, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Ga:CCC, 221Al:CCC, 221Bd:CCC, 222I:CC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cd:CCC, M212Db:CCP, M212Dc:CCC, M212Df:CCC, M212Ea:CCC, M212Eb:CCC, M212Fb:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Marsh-Billings-Rockefeller)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WCNH
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots): APPA.0024, APPA.0835.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo
Global Description Author(s): S.C. Gawler
References: Breden et al. 2001, CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Lee et al. 1998, Metzler and Barrett 2001, Metzler and Barrett 2006, NAP pers. comm. 1998, Rawinski 1984a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

A3241 *Quercus rubra - Acer saccharum* Forest Alliance

Alliance Summary Description: This alliance is regarded as the "red oak" version of northern hardwood forests and woodlands. Canopy composition is a variable mixture of hardwood species. *Quercus rubra* (usually at least 30% of the canopy) is considered the diagnostic species. The most common codominant species include *Acer saccharum, Acer rubrum, Betula alleghaniensis*, and *Fagus grandifolia*. Other minor canopy species may include *Betula papyrifera, Betula populifolia, Populus grandidentata*, and *Prunus pensylvanica*. Conifers, if present, generally make up less than 20% of the canopy cover and may include *Pinus strobus* or *Tsuga canadensis*. A subcanopy composed of *Acer pensylvanicum* and *Acer spicatum* may be present. Typical shrubs include *Acer pensylvanicum, Amelanchier* spp., *Corylus cornuta, Hamamelis virginiana, Lindera benzoin*, and *Viburnum acerifolium*. The herb layer may be quite diverse depending on site characteristics. Species may include *Actaea pachypoda, Actaea rubra, Arabis* spp., *Arisaema triphyllum, Carex blanda, Carex laxiflora, Carex pedunculata, Carex platyphylla, Festuca subverticillata, Hepatica nobilis var. obtusa (= Hepatica americana), Packera obovata (= Senecio obovatus), Phegopteris hexagonoptera (= Thelypteris hexagonoptera), Polygonatum pubescens, Thalictrum dioicum, Thalictrum thalictroides (= Anemonella thalictroides), Viola rotundifolia*, and *Viola sororia*. This alliance is found in the north-central and northeastern United States and southern Canada. These forests typically occur on deep, moist to well-drained loams and silt loams on north and east midslopes to mesic ridgetops and coves, but stands may also occur on talus slopes or dry-mesic fine sandy loams and loamy sands.

[CEGL006584] *Betula alleghaniensis - Quercus rubra / Polypodium virginianum* Woodland

Translated Name: **Yellow Birch - Northern Red Oak / Rock Polypody Woodland**
Common Name: **Northern Hardwood - Oak Talus Slope Woodland**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Laurentian-Acadian Hardwood Forest (G743)
Alliance	*Quercus rubra - Acer saccharum* Forest Alliance (A3241)

Element Concept

Global Summary: This acidic, large-boulder talus slope woodland occurs in the northern Appalachian Mountains, and northern New England north into eastern Canada. The substrate is large boulders, with vascular plants confined to coarse-textured soils in crevices. Sites are at low to mid elevations, from near sea level to about 520 m (1700 feet). Soils are thin, patchy, and nutrient-poor. The hardwood canopy is very patchy, with open talus interspersed with wooded areas. Canopy closure overall is usually less than 50%. Shrubs are patchy and may form thickets in openings. The herb layer is sparse overall, although dense patches may occur where some soil is available; bryophytes are likewise sparse. The ground cover is exposed talus, moss-covered boulders, and deciduous litter. The tree canopy is dominated by a variable mixture of oak and birch species, including *Quercus rubra* and *Betula alleghaniensis*. In the northern portion of this community's range, *Quercus rubra* may drop out entirely, with *Betula* spp. and *Acer* spp. dominant. Other canopy associates include *Acer saccharum, Betula papyrifera, Betula populifolia, Fagus grandifolia, Acer rubrum, Prunus pensylvanica, Populus grandidentata, Tsuga canadensis*, and *Pinus strobus*. At the northern end of the range, *Betula x caerulea* and *Betula papyrifera* are also associated. The understory is composed of scattered and clumped tall shrubs and small trees, including *Acer spicatum, Acer pensylvanicum, Rubus* spp., *Viburnum acerifolium*, and *Ribes* spp. Ericaceous shrubs are not generally prevalent, but when present may include *Vaccinium angustifolium, Gaylussacia baccata*, or *Kalmia angustifolia*. Vines are particularly characteristic, and include *Parthenocissus quinquefolia, Parthenocissus vitacea, Toxicodendron radicans, Toxicodendron rydbergii, Celastrus scandens*, and *Polygonum cilinode*. Scattered ferns and herbs are *Dryopteris marginalis, Polypodium virginianum, Pteridium aquilinum, Maianthemum racemosum, Eurybia macrophylla (= Aster macrophyllus), Deschampsia flexuosa, Carex pensylvanica, Carex lucorum, Corydalis sempervirens, Solidago bicolor, Solidago caesia*, and *Aralia nudicaulis*. Bryophytes include *Polytrichum commune, Leucobryum glaucum, Umbilicaria* spp., and *Cladina* spp. This association is characterized by the patchy deciduous canopy, with *Betula* spp. common and *Ostrya virginiana* sparse or absent, and by the lack of rich-site indicator herbs.

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This uncommon woodland association is only known from one location in New Hampshire at 590 m (1,935 feet) in elevation on a steep, exposed southwest-facing talus slope.
Global Environment: This acidic, large-boulder talus slope woodland occurs in the northern Appalachian Mountains and northern New England, north to eastern Canada. The substrate is large boulders, with vascular plants confined to coarse-textured soils in crevices. Sites are at low to mid elevations, from near sea level to about 520 m (0-1700 feet). Soils are thin, patchy, and nutrient-poor.

Vegetation Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association has an open canopy of *Betula alleghaniensis* and/or *Betula papyrifera* with *Picea rubens* and *Acer rubrum* at low cover. *Acer spicatum, Acer pensylvanicum, Rubus* spp., *Viburnum acerifolium*, and *Ribes* spp. also common. Vines are characteristic, including *Parthenocissus quinquefolia, Parthenocissus vitacea, Toxicodendron radicans*, and others *Dryopteris marginalis, Dryopteris campyloptera, Polypodium virginianum*, and *Maianthemum canadense* are common herbs; enriched-site herbs are absent. Oak may drop out entirely in the northern portion of range.
Global Vegetation: The hardwood canopy is very patchy, with open talus interspersed with wooded areas. Canopy closure overall is usually less than 50%. Shrubs are patchy and may form thickets in openings. The herb layer is sparse overall, although dense patches may occur where some soil is available; bryophytes are likewise sparse. The ground cover is exposed talus, moss-covered boulders, and deciduous litter. The tree canopy is dominated by a variable mixture of oak and birch species, including *Quercus rubra* and *Betula alleghaniensis*. In the northern portion of this community's range, *Quercus rubra* may drop out entirely, with *Betula* spp. and *Acer* spp. dominant. Other canopy associates include *Acer saccharum, Betula papyrifera, Betula populifolia, Fagus grandifolia, Acer*

rubrum, Prunus pensylvanica, Populus grandidentata, Tsuga canadensis, and *Pinus strobus*. At the northern end of the range, *Betula x caerulea* and *Betula papyrifera* are also associated. The understory is composed of scattered and clumped tall shrubs and small trees, including *Acer spicatum, Acer pensylvanicum, Rubus* spp., *Viburnum acerifolium*, and *Ribes* spp. Ericaceous shrubs are not generally prevalent, but when present may include *Vaccinium angustifolium, Gaylussacia baccata*, or *Kalmia angustifolia*. Vines are particularly characteristic, and include *Parthenocissus quinquefolia, Parthenocissus vitacea, Toxicodendron radicans, Toxicodendron rydbergii, Celastrus scandens*, and *Polygonum cilinode*. Scattered ferns and herbs are *Dryopteris marginalis, Polypodium virginianum, Pteridium aquilinum, Maianthemum racemosum, Eurybia macrophylla (= Aster macrophyllus), Deschampsia flexuosa, Carex pensylvanica, Carex lucorum, Corydalis sempervirens, Solidago bicolor, Solidago caesia*, and *Aralia nudicaulis*. Bryophytes include *Polytrichum commune, Leucobryum glaucum, Umbilicaria* spp., and *Cladina* spp.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula alleghaniensis*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Acer spicatum*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris campyloptera*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Betula lenta*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris marginalis*, *Polypodium virginianum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Betula alleghaniensis*
Global: *Betula alleghaniensis*, *Polypodium virginianum*, *Quercus rubra*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (2-Dec-2014).

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharum - Tilia americana - Fraxinus americana / Ostrya virginiana / Geranium robertianum* Woodland (CEGL005058)
- *Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland (CEGL006565)
- *Quercus rubra - (Quercus prinus) / Vaccinium* spp. / *Deschampsia flexuosa* Woodland (CEGL006134)
- *Quercus rubra - Betula lenta / Polypodium virginianum* Woodland (CEGL006585)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This is the northernmost occurrence of this association in the Northern Appalachian project area and is out of range of *Quercus rubra*.
Global Classification Comments: Intermediates between this type and the circumneutral/calcareous talus woodland (CEGL005058) do occur. See also a similar type, *Quercus rubra - Betula lenta / Polypodium virginianum* Woodland (CEGL006585), which was split from this type because it contains a greater mix of central hardwood oak and hardwood species, e.g., as shown by the distinction between the two Vermont talus types, the Transition Hardwood Talus Woodland and the Northern Hardwoods Talus Woodland (Sorenson and Thompson 2000).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Moose Mountain in New Hampshire.
Global Range: This woodland occurs in the northern Appalachian Mountains, northern New England and eastern maritime Canada and possibly Quebec.

Nations: CA, US
States/Provinces: MA, ME, NB, QC?, VT
TNC Ecoregions: 63:C, 64:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Cb:CCC, 212Dc:CCC, 212Ec:CCC, M212Ac:CCC, M212Ag:CCC, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCP, M212Dc:CCC, M212De:CCC, M212Ea:CCP, M212Eb:CCP, M212F:C?
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WHOT
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 observation point; 14 accuracy assessment points): APPA.1533, APPA_AA_1633, APPA_AA_1922, APPA_AA_2022, APPA_AA_2066, APPA_AA_2075, APPA_AA_2101, APPA_AA_2527, APPA_AA_2609, APPA_AA_2620, APPA_AA_2641, APPA_AA_2800, APPA_AA_2938, APPA_AA_3132, APPA_AA_3141.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler and D. Faber-Langendoen
References: Eastern Ecology Working Group n.d., Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, NatureServe n.d.*, Northern Appalachian Ecology Working Group 2000, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006633] *Quercus rubra - Acer saccharum - Fagus grandifolia / Viburnum acerifolium* Forest

Translated Name: **Northern Red Oak - Sugar Maple - American Beech / Mapleleaf Viburnum Forest**
Common Name: **Red Oak - Northern Hardwood Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Laurentian-Acadian Hardwood Forest (G743)
Alliance	*Quercus rubra - Acer saccharum* Forest Alliance (A3241)

ELEMENT CONCEPT

Global Summary: These mesic forests of oak and northern hardwoods, sometimes mixed with hemlock or pine, are distributed across the cooler parts of the glaciated northeastern United States and adjacent maritime Canada. They occur on slightly acidic, well-drained loamy and often rocky soils of intermediate fertility, most often positioned on midslopes and coves. Soil depth is often shallow, but some stands occur on deep tills. Most are at low to mid elevations, usually under 520 m (1700 feet).The deciduous-to-mixed canopy is mostly closed, and the lower layers are variable in extent. Tall shrubs are well-represented, although scattered, with occasional denser patches. Herbs are sparse and bryoids are nearly absent. Ericads and other dwarf-shrubs are also nearly absent, a characteristic that distinguishes this association from most other red oak forests in the Northeast. Canopy composition is a variable mixture of *Quercus rubra* (usually at least 30% of the canopy), *Fagus grandifolia, Acer saccharum, Acer rubrum*, and in some stands *Pinus strobus* or *Tsuga canadensis*. Conifers generally make up less than 20% of the canopy cover, and even in mixed stands the cover of deciduous trees exceeds that of conifers. Minor canopy associates include *Fraxinus americana, Tilia americana, Betula lenta, Juglans cinerea*, and *Ulmus americana*. *Acer pensylvanicum* is common as a small tree; *Corylus cornuta, Viburnum acerifolium*, and *Hamamelis virginiana* are typical shrubs. Typical species in the herb layer include *Gaultheria procumbens, Maianthemum canadense, Aralia nudicaulis, Trientalis borealis, Uvularia sessilifolia, Medeola virginiana, Brachyelytrum erectum, Dryopteris intermedia, Polystichum acrostichoides, Dennstaedtia punctilobula, Pteridium aquilinum*, and *Thelypteris noveboracensis*. On more nutrient-rich soils, the herb layer may contain *Solidago caesia, Caulophyllum thalictroides, Dryopteris marginalis*, and *Eurybia divaricata (= Aster divaricatus)*. This association is distinguished from northern hardwood forests by its greater amount of oak, from other oak forests by its greater prominence of northern hardwoods and lack of dwarf-shrub ericads, and from hemlock-hardwoods by the relatively low importance of hemlock.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This uncommon association is only known from two locations in the Northern Appalachian project area from 320 to 360 m (1,050-1,180 feet) in elevation on moderate to steep low to mid slopes on southeast and northwest aspects. Soils are dry to mesic sandy loams with abundant litter and duff.

Global Environment: These mesic forests of oak, beech, and maple are distributed across the cooler parts of the glaciated northeastern United States. They occur on slightly acidic, well-drained loamy and often rocky soils of intermediate fertility, most often positioned on mid-slopes and coves. Soil depth is often shallow, but some occur on deep tills. Most are at low to mid elevations, usually under 520 m (1700 feet).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by closed deciduous canopies dominated by a variable mixture of *Quercus rubra* and *Acer saccharum* in association with *Acer rubrum, Betula alleghaniensis, Betula papyrifera*, and *Ostrya virginiana* occurring at lower cover. Shrub cover is low and variable. Species may include *Acer pensylvanicum, Cornus alternifolia, Corylus cornuta*, and *Viburnum acerifolium*. The herbaceous layer is depauperate with low cover. Species may include *Arisaema triphyllum, Athyrium filix-femina, Dennstaedtia punctilobula, Dryopteris intermedia*, and *Polystichum acrostichoides*.

Global Vegetation: The deciduous-to-mixed canopy is mostly closed, and the lower layers are variable in extent. Tall shrubs are well represented, although scattered, with occasional denser patches. Herbs are sparse, and bryoids are nearly absent. Ericads and other dwarf-shrubs are also nearly absent, a characteristic that distinguishes this association from most other red oak forests in the Northeast. Canopy composition is a variable mixture of *Quercus rubra* (usually at least 30% of the canopy), *Fagus grandifolia, Acer saccharum, Acer rubrum*, and, in some stands, *Pinus strobus* or *Tsuga canadensis*. In mixed stands, the cover of deciduous trees exceeds that of conifers. Minor canopy associates include *Fraxinus americana, Tilia americana, Betula lenta, Juglans cinerea*, and *Ulmus americana*. *Acer pensylvanicum* is common as a small tree; *Corylus cornuta, Viburnum acerifolium*, and *Hamamelis virginiana* are typical shrubs. Typical species in the herb layer include *Gaultheria procumbens, Maianthemum canadense, Aralia nudicaulis, Trientalis borealis, Uvularia sessilifolia, Medeola virginiana, Brachyelytrum erectum, Dryopteris intermedia, Polystichum acrostichoides, Dennstaedtia punctilobula, Pteridium aquilinum*, and *Thelypteris noveboracensis*. On more nutrient-rich soils, the herb layer may contain *Solidago caesia, Caulophyllum thalictroides*, and *Eurybia divaricata (= Aster divaricatus)*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Cornus alternifolia*, *Viburnum acerifolium*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Corylus cornuta*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fagus grandifolia*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*, *Cornus florida*, *Prunus serotina*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hamamelis virginiana*, *Viburnum acerifolium*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Corylus cornuta*
Herb (field)	Flowering forb	*Aralia nudicaulis*, *Trientalis borealis*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer saccharum*, *Quercus rubra*
Global: *Acer pensylvanicum*, *Acer rubrum*, *Aralia nudicaulis*, *Cornus florida*, *Corylus cornuta*, *Dennstaedtia punctilobula*, *Hamamelis virginiana*, *Polystichum acrostichoides*, *Prunus serotina*, *Pteridium aquilinum*, *Quercus rubra*, *Trientalis borealis*, *Viburnum acerifolium*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Epipactis helleborine* (Medium/Low, exotic/invasive)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (2-Dec-2014). This association is well-distributed in the cooler parts of the northeastern U.S. and adjacent maritime Canada in its large-patch setting.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Betula alleghaniensis - Quercus rubra / Viburnum acerifolium* Forest (CEGL006943)
- *Acer saccharum - Pinus strobus / Acer pensylvanicum* Forest (CEGL005005)
- *Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest (CEGL006293)
- *Quercus rubra - Acer rubrum - Betula* spp. *- Pinus strobus* Ruderal Forest (CEGL006506)
- *Quercus rubra - Acer saccharum - (Betula alleghaniensis)* Forest (CEGL002461)
- *Quercus rubra - Acer saccharum - Tilia americana var. heterophylla - Aesculus flava - (Cladrastis kentukea)* Forest (CEGL007698)
- *Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest (CEGL006635)
- *Quercus rubra - Quercus alba - (Quercus velutina, Acer rubrum) / Viburnum acerifolium* Forest (CEGL002462)
- *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: This type was separated from *Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest (CEGL006635) to highlight its more distinctive Northern Appalachian, central and northern New England and maritime Canada characteristics.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from southeast of Balch Hill and south of Lambert Ridge in New Hampshire.
Global Range: This association occurs in central and northern New England, lower montane regions of New York and adjacent Canada.
Nations: CA, US
States/Provinces: MA, ME:S4, NB, NH, NY, QC, VT:S4
TNC Ecoregions: 59:?, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, M212Ae:CCC, M212Ag:CCC, M212Ba:CCC, M212Bb:CCC, M212Bd:CCC, M212Ca:CCC, M212Cb:CCC, M212Cc:CCC, M212Cd:CCP, M212E:C?
Federal Lands: NPS (Appalachian Trail [Northern Appalachians], Marsh-Billings-Rockefeller)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCNO
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 plot; 1 observation point; 5 accuracy assessment points): APPA.0750, APPA.1527, APPA_AA_1999, APPA_AA_2430, APPA_AA_2502, APPA_AA_2912, APPA_AA_3290.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler and D. Faber-Langendoen
References: Eastern Ecology Working Group n.d., Edinger et al. 2002, Edinger et al. 2007, Enser 1999, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, Gawler et al. 2005, NRCS 2004a, NatureServe n.d.*, Rawinski 1984a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

G741. LAURENTIAN-ACADIAN HEMLOCK - WHITE PINE - HARDWOOD FOREST

Group Summary Description: This cool, moist to dry-mesic forest type ranges from the northeastern United States and maritime Canada west to the Great Lakes and central Wisconsin. Canopy dominants include *Pinus strobus, Thuja occidentalis*, and *Tsuga canadensis* (at least 25% cover), with or without hardwoods, including *Acer saccharum, Fagus grandifolia, Betula alleghaniensis*, and *Quercus rubra* in varying percentages. *Acer rubrum* is also quite common; *Betula lenta* may be common at the southern periphery of this group's range. *Picea rubens* and *Abies balsamea* are <25%. *Quercus velutina* and *Quercus alba* are largely absent from this group, particularly in the northeast, being more representative of groups in the Central Interior-Appalachian division to the south. This is a widespread, matrix forest type for the more temperate portions of this division. Gap replacement and infrequent fire are the major natural regeneration modes. These mesic forests usually occur on low-nutrient soils at low elevations, mostly less than 610 m (2000 feet).

A3251 *Pinus strobus - Tsuga canadensis* Forest Alliance

Alliance Summary Description: These northern coniferous forests occur in southeastern and south-central Canada south to Wisconsin and east to northern New Jersey. These mesic northern coniferous forests are characterized by abundant *Pinus strobus* and *Tsuga canadensis*. Other conifers such as *Picea rubens* or *Abies balsamea* occur at the northern edge of the range of this group; hardwoods such as *Acer saccharum, Betula alleghaniensis, Betula lenta* and *Betula papyrifera* are frequent canopy associates, but are never codominant. Common shrubs include *Acer spicatum, Acer pensylvanicum, Hamamelis virginiana, Viburnum nudum var. cassinoides*, and *Vaccinium myrtilloides*. Herbaceous species are generally few and characterized by northern or cool climates and may include *Clintonia borealis, Cornus canadensis, Eurybia macrophylla, Maianthemum canadense, Oclemena acuminata*, and *Trientalis borealis*.. The bryophyte layer is often well-developed and characterized by *Dicranum* spp. and *Leucobryum glaucum*. The environmental setting is generally dry to slightly mesic, usually acidic and nutrient-poor sites.

[CEGL006324] *Pinus strobus - Tsuga canadensis - Picea rubens* Forest

Translated Name: **Eastern White Pine - Eastern Hemlock - Red Spruce Forest**
Common Name: **White Pine - Hemlock - Red Spruce Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Laurentian-Acadian Hemlock - White Pine - Hardwood Forest (G741)
Alliance	*Pinus strobus - Tsuga canadensis* Forest Alliance (A3251)

ELEMENT CONCEPT

Global Summary: This dry-mesic pine - hemlock forest occurs on lower-elevation slopes and flats in northern New England. The typical setting is sheltered slopes with sandy or stony, acidic, moderately well-drained soils overlying bedrock, talus, or till. The closed coniferous canopy admits little light, and lower layers are patchy and sparse. Dense needle accumulation and dry conditions appear to further limit the growth of herbs and bryoids. The canopy is composed of substantial *Pinus strobus*, with variable components of *Picea rubens* and *Tsuga canadensis*. Near the coast, *Thuja occidentalis* may be a canopy component. *Picea rubens* is characteristic, although it may not be abundant, and its presence indicates a cool climatic regime. Occasionally *Abies balsamea* will be present in the canopy or subcanopy. Minor deciduous associates may include *Quercus rubra, Acer rubrum, Betula alleghaniensis, Betula papyrifera*, or *Betula populifolia*. In the shrub layer, characteristic species include *Gaylussacia baccata, Kalmia angustifolia, Viburnum nudum var. cassinoides (= Viburnum cassinoides), Vaccinium angustifolium, Vaccinium myrtilloides*, or, less commonly, *Comptonia peregrina, Diervilla lonicera, Nemopanthus mucronatus*, or *Rubus hispidus*. Characteristic herb species include *Pteridium aquilinum, Polypodium virginianum, Aralia nudicaulis, Maianthemum canadense, Gaultheria procumbens, Oclemena acuminata (= Aster acuminatus), Eurybia macrophylla (= Aster macrophyllus), Cornus canadensis, Trientalis borealis*, and *Clintonia borealis*. The bryophyte layer often includes *Dicranum undulatum* and *Leucobryum glaucum*, and may include species of *Cladina*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This dry-mesic pine - hemlock - spruce forest occurs on lower-elevation slopes and flats from Massachusetts to Maine on sheltered slopes with sandy or stony, acidic, moderately well-drained soils.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is known from low elevations locally in the Northern Appalachian project area at elevations ranging from 350 to 650 m (1,150-2,130 feet). Positions include ravines and low to high slopes on all aspects. Soils are loams and sandy loams.
Global Environment: This dry-mesic pine - hemlock forest occurs on lower-elevation slopes and flats in northern New England. The typical setting is sheltered slopes with sandy or stony, acidic, moderately well-drained soils overlying bedrock, talus, or till.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This forest is codominated by *Tsuga canadensis* and *Pinus strobus*. *Picea rubens* and northern hardwoods are typical in the understory.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by closed-canopy evergreen forests dominated by variable mixtures of *Pinus strobus, Picea rubens*, and *Tsuga canadensis*, any of which can be dominant, codominant or a canopy associate. Other species that may occur at low cover include *Abies balsamea, Acer rubrum, Acer saccharum, Betula alleghaniensis, Fagus grandifolia*, and *Thuja occidentalis*. These heavily shaded forests typically have understories with low cover and diversity. Shrub species that may occur at low cover include *Lonicera canadensis, Taxus canadensis, Vaccinium angustifolium*, and *Viburnum lantanoides*. Herbaceous species are variable and occur at very low cover as well. Species include *Aralia nudicaulis, Chimaphila umbellata, Clintonia borealis, Coptis trifolia, Cornus canadensis, Dryopteris intermedia*, and *Medeola virginiana*.
Global Vegetation: The closed coniferous canopy admits little light, and lower layers are patchy and sparse. Dense needle accumulation and dry conditions appear to further limit the growth of herbs and bryoids. The canopy is composed of substantial *Pinus strobus*, with variable components of *Picea rubens* and *Tsuga canadensis*. Near the coast, *Thuja occidentalis* may be a canopy component. *Picea rubens* is characteristic, although it may not be abundant, and its presence indicates a cool climatic regime. Occasionally *Abies balsamea* will be present in the canopy or subcanopy. Minor deciduous associates may include *Quercus rubra, Acer rubrum, Betula alleghaniensis, Betula papyrifera*, or *Betula populifolia*. In the shrub layer, characteristic species include *Gaylussacia baccata, Kalmia angustifolia, Viburnum nudum var. cassinoides (= Viburnum cassinoides), Vaccinium angustifolium, Vaccinium myrtilloides*, or, less commonly, *Comptonia peregrina, Diervilla lonicera, Nemopanthus mucronatus*, or *Rubus hispidus*. Characteristic herb species include *Pteridium aquilinum, Polypodium virginianum, Aralia nudicaulis, Maianthemum canadense, Gaultheria procumbens, Oclemena acuminata (= Aster acuminatus), Eurybia macrophylla (= Aster macrophyllus), Cornus canadensis, Trientalis borealis*, and *Clintonia borealis*. The bryophyte layer often includes *Dicranum undulatum* and *Leucobryum glaucum*, and may include species of *Cladina*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*, *Pinus strobus*, *Tsuga canadensis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Tsuga canadensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Picea rubens*, *Pinus strobus*, *Tsuga canadensis*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Picea rubens*, *Pinus strobus*, *Tsuga canadensis*
Global: *Picea rubens*, *Pinus strobus*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Pinus strobus - Pinus resinosa / Cornus canadensis* Forest (CEGL006253)
- *Pinus strobus - Tsuga canadensis* Great Lakes Forest (CEGL002590)
- *Pinus strobus - Tsuga canadensis* Lower New England-Northern Piedmont Forest (CEGL006328)
- *Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest (CEGL006129)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed in Vermont during 2012 mapping reconnaissance.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This community is less xeric than *Pinus strobus - Pinus resinosa / Cornus canadensis* Forest (CEGL006253) and less mesic than *Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest (CEGL006129). It is similar to *Pinus strobus - Tsuga canadensis* Lower New England / Northern Piedmont Forest (CEGL006328), but is distinguished by the presence of red spruce.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed in Vermont during 2012 mapping reconnaissance.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association occurs occasionally in the Northern Appalachian project area at low elevations. Known locations include Pleasant River, Nahmakanta Lake, West Branch of the Ellis River and Dunn Falls in Maine.
Global Range: This forest occurs in northern New England.
Nations: CA, US
States/Provinces: MA, ME, NB, NH, NY, QC, VT
TNC Ecoregions: 60:C, 61:?, 63:C, 64:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 222Ob:CCP, M212Aa:CCC, M212Ab:CCC, M212Ad:CCC, M212Ae:CCC, M212Ba:CPP, M212Ca:CPP, M212Cd:CPP, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212Ea:CCC, M212Eb:CCC, M212Fa:CPP, M212Fb:CPP
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFWS (Carlton Pond, Moosehorn, Pondicherry?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FPHS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 accuracy assessment points): APPA_AA_1695, APPA_AA_1970, APPA_AA_2380, APPA_AA_3320.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 3 observation points; 15 accuracy assessment points): APPA.0742, APPA.0970, APPA.1541, APPA.1544, APPA.1667, APPA_AA_1717, APPA_AA_1782, APPA_AA_2281, APPA_AA_2291, APPA_AA_2490, APPA_AA_2564, APPA_AA_2573, APPA_AA_2662, APPA_AA_2761, APPA_AA_3012, APPA_AA_3083, APPA_AA_3139, APPA_AA_3143, APPA_AA_3145, APPA_AA_3329.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Fincher 1991, Gawler 2002, Gawler and Cutko 2010, Küchler 1956, Lubinski et al. 2003, Lundgren 1999a, MNAP 1991, Moore and Taylor 1927, Rawinski 1984a, Reschke 1990, Sperduto 1996, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

A4072 *Tsuga canadensis - Betula alleghaniensis - Acer saccharum* Forest Alliance

Alliance Summary Description: Forests in this alliance are late-successional upland forests dominated by coniferous and deciduous trees. *Tsuga canadensis* and some combination of *Acer saccharum, Betula alleghaniensis, Fagus grandifolia, Picea rubens*, and *Thuja occidentalis* (in the Midwest) are typically the dominant trees. Associated trees include *Acer rubrum, Betula lenta* (in the eastern portion of this alliance's range), *Betula papyrifera, Pinus strobus*, and *Prunus serotina var. serotina*. *Picea rubens* can be found in northern New England. The shade from the canopy and dense saplings and seedlings inhibit the growth of many other species. These stands often have depauperate ground layer strata. Where the shade is not as complete, shrubs such as *Corylus cornuta, Diervilla lonicera, Hamamelis virginiana, Sambucus racemosa var. racemosa (= Sambucus pubens)*, and *Viburnum lantanoides (= Viburnum alnifolium)* are common. The herbaceous layer consists of species such as *Anemone quinquefolia, Cornus canadensis, Dryopteris carthusiana, Maianthemum canadense, Medeola virginiana, Mitchella repens, Oxalis montana, Trientalis borealis, Trillium grandiflorum*, and *Viola* spp. This alliance is known from the Laurentian-Acadian region ranging from New Brunswick and Nova Scotia to Ontario and possibly Quebec, south to New England and northern Pennsylvania, and west to Wisconsin. Stands of this alliance tend to be on dry-mesic to mesic loam and sand soils. The soil is typically acidic with parent material of glacial till in the north. Stands can be on flat to moderately steep slopes of any aspect.

[CEGL005005] *Acer saccharum - Pinus strobus / Acer pensylvanicum* Forest

Translated Name: **Sugar Maple - Eastern White Pine / Striped Maple Forest**
Common Name: **Northern Hardwood - White Pine Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Laurentian-Acadian Hemlock - White Pine - Hardwood Forest (G741)
Alliance	*Tsuga canadensis - Betula alleghaniensis - Acer saccharum* Forest Alliance (A4072)

Element Concept

Global Summary: This dry white pine - northern hardwood forest occurs widely throughout the upper midwestern and northeastern United States and eastern Canada. The typical environmental setting is well-drained, acidic, sandy or gravelly soil over glacial till, in general a less mesic setting than northern hardwoods lacking white pine. Stands are characterized by a closed canopy, sometimes with supercanopy pine, patchy (but overall fairly sparse) shrubs, and relatively sparse herb and bryoid strata. Canopy dominants are the northern hardwood species *Acer saccharum, Betula alleghaniensis*, and in the Northeast *Fagus grandifolia*, with *Pinus strobus*, the pine often occurring as a supercanopy. Minor canopy associates may include *Tsuga canadensis* and *Quercus rubra*. In the Northeast at the northern edge of the range, *Abies balsamea, Picea rubens* and *Thuja occidentalis* may also occur sparingly. The subcanopy is dominated by *Acer pensylvanicum*. The herbaceous layer is characterized by *Trientalis borealis, Maianthemum canadense, Pteridium aquilinum, Oryzopsis asperifolia*, intermixed with the dwarf-shrubs *Gaultheria procumbens, Vaccinium angustifolium* and *Gaylussacia baccata*. Bryophytes include *Polytrichum commune, Pleurozium schreberi, Bazzania trilobata*, or *Hypnum imponens*. Distribution in Michigan needs further checking.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: Local data were not collected for this community.
Global Environment: In the Northern Appalachian region, stands occur on sandy-gravelly soils, eskers in the Adirondacks, and also in a narrow band along lakeshores (Northern Appalachian Ecoregional Planning Team pers. comm. 1998).

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: Local data were not collected for this community.
Global Vegetation: Stands are dominated primarily by *Acer saccharum* with a *Pinus strobus* supercanopy (pine may be less than 25%). There may be some *Tsuga canadensis*. Other northern hardwood tree species may also be present. The understory may contain *Oryzopsis asperifolia* and *Pteridium aquilinum* in addition to standard northern hardwood understory.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*
Tree subcanopy	Broad-leaved deciduous tree	*Acer pensylvanicum*
Herb (field)	Graminoid	*Oryzopsis asperifolia*
Herb (field)	Fern (Spore-bearing forb)	*Pteridium aquilinum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area):
Global: *Acer pensylvanicum*, *Acer saccharum*, *Pinus strobus*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (3-Oct-1996).

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631)
- *Acer saccharum - Betula alleghaniensis - Tilia americana* Forest (CEGL002457)
- *Acer saccharum - Fagus grandifolia - Betula* spp. / *Maianthemum canadense* Forest (CEGL005004)
- *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632)
- *Quercus rubra - Acer saccharum - Fagus grandifolia / Viburnum acerifolium* Forest (CEGL006633)
- *Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest (CEGL006635)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Observed during mapping reconnaissance in MA and VT but no plot or observation point data collected.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type is difficult to sort out, and stands with only a scattered supercanopy of *Pinus strobus* (less than 25% cover) are floristically very similar to northern hardwoods types [see *Acer saccharum - Betula alleghaniensis - Tilia americana* Forest (CEGL002457), *Acer saccharum - Fagus grandifolia - Betula* spp. / *Maianthemum canadense* Forest (CEGL005004), *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632), and *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631)]. Further review of this issue is needed. Note that the Ontario type to which this type is crosswalked is a mixed evergreen-deciduous type, with white pine between 25 and 50% canopy cover. The importance of white pine in this association is considered to indicate relatively dry, nutrient-poor site conditions and includes mature stands in natural condition. White pine can also be a successional component of forests that regenerated after clearing, which complicates interpretation. However, this association theoretically comprises stands where white pine is "natural" and not present as a result of land-use history.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed by UMESC in Massachusetts and Vermont.
Global Range: This type is found widely throughout the upper midwestern and northeastern United States and eastern Canada, ranging from Michigan and Ontario east to Pennsylvania and north to Maine.
Nations: CA, US
States/Provinces: MA, ME, MI, NH, NY, ON:S5, PA, QC, VT
TNC Ecoregions: 47:P, 48:C, 60:C, 61:P, 63:C, 64:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Fd:CCP, 212Ga:CCP, 212Hj:CPP, 212Hk:CPP, 212Hq:CPP, 212Jb:CCP, 212Jc:CCP, 212Jr:CCC, 212Oa:CCC, 221Bc:CCC, 222:P, M212Aa:CCC,

M212Ab:CCC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CPP, M212Cd:CPP, M212Ea:CCP
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Saratoga); USFS (Hiawatha)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHP
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed by UMESC in Massachusetts and Vermont and during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 accuracy assessment points): APPA_AA_1802, APPA_AA_2884, APPA_AA_3022, APPA_AA_3267.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): L.A. Sneddon, M. Anderson, and K. Metzler
References: CDPNQ unpubl. data, Chapman et al. 1989, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Eyre 1980, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Küchler 1956, Lee et al. 1998, Lubinski et al. 2003, Moore and Taylor 1927, NAP pers. comm. 1998, NRCS 2004a, Sperduto 2000a, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006129] *Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest

Translated Name: **Eastern Hemlock - (Yellow Birch) - Red Spruce / Bunchberry Dogwood Forest**
Common Name: **Hemlock - Spruce - Hardwood Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Laurentian-Acadian Hemlock - White Pine - Hardwood Forest (G741)
Alliance	*Tsuga canadensis - Betula alleghaniensis - Acer saccharum* Forest Alliance (A4072)

ELEMENT CONCEPT

Global Summary: This mesic coniferous to mixed hemlock forest of northern and central New England and New York occurs on somewhat sheltered slopes at moderate elevations (30-610 m [100-2000 feet]). Hillslopes, stream valleys, ravines, and river or kame terraces are typical settings. The soils are mesic, well-drained sands or loams, often derived from till, acidic and typically shallow (<50 cm to obstruction). Canopy cover is typically dense, resulting in low light levels near the forest floor and correspondingly sparse lower layers. The canopy is dominated by *Tsuga canadensis*, and may be either almost entirely coniferous or a mixture of conifers and deciduous trees. Northern hardwoods are characteristic associates, including *Betula alleghaniensis, Betula papyrifera, Fagus grandifolia*, and *Acer saccharum*. *Picea rubens* is a common conifer associate, and may approach codominance with hemlock at some sites. Scattered subcanopy and shrub layers may feature *Acer pensylvanicum* and *Viburnum lantanoides (= Viburnum alnifolium)*. Herb richness and cover are very low; typical species include *Aralia nudicaulis, Cornus canadensis, Dryopteris intermedia, Gaultheria procumbens, Maianthemum canadense, Medeola virginiana, Mitchella repens, Thelypteris noveboracensis*, and *Trientalis borealis*. In northern settings (e.g., where red spruce is common), the herb layer may contain more boreal species such as *Dryopteris campyloptera, Huperzia lucidula, Oxalis montana*, and *Trillium undulatum*. This association differs from other upland hemlock forest associations in the presence of red spruce and/or yellow birch and the more generally boreal species affinities, lacking plants such as *Kalmia latifolia, Rhododendron maximum, Betula lenta*, and *Quercus* spp.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This hemlock - hardwood forest is known from northern and central New England and New York. It occurs globally on sheltered slopes at moderate elevations of 30-610 m (100-2,000 feet). Sites include a somewhat steep ravine with well-drained sandy loam soil and a moderate lower slope with moderately well-drained silt loam soil. The unvegetated surface consists of leaf litter, with lesser amounts of exposed bedrock, large rocks, and downed wood. No evidence of disturbance was reported.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is known only from the southernmost and northernmost sections of the Northern Appalachian project area. It occurs at elevations ranging from 200 to 500 m (655-1,640 feet) on gentle to steep ravines, sheltered low and mid slopes. Soils are dry to mesic loam, silt loam and sandy loam often with abundant litter and duff.

Global Environment: This mesic coniferous to mixed hemlock forest of northern and central New England and New York occurs on somewhat sheltered slopes at moderate elevations (30-610 m [100-2000 feet]). Hillslopes, stream valleys, ravines, and river or kame terraces are typical settings. The soils are mesic, well-drained sands or loams, often derived from till, acidic and typically shallow (<50 cm to obstruction).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy and subcanopy are dominated by *Tsuga canadensis* with *Picea rubens* present (0.1-45% cover); additional tree species may include *Acer rubrum, Acer saccharum*, and *Betula alleghaniensis*. Shrubs include *Fagus grandifolia* and *Viburnum lantanoides*. The herb layer may contain more boreal species such as *Dryopteris campyloptera, Huperzia lucidula, Oxalis montana*, and *Trillium undulatum*. Common herbs in the sampled plots include *Aralia nudicaulis, Dryopteris intermedia*, and *Oxalis montana*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This mixed evergreen-deciduous forest is characterized by canopy cover of variable mixtures of *Tsuga canadensis, Picea rubens*, and *Betula alleghaniensis* with all three species typically present in stands. Other canopy associates may include *Acer rubrum, Betula papyrifera*, and *Pinus strobus*. The shrub layer is primarily dominated by saplings of canopy species, often with *Acer pensylvanicum*. Herbaceous cover tends to be relatively low, the most abundant species being *Aralia nudicaulis* and *Dryopteris intermedia*. Other herbaceous associates may include *Clintonia borealis, Coptis trifolia, Cornus canadensis, Maianthemum canadense, Medeola virginiana, Oclemena acuminata, Oxalis montana, Trientalis borealis*, and *Trillium undulatum*.

Global Vegetation: Canopy cover is typically dense, resulting in low light levels near the forest floor and correspondingly sparse lower layers. The canopy is dominated by *Tsuga canadensis*, and may be either almost entirely coniferous or a mixture of conifers and deciduous trees. Northern hardwoods are characteristic associates, including *Betula alleghaniensis, Betula papyrifera, Fagus grandifolia*, and *Acer saccharum*. *Picea rubens* is a common conifer associate, and may approach codominance with hemlock at some sites. Scattered subcanopy and shrub layers may feature *Acer pensylvanicum* and *Viburnum lantanoides (= Viburnum alnifolium)*. Herb richness and cover are very low; typical species include *Aralia nudicaulis, Cornus canadensis, Dryopteris intermedia, Gaultheria procumbens, Maianthemum canadense, Medeola virginiana, Mitchella repens, Thelypteris noveboracensis*, and *Trientalis borealis*. In northern settings (e.g., where red spruce is common), the herb layer may contain more boreal species such as *Dryopteris campyloptera, Huperzia lucidula, Oxalis montana*, and *Trillium undulatum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Needle-leaved tree	*Picea rubens*
Tall shrub/sapling	Broad-leaved deciduous tree	*Fagus grandifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Viburnum lantanoides*
Herb (field)	Flowering forb	*Aralia nudicaulis*, *Oxalis montana*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*, *Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Herb (field)	Flowering forb	*Aralia nudicaulis*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Picea rubens*, *Tsuga canadensis*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Betula alleghaniensis*, *Picea rubens*, *Tsuga canadensis*
Global: *Betula alleghaniensis*, *Cornus canadensis*, *Picea rubens*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Epipactis helleborine* (Medium/Low)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631)
- *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632)
- *Pinus strobus - Tsuga canadensis - Picea rubens* Forest (CEGL006324)
- *Tsuga canadensis - Acer saccharum - Betula alleghaniensis* Forest (CEGL005044)
- *Tsuga canadensis - Acer saccharum - Fagus grandifolia / Dryopteris intermedia* Forest (CEGL006639)
- *Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest (CEGL006638)
- *Tsuga canadensis - Fagus grandifolia - (Acer saccharum)* Great Lakes Forest (CEGL005042)
- *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at October Mountain State Forest in Massachusetts and at Roaring Brook in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known only from the southernmost and northernmost sections of the Northern Appalachian project area. Known locations include near Cole Hill in New Hampshire and Elliotsville Township, Nahmakanta Lake and Church Pond in Maine.
Global Range: This mesic hemlock forest occurs in northern and central New England and adjacent Canada.
Nations: CA, US
States/Provinces: MA, ME, NB, NH, NS, NY, ON?, VT:S4
TNC Ecoregions: 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212A:CC, 212B:CC, 212Cb:CPP, 212D:CC, 221Ah:CCP, 221Ai:CCP, 221Al:CCP, 221Bb:CCP, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ba:CCC, M212Bb:CCP, M212Bc:CCC, M212Bd:CCP, M212Ca:CCC, M212Cb:CCC, M212Cc:CCC, M212Cd:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212Ea:CCC, M212Fa:CCC, M212Fb:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFWS (Moosehorn?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FHSH
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 1 observation point; 2 accuracy assessment points): APPA.0813, APPA.0827, APPA.1471, APPA_AA_1871, APPA_AA_2917.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (5 plots; 4 observation points; 12 accuracy assessment points): APPA.0741, APPA.0751, APPA.0752, APPA.0757, APPA.0758, APPA.1660, APPA.1668, APPA.1669, APPA.1678, APPA_AA_1680, APPA_AA_1854, APPA_AA_2085, APPA_AA_2214, APPA_AA_2503, APPA_AA_2804, APPA_AA_2910, APPA_AA_2929, APPA_AA_3124, APPA_AA_3181, APPA_AA_3189, APPA_AA_3214.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, Küchler 1956, Lubinski et al. 2003, Moore and Taylor 1927, Rawinski 1984a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006638] *Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest

Translated Name: **Eastern Hemlock - Yellow Birch - Sugar Maple / Intermediate Woodfern Forest**
Common Name: **Hemlock - Northern Hardwood Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Laurentian-Acadian Hemlock - White Pine - Hardwood Forest (G741)
Alliance	*Tsuga canadensis - Betula alleghaniensis - Acer saccharum* Forest Alliance (A4072)

Element Concept

Global Summary: This association comprises hemlock - northern hardwood forests of the northeastern United States and adjacent maritime Canada. This forest is associated with cool, dry-mesic to mesic sites and acidic soils, often on rocky, north-facing slopes. Soils can have a thick, poorly decomposed duff layer over sandy loams. *Tsuga canadensis* is characteristic and usually dominant in the coniferous to mixed canopy. While hemlock generally forms at least 50% of the canopy, in some cases it may be as low as 25% relative dominance. Hardwood codominants include *Betula alleghaniensis* or *Acer saccharum*, with *Fagus grandifolia* common but not usually abundant in all but the very southern portion of the range of this type. *Betula lenta* may replace *Betula alleghaniensis* in some areas. *Ostrya virginiana* may be present as a small tree. *Quercus* spp. and *Pinus strobus* tend to be absent or, if present, only occur with low abundance. The shrub layer may be dense to fairly open and often includes *Viburnum acerifolium* and *Acer pensylvanicum* in addition to *Tsuga canadensis* regeneration. Herbs may be sparse, particularly in dense shade, but include *Dryopteris intermedia, Medeola virginiana, Oxalis montana, Mitchella repens, Maianthemum canadense, Uvularia sessilifolia, Polystichum acrostichoides, Trientalis borealis, Huperzia lucidula (= Lycopodium lucidulum), Oclemena acuminata (= Aster acuminatus), Dennstaedtia punctilobula*, and *Thelypteris noveboracensis*. Nonvascular plants may be well-developed, often characterized by the liverwort *Bazzania trilobata*. Diagnostic characteristics of this forest are the dominance of *Tsuga canadensis*, presence of *Betula alleghaniensis* and *Acer saccharum*, and a lack of abundant *Quercus* spp., *Pinus strobus*, other conifers, or *Betula lenta*.

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This uncommon association is known from only one location in New Hampshire at 542 m (1,778 feet) in elevation on a somewhat steep mesic midslope on an eastern aspect. The soil is sandy loam.
Global Environment: This forest is associated with cool, dry-mesic to mesic sites and acidic soils, often on rocky, north-facing slopes. Soils can have a thick, poorly decomposed duff layer over sandy loams.

Vegetation Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only occurrence of this association has a mixed evergreen-deciduous canopy dominated by *Tsuga canadensis* with about 50% of the canopy cover composed of *Betula alleghaniensis* with lesser amounts of *Picea rubens* and *Fagus grandifolia*. The tall-shrub layer is dominated by *Acer pensylvanicum*. The primary herbaceous species is the fern *Dryopteris intermedia*.
Global Vegetation: *Tsuga canadensis* is dominant and forms at least 50% of the canopy. *Betula alleghaniensis* can be codominant, with *Fagus grandifolia* and *Acer saccharum* common. The shrub layer may be dense to fairly open and often includes *Viburnum acerifolium* and *Acer pensylvanicum* in addition to *Tsuga canadensis* regeneration. Herbs may be sparse, particularly in dense shade, but often include *Dryopteris intermedia, Medeola virginiana, Oxalis montana, Mitchella repens, Maianthemum canadense, Trientalis borealis, Huperzia lucidula (= Lycopodium lucidulum)*, and *Thelypteris noveboracensis*. Nonvascular plants may be well-developed, often characterized by the liverwort *Bazzania trilobata*. Diagnostic characteristics of this forest are the presence of *Betula alleghaniensis* and *Acer saccharum* and a lack of abundant *Quercus* spp., *Pinus strobus*, or *Betula lenta*.

Most Abundant Species

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum acerifolium*
Herb (field)	Flowering forb	*Maianthemum canadense*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Tsuga canadensis*
Global: *Betula alleghaniensis*, *Carex albicans*, *Dryopteris intermedia*, *Huperzia lucidula*, *Maianthemum canadense*, *Medeola virginiana*, *Mitchella repens*, *Oclemena acuminata*, *Thelypteris noveboracensis*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (3-Dec-2014). This association has a very large geographic distribution and occurs in large patches in the northern part of its range.

RELATED CONCEPTS

Global Similar Types:
- *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861)
- *Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest (CEGL006129)
- *Tsuga canadensis - (Betula alleghaniensis, Quercus rubra) / Ilex montana / Rhododendron catawbiense* Forest (CEGL008513)
- *Tsuga canadensis - Acer saccharum - Fagus grandifolia / Dryopteris intermedia* Forest (CEGL006639)
- *Tsuga canadensis - Fagus grandifolia - Acer saccharum / (Hamamelis virginiana, Kalmia latifolia)* Forest (CEGL005043)
- *Tsuga canadensis - Fagus grandifolia - Quercus (prinus, alba)* Forest (CEGL006474)
- *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: This type was formerly included in CEGL006109, which was split into CEGL006638 and CEGL006639. It was separated from *Tsuga canadensis - Acer saccharum - Fagus grandifolia / Dryopteris intermedia* Forest (CEGL006639) to better recognize its Northern Appalachian - Acadian region characteristics, including much stronger dominance by *Betula alleghaniensis*. However, it may overlap strongly with *Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest (CEGL006129). See also another conifer-dominated association in this region, *Pinus strobus - Tsuga canadensis - Picea rubens* Forest (CEGL006324). Stands of this vegetation type could become threatened by adelgid-caused tree mortality should the adelgid continue to spread northward.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Franconia Notch in New Hampshire.
Global Range: This community is generally distributed in large patches in the northeastern United States and adjacent maritime Canada.
Nations: US
States/Provinces: ME, NH, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Ag:CCC, M212Ba:CCC, M212Bb:CCC, M212Bc:CCC, M212Cb:CCC, M212Cc:CCC, M221Ab:CC?
Federal Lands: NPS (Appalachian Trail [Northern Appalachians], Delaware Water Gap, Marsh-Billings-Rockefeller, Saratoga, Upper Delaware); USFS (Finger Lakes, George Washington, Green Mountain); USFWS (Erie, Iroquois)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FHNH
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 observation point; 6 accuracy assessment points): APPA.1756, APPA_AA_1715, APPA_AA_2637, APPA_AA_2642, APPA_AA_2826, APPA_AA_2994, APPA_AA_3301.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.L. Neid, S.C. Gawler, G.P. Fleming and D. Faber-Langendoen
References: Eastern Ecology Working Group n.d., Eyre 1980, Gawler 2002, Gawler and Cutko 2010, NAP pers. comm. 1998, NRCS 2004a, NatureServe n.d.*, Sperduto 2000a, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

G744. NORTHERN APPALACHIAN-ACADIAN RED SPRUCE - FIR - HARDWOOD FOREST

Group Summary Description: The vegetation comprises spruce-fir-hardwood forests and woodlands of northeastern North America within the range of *Picea rubens*, from the Acadian forests of southeastern Canada across northern New England and the Adirondacks and adjacent areas of New York and western Pennsylvania. Sites of this group occur in cool, mostly mesic settings on various glaciated landforms. Substrate geology also varies, although soils are generally acidic. They form the forest matrix in the coolest parts of this region, and they occur from sea level to treeline (below about 1370 m [4500 feet]). *Picea rubens* is generally present and often dominant. Following heavy disturbance from fire or timber harvesting, the canopy may be dominated by *Abies balsamea, Betula papyrifera*, or *Populus* spp. Typical canopy associates include *Betula alleghaniensis, Betula papyrifera, Thuja occidentalis*, and *Acer rubrum*. On less exposed sites in the southern part of this group's range, *Tsuga canadensis* may be an important canopy associate. Characteristic shrubs include *Vaccinium angustifolium* and/or *Vaccinium myrtilloides, Viburnum lantanoides*, and *Viburnum nudum var. cassinoides*. Characteristic herbs include *Clintonia borealis, Cornus canadensis, Mitchella repens, Oxalis montana, Trientalis borealis*, and *Trillium undulatum*. Ferns include *Dryopteris campyloptera, Dryopteris carthusiana*, and *Dryopteris intermedia*, among others. The bryophyte layer is generally very well-developed, characterized by *Bazzania trilobata, Pleurozium schreberi, Dicranum* spp., and many others. Moist sites may support *Sphagnum* spp. Mosses and liverworts grow densely on fallen logs, tree trunks, and the forest floor, giving these forests a distinctive carpeted appearance.

A0150 *Picea rubens - Abies balsamea* Forest Alliance

Alliance Summary Description: This alliance contains red spruce - balsam fir and mixed spruce - northern hardwood forest associations of southeastern Canada ranging to northern New England and New York. The canopy may be dominated by *Picea rubens, Abies balsamea*, or codominated by both species, with or without northern hardwood species such as *Betula alleghaniensis*. Typical canopy associates include *Betula alleghaniensis* and *Betula papyrifera*, with an understory of *Sorbus americana, Acer spicatum*, and *Acer pensylvanicum*. Occasional associates include a diversity of northern hardwoods, such as *Acer rubrum, Acer saccharum, Fagus grandifolia*, and *Tsuga canadensis*. Common herbs of this alliance include *Clintonia borealis, Coptis trifolia, Cornus canadensis, Huperzia lucidula (= Lycopodium lucidulum), Maianthemum canadense, Oclemena acuminata (= Aster acuminatus), Oxalis montana*, and *Trientalis borealis*. The bryophyte layer is generally very well-developed, characterized by *Bazzania trilobata, Brotherella recurvans, Pleurozium schreberi*, and many others. Stands occur primarily on acidic till derived from granites or from sandstone, at elevations from near sea level up to 1370 m (0-4500 feet). Though typically on mesic site, some site are relatively moist ("spruce flats").

[CEGL006112] *Abies balsamea - (Betula papyrifera var. cordifolia)* Forest

Translated Name: **Balsam Fir - (Mountain Paper Birch) Forest**
Common Name: **Montane Balsam Fir - Birch Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Northern Appalachian-Acadian Red Spruce - Fir - Hardwood Forest (G744)
Alliance	*Picea rubens - Abies balsamea* Forest Alliance (A0150)

ELEMENT CONCEPT

Global Summary: These subalpine forests occur near treeline on mountains of the northeastern United States and adjacent Canada. They are found on upper mountain slopes and ridgetops (above 915 m [3000 feet]) where they are associated with high winds, cold temperatures and shallow, acidic soils with a strong organic component. They are usually coniferous, but in some cases *Betula papyrifera var. cordifolia* may be a long-term replacement after disturbance. Canopy coverage is usually 70-85%. The shrub layer is sparse where the canopy is closed, but disturbance-created patches that are frequent within this forest may have dense shrub cover. Dwarf-shrubs and herbs are sparse; the coverage of bryoids is variable. In the canopy, *Abies balsamea* is often dominant and may form pure stands; *Betula papyrifera var. cordifolia* and *Picea rubens* are common associates, usually of minor importance except for post-disturbance patches that may be strongly birch-dominated. Typically forms large patches between 1070 and 1370 m (3500-4500 feet), but may be almost matrix. The shrub layer is predominantly *Abies* seedlings with occasional *Sorbus americana, Alnus viridis, Viburnum nudum var. cassinoides*, and *Ledum groenlandicum*. Characteristic herbs include *Dryopteris campyloptera, Oxalis montana (= Oxalis acetosella), Maianthemum canadense, Clintonia borealis, Cornus canadensis, Coptis trifolia (= Coptis groenlandica), Solidago macrophylla*, and the clubmoss *Lycopodium annotinum*. Bryophytes include *Dicranum scoparium, Dicranum fuscescens, Polytrichum ohioense, Plagiothecium laetum, Bazzania trilobata*, and *Pleurozium schreberi*. These forests generally occur above montane spruce-fir forests and spruce-hardwood forests, and approach a matrix forest above 1220 m (4000 feet). Fir waves are a physiognomically unusual expression of this community.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This subalpine balsam fir forest occurs near treeline on upper mountain slopes and ridgetops above 914 m (3,000 feet). It is peripheral in Lower New England project area and common in Northern Appalachian project area. Sites are moderate north- and southwest-facing slopes with moderately well- to well-drained silt loam and sandy loam soil. The unvegetated surface consists of leaf litter, with small amounts of exposed bedrock, downed wood and/or bare soil. Evidence of disturbance includes windthrow.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is scattered throughout the Northern Appalachian project area at elevations ranging from 300 to 1200 m (985-3,940 feet). Positions include low to high slopes, summits and ridges on all aspects. Slopes range from gentle to steep. Soils are variable and range from dry to mesic sandy loams or loams often with abundant organic material. Unvegetated surfaces are typically high in litter and duff, although some sites have abundant exposed large rocks.

Global Environment: These subalpine forests occur near treeline on mountains of the northeastern United States and adjacent Canada. They are found on upper mountain slopes and ridgetops (above 915 m [3000 feet] elevation) where they are associated with high winds, cold temperatures and shallow, acidic soils with a strong organic component.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This subalpine forest is dominated by *Abies balsamea*. *Picea rubens* may be present but at less than 20% cover. The shrub layer is predominantly *Abies balsamea* seedlings with occasional *Sorbus americana*. Characteristic herbs include *Clintonia borealis, Dryopteris campyloptera, Huperzia lucidula, Oclemena acuminata*, and *Oxalis montana*. In addition, this community supports MA state-imperiled *Solidago macrophylla*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by open to closed evergreen or mixed evergreen-deciduous canopies ranging from 40-90% total cover. *Abies balsamea* is the always present and is the sole dominant or may be codominated by *Betula papyrifera var. cordifolia*. *Picea rubens* is frequently present at low cover. Few other canopy associates are consistently present, but may include *Acer rubrum, Acer saccharum*, and *Betula alleghaniensis*. A dense subcanopy may be present and composed of the mentioned canopy species. Other subcanopy dominants include *Acer pensylvanicum, Sorbus americana*, and *Sorbus decora*. The shrub layer is inconsistent and typically dominated by saplings of canopy species and may be extremely dense. No actual shrub species have high cover or consistency. The herbaceous layer ranges from open to dense. The most consistent dominant species include *Clintonia borealis, Dryopteris campyloptera, Huperzia lucidula*, and *Oxalis montana*. Other herbaceous associates include *Aralia nudicaulis, Coptis trifolia, Cornus canadensis, Dryopteris intermedia, Maianthemum canadense, Monotropa uniflora, Oclemena acuminata, Solidago macrophylla*, and *Trientalis borealis*.

Global Vegetation: They are usually coniferous, but in some cases *Betula papyrifera var. cordifolia* may be a long-term replacement after disturbance. Canopy coverage is usually 70-85%. The shrub layer is sparse where the canopy is closed, but disturbance-created patches that are frequent within this forest may have dense shrub cover. Dwarf-

shrubs and herbs are sparse; the coverage of bryoids is variable. In the canopy, *Abies balsamea* is often dominant and may form pure stands; *Betula papyrifera var. cordifolia* and *Picea rubens* are common associates, usually of minor importance except for post-disturbance patches that may be strongly birch-dominated. Typically forms large patches between 1070 and 1370 m (3500-4500 feet), but may be almost matrix. The shrub layer is predominantly *Abies* seedlings with occasional *Sorbus americana, Alnus viridis, Viburnum nudum var. cassinoides*, and *Ledum groenlandicum*. Characteristic herbs include *Dryopteris campyloptera, Oxalis montana (= Oxalis acetosella), Maianthemum canadense, Clintonia borealis, Cornus canadensis, Coptis trifolia (= Coptis groenlandica), Solidago macrophylla*, and the clubmoss *Lycopodium annotinum*. Bryophytes include *Dicranum scoparium, Dicranum fuscescens, Polytrichum ohioense, Plagiothecium laetum, Bazzania trilobata*, and *Pleurozium schreberi*. These forests generally occur above montane spruce-fir forests and spruce-hardwood forests, and approach a matrix forest above 1220 m (4000 feet). Fir waves are a physiognomically unusual expression of this community.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Abies balsamea*
Shrub/sapling (tall & short)	Needle-leaved tree	*Abies balsamea*
Herb (field)	Flowering forb	*Clintonia borealis*, *Oclemena acuminata*, *Oxalis montana*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris campyloptera*, *Huperzia lucidula*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*
Tree canopy	Broad-leaved deciduous tree	*Betula papyrifera* var. *cordifolia*
Herb (field)	Flowering forb	*Clintonia borealis*, *Oxalis montana*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris campyloptera*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Betula papyrifera* var. *cordifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Abies balsamea*, *Dryopteris campyloptera*, *Huperzia lucidula*, *Oclemena acuminata*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Abies balsamea*, *Dryopteris campyloptera*, *Oxalis montana*
Global: *Abies balsamea*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Solidago macrophylla* (G5, MA state-imperiled)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Picea mariana - Abies balsamea / Sibbaldiopsis tridentata* Shrubland (CEGL006038)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: (Summarized from Fitzgerald 1989): Frequent wind-induced disturbance tends to favor growth of balsam fir over red spruce when the two occur together (McIntosh and Hurley 1964, Sprugel 1976). Seedlings of both species can live suppressed for many years, but balsam fir has a competitive advantage due

to its more highly developed root system (Fowells 1965). This results in an increase of balsam fir at the expense of red spruce.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Greylock Summit Natural Heritage Site in Massachusetts and in Vermont (including the Coolidge Range).
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from Mount Moosilauke, Franconia Notch, Wildcat Ridge and Old Jackson Road in New Hampshire and Crocker Mountain, Little Bigelow, White Cap Mountains, Black Brook Notch, Baldpate Mountain, Grafton West, Surplus Pond, Saddleback North and Baxter State Park in Maine.
Global Range: These subalpine forests occur near treeline on mountains of the northeastern United States and adjacent Canada.
Nations: CA, US
States/Provinces: MA, ME:S3, NB, NH:S3S4, NY:S2, QC?, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ac:CCC, M212Ad:CCP, M212Ae:CCC, M212Af:CCC, M212B:CC, M212Ca:CCC, M212Cd:CCC, M212Dd:CCC, M212Df:CCC, M212E:CC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFS (Green Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FMFB
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 plots; 2 observation points; 2 accuracy assessment points): APPA.0044, APPA.0398, APPA.0399, APPA.0958, APPA.1560, APPA.1718, APPA_AA_2228, APPA_AA_2248.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (12 plots; 12 observation points; 31 accuracy assessment points): APPA.0194, APPA.0195, APPA.0196, APPA.0197, APPA.0198, APPA.0713, APPA.0714, APPA.0721, APPA.0851, APPA.0855, APPA.0986, APPA.0989, APPA.1583, APPA.1584, APPA.1595, APPA.1609, APPA.1610, APPA.1616, APPA.1689, APPA.1761, APPA.1765, APPA.1766, APPA.1767, APPA.1770, APPA_AA_1654, APPA_AA_1773, APPA_AA_1862, APPA_AA_1911, APPA_AA_1917, APPA_AA_1987, APPA_AA_2037, APPA_AA_2040, APPA_AA_2046, APPA_AA_2079, APPA_AA_2102, APPA_AA_2156, APPA_AA_2371, APPA_AA_2414, APPA_AA_2425, APPA_AA_2474, APPA_AA_2608, APPA_AA_2659, APPA_AA_2688, APPA_AA_2692, APPA_AA_2733, APPA_AA_2769, APPA_AA_2850, APPA_AA_2855, APPA_AA_2866, APPA_AA_2882, APPA_AA_2985, APPA_AA_3009, APPA_AA_3039, APPA_AA_3072, APPA_AA_3080.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Cogbill 1987, Cogbill and White 1991, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Fitzgerald 1989, Fowells 1965, Gawler 2002, Gawler and Cutko 2010, MNAP 1991, McIntosh and Hurley 1964, Rawinski 1984a, Reschke 1990, Slack 1977, Sperduto 1996, Sperduto 2000a, Sperduto 2000b, Sperduto and Nichols 2004, Sprugel 1976, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006267] *Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest

Translated Name: **Yellow Birch - Red Spruce / Mountain Woodfern Forest**
Common Name: **Transitional Northern Hardwood - Red Spruce Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Northern Appalachian-Acadian Red Spruce - Fir - Hardwood Forest (G744)
Alliance	*Picea rubens - Abies balsamea* Forest Alliance (A0150)

ELEMENT CONCEPT

Global Summary: This transitional hardwood - spruce forest occurs in montane regions of northern New England, the Northern Appalachians, and in adjacent Canada. This forest is most extensive at middle elevations, between 305 and 760 m (1000-2500 feet), occurring on slopes with rocky, nutrient-poor, and often shallow till soils that are well-drained to excessively well-drained. This association forms a relatively broad transitional zone between northern hardwood forests and montane spruce-fir forests. The canopy varies from nearly closed to partly open. Shrubs, herbs, and tree regeneration forms a dense cover in gaps; under closed canopies, understory layers can be sparse. The dominant trees are *Picea rubens* and a variable mixture of the northern hardwoods *Acer saccharum, Betula alleghaniensis*, and *Fagus grandifolia*. Other canopy associates include *Acer rubrum, Abies balsamea, Thuja occidentalis*, and *Betula papyrifera*. *Abies balsamea* may be the major conifer, in either the canopy or subcanopy, in stands that have been selectively logged. Shrub and herbaceous layers contain species common to both northern hardwood and spruce-fir forests. Characteristic shrubs include *Sorbus americana, Sorbus decora, Acer pensylvanicum, Acer spicatum*, and *Viburnum lantanoides (= Viburnum alnifolium)*. Characteristic herbs include *Dryopteris intermedia, Dryopteris campyloptera, Clintonia borealis, Oxalis montana, Linnaea borealis, Maianthemum canadense, Streptopus lanceolatus var. roseus (= Streptopus roseus)*, and *Aralia nudicaulis*. The bryophyte layer is of variable cover and may include *Bazzania trilobata, Dicranum scoparium, Hypnum imponens, Hylocomium splendens, Leucobryum glaucum*, and *Polytrichum commune*. On the ground, this community can grade into both northern hardwood forest and spruce-fir forest types; this type is distinguished by the codominance of conifers and hardwoods.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This mixed deciduous - spruce forest is most extensive at middle elevations. Elevations at sampled sites range from 460-929 m (1,509-3,047 feet) on rocky slopes. Sites are variable, ranging from flat to somewhat steep mid and lower slopes. Soils are mesic poorly drained muck to well-drained sandy loam, silt loam and loam. The unvegetated surface consists almost exclusively of leaf litter, with very small amounts of exposed bedrock, large rocks, and downed wood. Evidence of disturbance includes possible past logging and wind damage.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association occurs at elevations ranging from 300 to 730 m (985-2,395 feet) on moderate to steep low to high slopes typically with cooler north, northwest, east and northeast aspects. Soils range from dry to mesic sand, sandy loams and clay loams. Unvegetated surfaces are most prominently litter and duff.

Global Environment: This transitional hardwood - spruce forest occurs in montane regions of northern New England, the northern Appalachian Mountains, and in adjacent Canada. This forest is most extensive at middle elevations, between 305 and 760 m (1000-2500 feet), occurring on slopes with rocky, nutrient-poor, and often shallow till soils that are well-drained to excessively well-drained. This association forms a relatively broad transitional zone between northern hardwood forests and montane spruce-fir forests.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These mixed deciduous northern hardwood - spruce forests are dominated by *Picea rubens* and, in logged stands, *Abies balsamea* comprises at least 25-50% total cover. Deciduous northern hardwood species, including *Betula alleghaniensis* and *Acer rubrum*, are abundant (>50% cover) along with occasional *Acer saccharum* and *Fagus grandifolia* in the canopy and subcanopy. *Picea rubens* is also common in the understory. Tall shrubs include *Acer pensylvanicum, Viburnum lantanoides*, and *Acer spicatum*. Herbs include *Clintonia borealis, Dennstaedtia punctilobula, Coptis trifolia, Oxalis montana, Oclemena acuminata, Maianthemum canadense*, and *Dryopteris intermedia*. This community lacks *Betula papyrifera var. cordifolia*, and *Sorbus americana* is sparse to absent.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by closed-canopy mixed deciduous-evergreen forests where *Betula alleghaniensis* and *Picea rubens* are codominant or present. Other canopy associates present at low cover may include *Acer rubrum, Acer spicatum, Abies balsamea, Fagus grandifolia, Acer saccharum*, and *Betula papyrifera*. The most frequent dominant shrub is *Viburnum lantanoides*. Other shrub species have low constancy among sites and may include *Chamaedaphne calyculata, Empetrum nigrum, Kalmia angustifolia*, and *Ledum groenlandicum*. The herbaceous layer is dense and most commonly dominated by the ferns *Dryopteris campyloptera, Dryopteris intermedia*, and *Dennstaedtia punctilobula*. Other herbaceous associates include *Aralia nudicaulis, Carex intumescens, Clintonia borealis, Coptis trifolia, Maianthemum canadense, Oclemena acuminata, Oxalis montana, Streptopus lanceolatus*, and *Trientalis borealis*. Nonvascular moss and lichen species may have as much as 60% cover.

Global Vegetation: The canopy varies from nearly closed to partly open. Shrubs, herbs, and tree regeneration forms a dense cover in gaps; under closed canopies, understory layers can be sparse. The dominant trees are *Picea rubens* and a variable mixture of the northern hardwoods *Acer saccharum, Betula alleghaniensis*, and *Fagus grandifolia*. Other canopy associates include *Acer rubrum, Abies balsamea, Thuja occidentalis*, and *Betula papyrifera*. *Abies balsamea* may be the major conifer, in either the canopy or subcanopy, in stands that have been selectively logged. Shrub and herbaceous layers contain species common to both northern hardwood and spruce-fir forests. Characteristic shrubs include *Sorbus americana, Sorbus decora, Acer pensylvanicum, Acer spicatum*, and *Viburnum lantanoides (= Viburnum alnifolium)*. Characteristic herbs include *Dryopteris intermedia, Dryopteris campyloptera, Clintonia borealis, Oxalis montana, Linnaea borealis, Maianthemum canadense, Streptopus lanceolatus var. roseus (= Streptopus roseus)*, and *Aralia nudicaulis*. The bryophyte layer is of variable cover and may include *Bazzania trilobata, Dicranum scoparium, Hypnum imponens, Hylocomium splendens, Leucobryum glaucum*, and *Polytrichum commune*.
Global Dynamics: This association forms a relatively broad transitional zone between northern hardwood forests and montane spruce-fir forests.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula alleghaniensis*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Fagus grandifolia*
Herb (field)	Flowering forb	*Maianthemum canadense*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Dryopteris campyloptera*, *Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*, *Betula alleghaniensis*, *Fagus grandifolia*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Sorbus americana*
Herb (field)	Flowering forb	*Maianthemum canadense*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Betula alleghaniensis*, *Dryopteris campyloptera*, *Picea rubens*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Betula alleghaniensis*, *Dryopteris campyloptera*, *Picea rubens*, *Viburnum lantanoides*
Global: *Betula alleghaniensis*, *Dryopteris campyloptera*, *Picea rubens*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

Related Concepts

Global Similar Types:
- *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006631)
- *Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest (CEGL006632)
- *Picea rubens - (Betula alleghaniensis, Aesculus flava) / Viburnum lantanoides / Solidago glomerata* Forest (CEGL006256)
- *Picea rubens - Abies balsamea - Betula papyrifera* Forest (CEGL006273)
- *Picea rubens - Abies balsamea - Betula* spp. - *Acer rubrum* Forest (CEGL006505)
- *Picea rubens - Abies balsamea / Sorbus americana* Forest (CEGL006128)

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: On the ground, this community can grade into both northern hardwood forest and spruce-fir forest types; this type is distinguished by the codominance of conifers and hardwoods.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

Element Distribution

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Mount Prospect and October Mountain State Forest in Massachusetts and at Bridgewater Heights, Harmon Hill, Kent Pond, Stratton Pond, Sunderland, and Wallingford Pond West in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from Old Jackson Road in New Hampshire and West Branch Pleasant River, south of Mount Cube, Grafton West, Grafton East, Surplus Pond, Andover East, Joe's Hole and Big Wilson Stream in Maine.
Global Range: This forest occurs in montane regions of northern New England, the Northern Appalachians, and adjacent Canada.
Nations: CA, US
States/Provinces: MA, ME:S4, NB, NH:S4, NS, NY:S3S4, QC, VT
TNC Ecoregions: 60:C, 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Cb:CCC, 212Eb:CCC, 212Ed:CCC, 221Ah:CCC, 221Al:CCC, 221Bc:CCC, 222Ob:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ba:CCC, M212Bc:CCC, M212Bd:CCC, M212Ca:CCC, M212Cb:CCC, M212Cc:CCC, M212Cd:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212Ea:CCC, M212Fa:CCC, M212Fb:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFS (White Mountain); USFWS (Nulhegan Basin, Pondicherry)

Element Sources

Appalachian National Scenic Trail Map-Class Code: FTHS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 plots; 6 observation points; 9 accuracy assessment points): APPA.0808, APPA.0810, APPA.0823, APPA.1478, APPA.1479, APPA.1482, APPA.1498, APPA.1506, APPA.1695, APPA_AA_1725, APPA_AA_1743, APPA_AA_1771, APPA_AA_1975, APPA_AA_2298, APPA_AA_2383, APPA_AA_2560, APPA_AA_2878, APPA_AA_3027.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 10 observation points; 29 accuracy assessment points): APPA.0748, APPA.0767, APPA.1545, APPA.1546, APPA.1547, APPA.1579, APPA.1588, APPA.1596, APPA.1600, APPA.1644, APPA.1649, APPA.1768, APPA_AA_1689, APPA_AA_1692, APPA_AA_1708, APPA_AA_1758, APPA_AA_1827, APPA_AA_1845, APPA_AA_1848, APPA_AA_1902, APPA_AA_1914, APPA_AA_2100, APPA_AA_2180, APPA_AA_2189, APPA_AA_2340, APPA_AA_2350, APPA_AA_2421, APPA_AA_2428, APPA_AA_2471, APPA_AA_2481, APPA_AA_2537, APPA_AA_2581, APPA_AA_2587, APPA_AA_2678, APPA_AA_2706, APPA_AA_2753, APPA_AA_2797, APPA_AA_2827, APPA_AA_3163, APPA_AA_3284, APPA_AA_3336.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, Küchler 1956, Lubinski et al. 2003, Moore and Taylor 1927, Reschke 1990,

Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006273] *Picea rubens - Abies balsamea - Betula papyrifera* Forest

Translated Name: **Red Spruce - Balsam Fir - Paper Birch Forest**
Common Name: **Low-Elevation Spruce - Fir Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Northern Appalachian-Acadian Red Spruce - Fir - Hardwood Forest (G744)
Alliance	*Picea rubens - Abies balsamea* Forest Alliance (A0150)

Element Concept

Global Summary: These red spruce - balsam fir forests are widespread on lower-elevation slopes across boreal regions of the northeastern United States and adjacent Canada. They occur in cool and generally moist upland settings, on well-drained tills, and occasionally on kame deposits or eskers. Some areas of poorly drained soils may be present. Most are at elevations of 245-610 m (800-2000 feet). Cold-air drainage allows them to occur in lowlands elevationally below northern hardwood forests. These low-diversity forests have a closed canopy and very sparse shrub and herbaceous layers, except in gaps where regeneration can be dense. The canopy is dominated by *Picea rubens*, with a minor to moderate amount of *Abies balsamea*. Associate canopy species may include *Picea glauca, Picea mariana, Betula alleghaniensis (= Betula lutea), Betula papyrifera*, and minor amounts of *Acer rubrum, Populus tremuloides*, or *Larix laricina*. *Tsuga canadensis* and *Pinus strobus* may be present, but are rarely abundant. The shrub layer is patchy and typically includes *Acer pensylvanicum* and *Viburnum lantanoides (= Viburnum alnifolium)*. Occasional shrubs include *Viburnum nudum var. cassinoides, Nemopanthus mucronatus*, and *Sorbus americana* or *Sorbus decora*. The herb layer includes *Oxalis montana (= Oxalis acetosella), Cornus canadensis, Gaultheria hispidula, Clintonia borealis, Huperzia lucidula (= Lycopodium lucidulum), Aralia nudicaulis, Tiarella cordifolia*, and *Trillium erectum*. The bryoid layer varies from sparse to locally well-developed, and is typified by *Dicranum* spp. and *Bazzania trilobata*. Feathermosses, including *Hylocomium splendens, Pleurozium schreberi, Ptilium crista-castrensis*, and *Thuidium delicatulum*, are often present but less abundant than in other spruce-fir forest types. The influence of local cold-air drainage creates a micro-climate that favors this coniferous forest at elevations below the norm for montane spruce-fir. Certain high-elevation species such as *Dryopteris campyloptera* and *Sorbus decora* are less abundant here while other lower-elevation species such as *Aralia nudicaulis, Tiarella cordifolia*, and *Trillium erectum* may be more abundant. This association is distinguished from other spruce-fir forest types by the combination of upland soils, low- to mid-elevation setting, absence or low importance of black spruce, and not maritime-influenced.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This spruce-fir forest is widespread on lower-elevation slopes between 244 and 687 m (800-2,254 feet) elevation. It occurs across boreal regions of the northeastern United States and adjacent Canada. Sites range from moderate to steep slopes and ridges with mesic rapidly to well-drained sandy loam or loam soil. The unvegetated surface consists of leaf litter, with very small amounts of large rocks and downed wood. Evidence of disturbance includes past logging.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association occurs throughout the Northern Appalachian project area at elevations ranging from 200 to 750 m (655-2,460 feet) in elevation on low level areas, low to high slopes, ridges and summits on all aspects. Soils are dry to mesic sandy loams often with high organic content.
Global Environment: These red spruce - balsam fir forests are widespread on lower-elevation slopes across boreal regions of the northeastern United States and adjacent Canada. They occur in upland settings, on well-drained tills, and occasionally on kame deposits or eskers. Some areas of poorly drained soils may be present. Most are at elevations of 245-610 m (800-2000 feet). Cold-air drainage allows them to occur in lowlands elevationally below northern hardwood forests; they may be adjacent to wetlands of various types.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy is dominated by *Picea rubens* with variable amounts of *Abies balsamea* and *Betula papyrifera*. *Acer rubrum* and *Betula alleghaniensis* are common subcanopy trees. *Acer pensylvanicum* is common in the shrub layer. Low-elevation

species such as *Aralia nudicaulis, Tiarella cordifolia*, and *Trillium erectum* are abundant. Common herbs in the sampled plots include *Clintonia borealis, Dryopteris intermedia, Trientalis borealis*, and *Trillium undulatum*. High-elevation species such as *Dryopteris campyloptera* and *Sorbus americana* are sparse to absent.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by variably closed-canopy forests dominated by *Picea rubens* and *Abies balsamea*. *Betula papyrifera* is typically present or codominant. Few other canopy associates are present, although *Acer pensylvanicum* may be prominent in the understory on some sites. Understories are low in diversity and are dominated by saplings of canopy species. No shrub species are consistent across sites to consider as typical to the association. Herbaceous cover is sparse to open. No species have high consistency, but may include *Aralia nudicaulis, Coptis trifolia, Cornus canadensis, Dryopteris intermedia, Gaultheria hispidula, Gaultheria procumbens, Maianthemum canadense, Trientalis borealis*, and *Trillium undulatum*. Nonvascular cover of mosses and lichens is often high in excess of 80%.

Global Vegetation: These low-diversity forests have a closed canopy and very sparse shrub and herbaceous layers, except in gaps where regeneration can be dense. The canopy is dominated by *Picea rubens*, with a minor to moderate amount of *Abies balsamea*. Associate canopy species may include *Picea glauca, Picea mariana, Betula alleghaniensis (= Betula lutea), Betula papyrifera*, and minor amounts of *Acer rubrum, Populus tremuloides*, or *Larix laricina*. *Tsuga canadensis* and *Pinus strobus* may be present, but are rarely abundant. The shrub layer is patchy and typically includes *Acer pensylvanicum* and *Viburnum lantanoides (= Viburnum alnifolium)*. Occasional shrubs include *Viburnum nudum var. cassinoides, Nemopanthus mucronatus*, and *Sorbus americana*. The herb layer includes *Oxalis montana (= Oxalis acetosella), Cornus canadensis, Gaultheria hispidula, Clintonia borealis, Huperzia lucidula (= Lycopodium lucidulum), Aralia nudicaulis, Tiarella cordifolia*, and *Trillium erectum*. The bryoid layer varies from sparse to locally well-developed, and is typified by *Dicranum* spp. and *Bazzania trilobata*. Feathermosses, including *Hylocomium splendens, Pleurozium schreberi, Ptilium crista-castrensis*, and *Thuidium delicatulum*, are often present but less abundant than in other spruce-fir forest types. The influence of local cold-air drainage and moist soils creates a micro-climate that favors this coniferous forest at elevations below the norm for montane spruce-fir. Certain high-elevation species such as *Dryopteris campyloptera* and *Sorbus decora* are less abundant here while other lower-elevation species such as *Aralia nudicaulis, Tiarella cordifolia*, and *Trillium erectum* may be more abundant.

Global Dynamics: The influence of local cold-air drainage creates a micro-climate that favors this coniferous forest at elevations below the norm for montane spruce-fir. Certain high-elevation species such as *Dryopteris campyloptera* and *Sorbus decora* are less abundant here while other lower-elevation species such as *Aralia nudicaulis, Tiarella cordifolia*, and *Trillium erectum* may be more abundant.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Picea rubens*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula alleghaniensis*
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer pensylvanicum*
Herb (field)	Flowering forb	*Trientalis borealis*, *Trillium undulatum*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Betula papyrifera*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula alleghaniensis*, *Betula papyrifera*
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer pensylvanicum*
Herb (field)	Flowering forb	*Trientalis borealis*, *Trillium undulatum*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Picea rubens*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Abies balsamea*, *Betula papyrifera*, *Picea rubens*
Global: *Abies balsamea*, *Picea rubens*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest (CEGL006267)
- *Picea rubens - Abies balsamea - Betula* spp. *- Acer rubrum* Forest (CEGL006505)
- *Picea rubens - Abies balsamea / Sorbus americana* Forest (CEGL006128)
- *Picea rubens - Picea glauca* Forest (CEGL006151)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: *Abies balsamea* is absent from this community in the Chateauguay - Notown region of Vermont. Northern Hardwood Forest (CEGL006252) often occurs downslope of this community in Vermont. At the Bridgewater Heights site in Vermont, there is an extraordinary soil profile with very deep OA (50-60 cm) and E horizons. *Betula papyrifera* is dying out of the canopy at this site. At the October Mountain site in Massachusetts, there is abundant *Kalmia latifolia*.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: These forests are often some of the most productive spruce forests, producing trees of extraordinary size; almost all have been logged.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at October Mountain State Forest in Massachusetts and in Vermont at Bear Mountain, Bridgewater Heights, Harmon Hill and Stratton.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is found throughout the Northern Appalachian project area. Known locations include Kinsman Notch and Franconia Notch in New Hampshire and Big Boardman Mountain, Grafton East, Andover East, Saddleback South, Nahmakanta Lake and Baxter State Park in Maine.
Global Range: These red spruce - balsam fir forests are widespread on lower-elevation slopes across boreal regions of the northeastern United States and adjacent Canada.
Nations: CA, US
States/Provinces: MA, ME, NB, NH:S3, NY, QC, VT
TNC Ecoregions: 60:?, 61:P, 63:C, 64:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Dc:CCC, M212Aa:CCC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cc:CCP, M212Cd:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212Ea:CC?, M212Eb:CC?, M212Fa:CCC, M212Fb:CCP
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFWS (Aroostook, Moosehorn, Nulhegan Basin, Pondicherry)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FLSF
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 1 observation point; 1 accuracy assessment point): APPA.0829, APPA.1453, APPA.1692, APPA_AA_2987.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 15 observation points; 19 accuracy assessment points): APPA.0788, APPA.0857, APPA.0860, APPA.1534, APPA.1549, APPA.1550, APPA.1586, APPA.1591, APPA.1605, APPA.1674, APPA.1677, APPA.1683, APPA.1686, APPA.1687,

APPA.1688, APPA.1758, APPA.1759, APPA_AA_1734, APPA_AA_1899, APPA_AA_2047, APPA_AA_2071, APPA_AA_2215, APPA_AA_2220, APPA_AA_2285, APPA_AA_2398, APPA_AA_2449, APPA_AA_2536, APPA_AA_2588, APPA_AA_2606, APPA_AA_2630, APPA_AA_2696, APPA_AA_2730, APPA_AA_2803, APPA_AA_2875, APPA_AA_3117, APPA_AA_3310.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Cogbill 1987, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, Sperduto 1996, Sperduto 2000b, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

[CEGL006505] *Picea rubens - Abies balsamea - Betula* spp. - *Acer rubrum* Forest

Translated Name: **Red Spruce - Balsam Fir - Birch species - Red Maple Forest**
Common Name: **Successional Mixed Spruce - Fir - Hardwood Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Northern Appalachian-Acadian Red Spruce - Fir - Hardwood Forest (G744)
Alliance	*Picea rubens - Abies balsamea* Forest Alliance (A0150)

Element Concept

Global Summary: This association is a mixed forest of northern New England and New York in which the typical spruce and fir are mixed with earlier successional species. This forest occurs at various landscape positions and aspects but in general is more common on gentle to moderate slopes and low flats. Soils are loamy to sandy till and, in general, are deeper than those of pure spruce-fir forests. The canopy is more-or-less closed, and the cover of the lower layers is variable, but rarely extensive. The boreal conifers *Picea rubens* and/or *Abies balsamea* form a mixed canopy with *Acer rubrum* and other trees such as *Populus tremuloides, Populus grandidentata, Betula papyrifera, Thuja occidentalis*, or *Pinus strobus*. Less common associates include *Quercus rubra, Acer saccharum, Betula alleghaniensis, Picea glauca*, or *Prunus serotina*. The subcanopy and shrub layers are composed of *Picea rubens, Abies balsamea*, and *Acer pensylvanicum*. Dwarf-shrubs are usually absent or sparse; *Vaccinium angustifolium* or *Vaccinium myrtilloides* are typical species. The herbaceous layer is dominated by tree seedlings with herbs including *Pteridium aquilinum, Trientalis borealis, Cornus canadensis*, and *Maianthemum canadense*. In wetter spots, *Osmunda cinnamomea* and *Symplocarpus foetidus* (the latter usually only at near-coastal sites) may also be present. The bryophyte layer includes *Bazzania trilobata, Dicranum polysetum, Leucobryum glaucum, Hypnum imponens, Pleurozium schreberi*, and *Sphagnum girgensohnii*. This association has a mixed canopy, in contrast to the ecologically similar *Picea rubens - Abies balsamea - Betula papyrifera* Forest (CEGL006273). It can have relatively deeper soils than *Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest (CEGL006267), and usually lacks any appreciable amount of yellow birch.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This successional mixed spruce-fir-hardwoods forest is found in northern New England and New York. The elevation of sampled sites ranges from 601-798 m (1,972-2,618 feet). Sites range from gentle to steep slopes and summits with mostly western aspects. Soils are mesic, moderately well- to well-drained loam and sandy loam. The unvegetated surface consists of leaf litter, with some downed wood and occasional exposed bedrock. No evidence of disturbance was reported.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This widespread successional forest is found throughout the Northern Appalachian project area at lower elevations ranging from 300 to 750 m (985-2,460 feet) on flat to moderately steep low to high slopes on all aspects. Soils are mesic sandy loam, silt loam and loams and have well-developed organic layers.
Global Environment: This association is a mixed forest of northern New England and New York in which the typical spruce and fir are mixed with earlier successional species. This forest occurs at various landscape positions and aspects but in general is more common on gentle to moderate slopes and low flats. Soils are loamy to sandy till and, in general, are deeper than those of pure spruce-fir forests.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy is made up of *Picea rubens* and/or *Abies balsamea* (>50% total cover) and early-successional trees including *Acer rubrum, Populus tremuloides, Populus grandidentata*, and *Betula papyrifera*, or, less commonly, *Betula populifolia* or *Betula papyrifera var. cordifolia*. *Acer pensylvanicum* is a characteristic shrub. Common herbs include *Uvularia sessilifolia, Maianthemum canadense*, and *Trientalis borealis*. *Dryopteris intermedia* is a common fern.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This highly variable successional forest is characterized by canopies dominated by combinations of *Picea rubens, Abies balsamea, Acer rubrum, Betula alleghaniensis*, and *Betula papyrifera*. *Acer saccharum, Fagus grandifolia, Fraxinus americana, Pinus strobus*, and *Tsuga canadensis* often occur at low cover. It includes young stands dominated by softwoods. The shrub layer mainly consists of sapling of species from the canopy and may be very dense on some sites. Shrub species are inconsistent and occur at low cover, although *Viburnum lantanoides* may dominate some sites. Herbaceous species are inconsistent as well, although some species are locally dominant, including *Aralia nudicaulis, Carex gynandra, Clintonia borealis, Coptis trifolia, Cornus canadensis, Dennstaedtia punctilobula, Dryopteris campyloptera, Dryopteris intermedia, Huperzia lucidula, Maianthemum canadense, Oxalis montana, Pteridium aquilinum, Thelypteris noveboracensis*, and *Uvularia sessilifolia*.
Global Vegetation: The canopy is more-or-less closed, and the cover of the lower layers is variable, but rarely extensive. The boreal conifers *Picea rubens* and/or *Abies balsamea* form a mixed canopy with *Acer rubrum* and other trees such as *Populus tremuloides, Populus grandidentata, Betula papyrifera, Thuja occidentalis*, or *Pinus strobus*. Less common associates include *Quercus rubra, Acer saccharum, Betula alleghaniensis, Picea glauca*, or *Prunus serotina*. The subcanopy and shrub layers are composed of *Picea rubens, Abies balsamea*, and *Acer pensylvanicum*. Dwarf-shrubs are usually absent or sparse; *Vaccinium angustifolium* or *Vaccinium myrtilloides* are typical species. The herbaceous layer is dominated by tree seedlings with herbs including *Pteridium aquilinum, Trientalis borealis, Cornus canadensis*, and *Maianthemum canadense*. In wetter spots, *Osmunda cinnamomea* and *Symplocarpus foetidus* (the latter usually only at near-coastal sites) may also be present. The bryophyte layer includes *Bazzania trilobata, Dicranum polysetum, Leucobryum glaucum, Hypnum imponens, Pleurozium schreberi*, and *Sphagnum girgensohnii*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Abies balsamea*
Tree canopy	Needle-leaved tree	*Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula alleghaniensis*, *Betula papyrifera*
Herb (field)	Flowering forb	*Aralia nudicaulis*, *Maianthemum canadense*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris campyloptera*, *Dryopteris intermedia*, *Pteridium aquilinum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula alleghaniensis*, *Betula papyrifera*
Herb (field)	Flowering forb	*Aralia nudicaulis*, *Maianthemum canadense*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris campyloptera*, *Dryopteris intermedia*, *Pteridium aquilinum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Abies balsamea*, *Acer rubrum*, *Picea rubens*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Abies balsamea*, *Acer rubrum*, *Betula alleghaniensis*, *Betula papyrifera*, *Picea rubens*
Global: *Abies balsamea*, *Acer rubrum*, *Betula alleghaniensis*, *Betula papyrifera*, *Picea rubens*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Epipactis helleborine* (Medium/Low)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (2-Jul-1999).

RELATED CONCEPTS

Global Similar Types:
- *Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest (CEGL006267)
- *Picea rubens - Abies balsamea - Betula papyrifera* Forest (CEGL006273)
- *Picea rubens - Abies balsamea / Sorbus americana* Forest (CEGL006128)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community is most common in the Northern Appalachian project area, but extends south into the Lower New England project area in Massachusetts and Vermont. The community must have a spruce-fir component in the tree layer. It most often occurs in close proximity to Transitional Northern Hardwood - Red Spruce Forest (CEGL006267).
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: This community is similar to Transitional Northern Hardwood - Red Spruce Forest (CEGL006267), but includes early-successional species including *Acer rubrum, Populus tremuloides, Populus grandidentata*, and *Betula papyrifera* and usually lacks any appreciable amount of *Betula alleghaniensis* and *Fagus grandifolia*.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: In northern Maine it's not uncommon to find clearcuts that regenerate to straight spruce-fir. Sometimes this softwood dominance is 'enhanced' by herbicides, but it's often natural. Clearcuts regenerating to straight softwoods tend to occur at either end of the elevation spectrum - at high elevations >610 m (2000 feet), and in low, poorly drained flats. During this project we broadened this type (CEGL006505) to include young stands dominated by softwoods. The UMESC mapping team observed many examples of this community with >75% red spruce; stumps and all.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: The global description is based on data from Acadia National Park. Rangewide information is needed, as this type is suspected to be more common than current state and subsection lists indicate.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Vermont in the vicinity of Quimby Mountain, Stratton Pond and Shrewsbury.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is found throughout the Northern Appalachian project area with known locations from south of Lambert Ridge, east of Quintown, northwest of Mount Cube, east of Wachipauka Pond, Franconia Notch and Mount Hayes in New Hampshire, and East Flagstaff Lake, Black Brook Notch, Grafton West, Andover West, Saddleback South Jones Pond, Joe's Hole, Church Pond and Baxter State Park in Maine.
Global Range: This association is found in northern New England and New York and adjacent Canada.
Nations: CA, US
States/Provinces: ME, NB, NH, NY, QC, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): 212Cb:CCC, M212Ae:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFWS (Aroostook, Carlton Pond?, Moosehorn, Pondicherry)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FXSF
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 observation points, 1 accuracy assessment point): APPA.1518, APPA.1519, APPA.1704, APPA.1724, APPA_AA_3283.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (7 plots; 16 observation points; 38 accuracy assessment points): APPA.0724, APPA.0756, APPA.0765, APPA.0772, APPA.0780, APPA.0985, APPA.1574, APPA.1597, APPA.1604, APPA.1624, APPA.1631, APPA.1641, APPA.1645, APPA.1664, APPA.1679, APPA.1680, APPA.1682, APPA.1684, APPA.1685, APPA.1690, APPA.1760, APPA.1773, APPA.1775, APPA_AA_1830, APPA_AA_1913, APPA_AA_1928, APPA_AA_1954, APPA_AA_2024, APPA_AA_2028, APPA_AA_2118, APPA_AA_2140, APPA_AA_2141, APPA_AA_2152, APPA_AA_2154, APPA_AA_2218, APPA_AA_2283, APPA_AA_2290, APPA_AA_2335, APPA_AA_2542, APPA_AA_2550, APPA_AA_2685, APPA_AA_2748, APPA_AA_2757, APPA_AA_2776, APPA_AA_2780, APPA_AA_2784, APPA_AA_2825, APPA_AA_2829, APPA_AA_2869, APPA_AA_2890, APPA_AA_3050, APPA_AA_3063, APPA_AA_3099, APPA_AA_3186, APPA_AA_3206, APPA_AA_3228, APPA_AA_3254, APPA_AA_3255, APPA_AA_3258, APPA_AA_3343, APPA_AA_3353.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d., Edinger et al. 2002, Gawler 2000, Gawler 2002, Gawler and Cutko 2010, Küchler 1956, Lubinski et al. 2003, Lubinski et al. 2003*, Moore and Taylor 1927, Sperduto and Nichols 2004, Thompson and Sorenson 2000

[CEGL006128] *Picea rubens - Abies balsamea / Sorbus americana* Forest

Translated Name: **Red Spruce - Balsam Fir / American Mountain-ash Forest**
Common Name: **Montane Spruce - Fir Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Northern Appalachian-Acadian Red Spruce - Fir - Hardwood Forest (G744)
Alliance	*Picea rubens - Abies balsamea* Forest Alliance (A0150)

ELEMENT CONCEPT

Global Summary: These are red spruce - balsam fir forests in moist upland environments of the northern Appalachian Mountains, northern Maine, and adjacent Canada, forming the matrix forest of elevations between 670 and 1070 m (2200-3500 feet), patchy at lower and higher elevations. They occur on well-drained, strongly podzolized, nutrient-poor, usually shallow soils in areas where high-elevation clouds and fog or other microsite conditions provide a continuously moist environment. Through much of its range in the Northeast, this forest is strictly montane; however, north of the 45th parallel it occurs in cool lower-elevation settings as well. It occurs on gentle to steep slopes, north-, east- or west-facing. These forests have mostly closed canopies, but gaps from windthrow are common and are rapidly colonized by regenerating tree species. The shrub and herb layers are variable in cover, generally sparse under closed canopies and better developed in gaps. The bryoid layer is well-developed: one of the characteristic features of these forests is the lush carpet of mosses and liverworts. The moderate to low light levels, persistent snowpack and high moisture availability create favorable conditions for mosses and ferns. The canopy is dominated by *Picea rubens* and *Abies balsamea* with associates including *Betula papyrifera var. cordifolia, Betula alleghaniensis*, and *Picea mariana*. Scattered shrubs include *Sorbus americana, Sorbus decora, Amelanchier bartramiana, Nemopanthus mucronatus*, and *Vaccinium myrtilloides*. Particularly characteristic herbs are boreal/montane species such as *Oxalis montana (= Oxalis acetosella), Clintonia borealis, Linnaea borealis, Coptis trifolia (= Coptis groenlandica), Huperzia lucidula, Dryopteris campyloptera*, and *Gaultheria hispidula*. More widespread associated herbs include *Trientalis borealis, Maianthemum canadense, Cornus canadensis*, and the ferns *Dryopteris intermedia* and *Phegopteris connectilis (= Thelypteris phegopteris)*. Bryophytes include *Pleurozium schreberi, Hylocomium splendens, Bazzania trilobata, Dicranum scoparium, Hypnum curvifolium*, and *Ptilium crista-castrensis*. These spruce-fir forests are distinguished from similar types by their montane or higher-latitude upland setting, prevalence of both red spruce and balsam fir in the canopy, and boreal herbs scattered in the lush bryoid layer.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This spruce-fir forest is widespread on lower-elevation slopes between 244 and 687 m (800-2,254 feet). It occurs across boreal regions of the northeastern United States and adjacent Canada. Sampled sites include a moderate northwest-facing shoulder summit with mesic moderately well-drained sandy loam soil and a gentle north-facing slope with somewhat poorly drained silt loam soil. The unvegetated surface consists of leaf litter, with small amounts of large rocks and downed wood. Evidence of disturbance includes wind damage and past logging. At the latter site, the canopy has been blown apart, in part due to windthrow, and there has been spruce decline due to acid precipitation.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is found throughout the Northern Appalachian project area from mid to high elevations ranging from 300 to 950 m (985-3,115 feet) on gentle to steep low to high slopes, ridges and summits, on primarily cooler north, northwest, northeast and east aspects and occasionally south and southeast aspects. Soils are dry to mesic with variable textures often with a high organic content. Unvegetated surfaces are primarily litter and duff.
Global Environment: These are red spruce - balsam fir forests in moist upland environments of the northern Appalachian Mountains, northern Maine, and adjacent Canada, forming the matrix forest of elevations between 670 and 1070 m (2200-3500 feet), patchy at lower and higher elevations. They occur on well-drained, strongly podzolized, nutrient-poor, usually shallow soils in areas where high-elevation clouds and fog or other microsite conditions provide a continuously moist environment. Through much of its range in the Northeast, this forest is strictly montane; however, north of the 45th parallel it occurs in cool lower-elevation settings as well. It occurs on gentle to steep slopes, north-, east- or west-facing.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy is dominated by *Picea rubens* and *Abies balsamea*. High-elevation species such as *Dryopteris campyloptera* and *Sorbus americana* are less abundant here, while other lower-elevation species such as *Aralia nudicaulis, Tiarella cordifolia*, and *Trillium erectum* may be more abundant. *Viburnum lantanoides* is the dominant shrub. Herbs include *Clintonia borealis, Dryopteris campyloptera, Dryopteris intermedia, Huperzia lucidula, Maianthemum canadense*, and *Oxalis montana*.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by closed-canopy evergreen forests dominated by variable mixtures of *Picea rubens* and *Abies balsamea* with *Acer pensylvanicum, Acer spicatum*, and *Sorbus americana* often forming an open to dense subcanopy. *Betula papyrifera var. cordifolia* and *Betula alleghaniensis* are common canopy associates occurring at lower cover. The shrub layer has low diversity and is typically composed of saplings of species from the canopy, although *Viburnum lantanoides* may dominate some sites. The herb layer is patchy and typical species include *Clintonia borealis, Cornus canadensis, Dryopteris campyloptera, Dryopteris intermedia, Maianthemum canadense, Oxalis montana*, and *Trientalis borealis*. Nonvascular moss and lichen species are often a prominent feature of the ground layer and may be in excess of 70% cover.
Global Vegetation: These forests have mostly closed canopies, but gaps from windthrow are common and are rapidly colonized by regenerating tree species. The shrub and herb layers are variable in cover, generally sparse under closed canopies and better developed in gaps. The bryoid layer is well-developed: one of the characteristic features of these forests is the lush carpet of mosses and liverworts. The moderate to low light levels, persistent snowpack and high moisture availability create favorable conditions for mosses and ferns. The canopy is dominated by *Picea rubens* and *Abies balsamea* with associates including *Betula papyrifera var. cordifolia, Betula alleghaniensis*, and *Picea mariana*. Scattered shrubs include *Sorbus americana, Sorbus decora, Amelanchier bartramiana, Nemopanthus mucronatus*, and *Vaccinium myrtilloides*. Particularly characteristic herbs are boreal/montane species such as *Oxalis montana (= Oxalis acetosella), Clintonia borealis, Linnaea borealis, Coptis trifolia (= Coptis groenlandica), Huperzia lucidula, Dryopteris campyloptera*, and *Gaultheria hispidula*. More widespread associated herbs include *Trientalis borealis, Maianthemum canadense, Cornus canadensis*, and the ferns *Dryopteris intermedia* and *Phegopteris connectilis (= Thelypteris phegopteris)*. Bryophytes include *Pleurozium schreberi, Hylocomium splendens, Bazzania trilobata, Dicranum scoparium, Hypnum curvifolium*, and *Ptilium crista-castrensis*.
Global Dynamics: High winds and associated windthrow are probably the dominant disturbance factors. Over time this creates old-growth stands with mixed age classes and abundant decaying woody material. Associated tree species are generally short-lived, disturbance-adapted species which colonize light gaps created by windthrow, extensive blowdowns, or (in some cases) old logging roads.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Shrub/sapling (tall & short)	Needle-leaved tree	*Abies balsamea*
Short shrub/sapling	Broad-leaved deciduous shrub	*Viburnum lantanoides*
Herb (field)	Flowering forb	*Clintonia borealis*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris campyloptera*
Nonvascular	Liverwort/hornwort	*Bazzania trilobata*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum lantanoides*
Herb (field)	Flowering forb	*Clintonia borealis*, *Cornus canadensis*, *Maianthemum canadense*, *Oxalis montana*, *Trientalis borealis*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris campyloptera*, *Dryopteris intermedia*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Shrub/sapling (tall & short)	Needle-leaved tree	*Abies balsamea*
Short shrub/sapling	Broad-leaved deciduous shrub	*Viburnum lantanoides*
Herb (field)	Flowering forb	*Clintonia borealis*, *Maianthemum canadense*, *Oxalis montana*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris campyloptera*
Nonvascular	Liverwort/hornwort	*Bazzania trilobata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Abies balsamea*, *Picea rubens*, *Sorbus americana*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Abies balsamea*, *Maianthemum canadense*, *Oxalis montana*, *Picea rubens*
Global: *Abies balsamea*, *Maianthemum canadense*, *Oxalis montana*, *Picea rubens*, *Sorbus americana*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Carya cordiformis* (G5, ME state-critically imperiled)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest (CEGL006267)
- *Picea rubens - Abies balsamea - Betula papyrifera* Forest (CEGL006273)
- *Picea rubens - Abies balsamea - Betula* spp. - *Acer rubrum* Forest (CEGL006505)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Possible spruce decline due to acid precipitation in Vermont. Canopy blown apart and much windthrow at Styles Peak in Bennington, Vermont.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: The evergreen habit of the dominant trees increases nutrient retention, limits wind desiccation and allows for a slightly longer photosynthetic season than broad-leaved types.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Styles Peak and Sunderland in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known throughout the Northern Appalachian project area with known locations from Mount Moosilauke, Moose Mountain and Wildcat Ridge in New Hampshire and Crocker Mountain, Little Bigelow, Roundtop Mountain, North Pond, White Cap Mountains, Little Swift River Pond Area, Baldpate Mountain, Grafton West, Surplus Pond and Saddleback South in Maine.
Global Range: This red spruce - balsam fir forest occurs in moist upland environments of the northern Appalachian Mountains to northern Maine and adjacent Canada.
Nations: CA, US
States/Provinces: MA, ME:S4, NB, NH, NY:S2S3, QC, VT
TNC Ecoregions: 60:C, 61:C, 63:C
USFS Ecoregions (1994/95): 221A:CC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cb:CCC, M212Cd:CCC, M212Da:CCP, M212Db:CCP, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212Ea:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFS (Green Mountain, White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FMSF
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 2 observation points; 2 accuracy assessment points): APPA.0806, APPA.1520, APPA.1719, APPA_AA_1839, APPA_AA_2171.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (10 plots; 10 observation points; 30 accuracy assessment points): APPA.0192, APPA.0193, APPA.0716, APPA.0719, APPA.0720, APPA.0727, APPA.0735, APPA.0854, APPA.0977, APPA.0988, APPA.1551, APPA.1576, APPA.1577, APPA.1578, APPA.1580, APPA.1582, APPA.1593, APPA.1607, APPA.1608, APPA.1772, APPA_AA_1875, APPA_AA_1898, APPA_AA_2076, APPA_AA_2109, APPA_AA_2112, APPA_AA_2133, APPA_AA_2341, APPA_AA_2346, APPA_AA_2358, APPA_AA_2418, APPA_AA_2437, APPA_AA_2466, APPA_AA_2575, APPA_AA_2598, APPA_AA_2615, APPA_AA_2668, APPA_AA_2710, APPA_AA_2713, APPA_AA_2770, APPA_AA_2794, APPA_AA_2835, APPA_AA_2930, APPA_AA_2991, APPA_AA_3008, APPA_AA_3036, APPA_AA_3087, APPA_AA_3182, APPA_AA_3225, APPA_AA_3289, APPA_AA_3328.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): Northern Appalachian Planning Team
References: CDPNQ unpubl. data, Cogbill 1987, Cogbill and White 1991, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Fincher 1991, Gawler 2002, Gawler and Cutko 2010, Heimburger 1934, Leak and Graber 1974, Leopold et al. 1988, MNAP 1991, Rawinski 1984a, Reschke 1990, Roman 1980, Royte et al. 1996, Sperduto 1996, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006250] *Picea rubens / Ribes glandulosum* Woodland

Translated Name: **Red Spruce / Skunk Currant Woodland**
Common Name: **Red Spruce Talus Slope Woodland**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Northern Appalachian-Acadian Red Spruce - Fir - Hardwood Forest (G744)
Alliance	*Picea rubens - Abies balsamea* Forest Alliance (A0150)

ELEMENT CONCEPT

Global Summary: This association is a red spruce woodland of acidic talus slopes in the Northern Appalachians. The community occurs generally within the spruce-fir forest zone at moderate to high elevations inland, and may occur near sea level along the coast. The substrate varies, even within a site, from cobble to large boulder-sized

talus. There is variable soil development depending on the periodicity and intensity of rockslides, but generally soils are thin and extremely patchy. The tree distribution is likewise patchy: in some areas there may be a partial to almost closed canopy; at most sites these areas are interspersed with patches of nearly open talus. Shrub and herb vegetation is very scattered and sparse. The bryoid layer ranges from sparse to well-developed; bryophytes are mostly desiccation-tolerant species, and crustose lichens may be extensive. The canopy is dominated by *Picea rubens*, in association with *Abies balsamea, Betula papyrifera var. papyrifera, Betula papyrifera var. cordifolia*, and *Betula alleghaniensis*. The tall-shrub cover is composed of *Acer spicatum, Acer pensylvanicum, Sorbus americana*, and *Sorbus decora*. *Ribes glandulosum* is a typical and diagnostic smaller shrub. Low heaths include *Kalmia angustifolia, Vaccinium angustifolium, Vaccinium myrtilloides*, and occasionally *Gaylussacia baccata*. The herbaceous layer is made up of vines and forbs confined to crevices and may include *Parthenocissus quinquefolia, Dryopteris marginalis, Polypodium appalachianum, Polygonum cilinode, Solidago simplex var. randii, Deschampsia flexuosa*, and, occasionally *Juncus trifidus*. The bryoid is made up of *Umbilicaria* spp., *Cladina* spp., *Grimmia* spp., *Ptilidium ciliare, Dicranum polysetum*, and other *Dicranum* spp. Ground cover is talus with variable litter accumulation. This association is differentiated from most other red spruce woodlands (e.g., *Picea rubens / Vaccinium angustifolium / Sibbaldiopsis tridentata* Woodland (CEGL006053)) in its occurrence on talus on steep slopes, and in general has a lower cover of heath shrubs. At some sites, near the base of the talus slope it may grade into *Picea mariana / Ledum groenlandicum - Empetrum nigrum / Cladina* spp. Dwarf-shrubland (CEGL006268); that cold-air talus community has a much more extensive dwarf-shrub layer dominated by *Ledum groenlandicum*.

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This uncommon woodland association is known from elevations ranging from 650 to 900 m (2,130-2,950 feet) on steep to very steep exposed boulder and talus slopes on western and southern aspects. Soils may be purely organic or sandy loam.
Global Environment: This association is a red spruce woodland of acidic talus slopes in the northern Appalachians. The community occurs generally within the spruce-fir forest zone at moderate to high elevations inland, and may occur near sea level along the coast. The substrate varies, even within a site, from cobble to large boulder-sized talus. There is variable soil development depending on the periodicity and intensity of rockslides, but generally soils are thin and extremely patchy.

Vegetation Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association may be forest or woodland in structure and is known from two sites in the Northern Appalachian project area, one of which is dominated *Picea rubens* in the canopy with lesser amounts of *Acer pensylvanicum, Betula alleghaniensis*, and *Abies balsamea*. The understory is entirely herbaceous with patchy cover. Species include *Dryopteris intermedia, Maianthemum canadense, Phegopteris connectilis*, and *Polygonum virginianum*. The other site is dominated by *Betula papyrifera var. cordifolia* with only trace amounts of understory species, including *Juncus trifidus, Rhododendron canadense, Solidago simplex ssp. randii, Spiraea alba var. latifolia*, and *Vaccinium myrtilloides*. Vegetation may be sparse in areas with massive talus blocks.
Global Vegetation: In some areas there may be a partial to almost closed canopy; at most sites these areas are interspersed with patches of nearly open talus. Shrub and herb vegetation is very scattered and sparse. The bryoid layer ranges from sparse to well-developed; bryophytes are mostly desiccation-tolerant species, and crustose lichens may be extensive. The canopy is dominated by *Picea rubens*, in association with *Abies balsamea, Betula papyrifera var. papyrifera, Betula papyrifera var. cordifolia*, and *Betula alleghaniensis*. The tall-shrub cover is composed of *Acer spicatum, Acer pensylvanicum, Sorbus americana*, and *Sorbus decora*. *Ribes glandulosum* is a typical and diagnostic smaller shrub. Low heaths include *Kalmia angustifolia, Vaccinium angustifolium, Vaccinium myrtilloides*, and occasionally *Gaylussacia baccata*. The herbaceous layer is made up of vines and forbs confined to crevices and may include *Parthenocissus quinquefolia, Dryopteris marginalis, Polypodium appalachianum, Polygonum cilinode, Solidago simplex var. randii, Deschampsia flexuosa*, and, occasionally *Juncus trifidus*. The bryoid is made up of *Umbilicaria* spp., *Cladina* spp., *Grimmia* spp., *Ptilidium ciliare, Dicranum polysetum*, and other *Dicranum* spp. Ground cover is talus with variable litter accumulation.

Most Abundant Species

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Betula papyrifera* var. *cordifolia*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Betula papyrifera* var. *cordifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Betula papyrifera* var. *cordifolia*, *Picea rubens*
Global: *Betula papyrifera* var. *cordifolia*, *Picea rubens*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Picea rubens / Kalmia latifolia - Menziesia pilosa* Woodland (CEGL006254)
- *Picea rubens / Ribes glandulosum* Forest (CEGL007128)
- *Picea rubens / Vaccinium angustifolium / Sibbaldiopsis tridentata* Woodland (CEGL006053)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This is a poorly documented association in the Northern Appalachian project area and its overall distribution is unknown. The site that is dominated *Betula papyrifera var. cordifolia* was placed here for a lack of better attribution and evidence to support a new association.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Zealand Notch in New Hampshire and Saddleback Mountain in Maine.
Global Range: This association is found on acidic talus slopes in the northern Appalachians.
Nations: CA, US
States/Provinces: MA, ME, NB, NH:S3, NY, QC, VT:S3
TNC Ecoregions: 63:C, 64:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, M212Aa:CCC, M212Ab:CCP, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cd:CCC, M212De:CCC, M212Df:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WSTS
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 25 accuracy assessment points): APPA.0413, APPA.0703, APPA_AA_1756, APPA_AA_1788, APPA_AA_1915, APPA_AA_2057, APPA_AA_2103, APPA_AA_2135, APPA_AA_2161, APPA_AA_2193, APPA_AA_2301, APPA_AA_2399, APPA_AA_2429, APPA_AA_2510, APPA_AA_2622, APPA_AA_2634, APPA_AA_2681, APPA_AA_2738, APPA_AA_2752, APPA_AA_2821, APPA_AA_2914, APPA_AA_2982, APPA_AA_3029, APPA_AA_3052, APPA_AA_3092, APPA_AA_3127, APPA_AA_3354.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2000, Gawler 2002, Gawler and Cutko 2010, Hunt 1999, Lubinski et al. 2003, Rawinski 1984a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

A3314 *Picea rubens / Vaccinium angustifolium* Northern Rocky Woodland Alliance

Alliance Summary Description: These are evergreen woodlands dominated by *Picea rubens* that occur in the Northern Appalachian and Acadian regions of the northeastern U.S. and Atlantic Canada on acidic bedrock or talus at high elevations. *Picea mariana* may occasionally be the dominant instead of *Picea rubens*. In the northern part of the range, associated canopy trees include *Abies balsamea, Betula papyrifera var. papyrifera*, and *Betula papyrifera var. cordifolia*. Shrubs include *Acer spicatum, Gaylussacia baccata, Ribes glandulosum, Sorbus americana, Vaccinium angustifolium*, and *Vaccinium myrtilloides*; typical herbs are *Clintonia borealis, Juncus trifidus, Piptatherum pungens (= Oryzopsis pungens), Sibbaldiopsis tridentata*, and *Solidago simplex var. randii*. These woodlands are often stunted and grade into montane shrublands. Stands occur either on steep, seepy boulderfields, on ridges and steep slopes with northeast to southwest exposures, above 1370 m (4500 feet) elevation, or at lower elevations on cold, clayey or rocky soils. Soils are shallow, often only a thin layer of duff overlying bedrock.

[CEGL006053] *Picea rubens / Vaccinium angustifolium / Sibbaldiopsis tridentata* Woodland

Translated Name: **Red Spruce / Lowbush Blueberry / Shrubby Fivefingers Woodland**
Common Name: **Northern Appalachian Red Spruce Rocky Ridge**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Northern Appalachian-Acadian Red Spruce - Fir - Hardwood Forest (G744)
Alliance	*Picea rubens / Vaccinium angustifolium* Northern Rocky Woodland Alliance (A3314)

Element Concept

Global Summary: This red spruce woodland of the Northern Appalachians occurs primarily on acidic bedrock outcrops or summits. Soil development is restricted to crevices or sheltered areas interspersed with significant amounts of exposed bedrock. What soils are present are shallow, well-drained to excessively drained, acidic, coarse sands. Elevations of known examples range from near sea level at the coast to 305-760 m (1000-2500 feet) inland. The canopy is patchy and open, with areas of moderate canopy cover interspersed with areas of sparse vegetation and much open rock. Taken over a large area, woodland structure (25-60% canopy cover) is evident. Tall shrubs and herb are sparse. The dwarf-shrub layer is of variable cover, and may be locally extensive, as may bryoids. Canopy trees are primarily *Picea rubens* and *Abies balsamea*, with *Pinus strobus* occasionally codominant. Associated tree species include *Betula papyrifera var. papyrifera, Betula papyrifera var. cordifolia, Pinus rigida, Thuja occidentalis*, and *Picea mariana*. Typical tall shrubs are *Sorbus americana, Sorbus decora, Viburnum nudum var. cassinoides, Nemopanthus mucronatus, Photinia melanocarpa (= Aronia melanocarpa)*, or *Amelanchier* spp. *Morella pensylvanica (= Myrica pensylvanica)* and *Picea glauca* may be present in this community near the seacoast. The low heath layer is made up of *Vaccinium angustifolium, Vaccinium myrtilloides, Gaylussacia baccata*, and *Kalmia angustifolia*. Forbs and graminoids include *Deschampsia flexuosa, Danthonia spicata, Piptatherum pungens (= Oryzopsis pungens), Sibbaldiopsis tridentata, Solidago simplex var. randii*, and *Maianthemum canadense*. Bryoids include *Cladina* spp., *Pleurozium schreberi, Dicranum polysetum, Polytrichum juniperinum, Polytrichum piliferum*, and *Polytrichum commune*. Ground cover is sparse needle litter and exposed bedrock. This association occurs on bedrock ridges and outcrops, compared to the floristically similar *Picea rubens / Ribes glandulosum* Woodland (CEGL006250), which occurs on talus.

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This woodland association is known from 305 to 880 m (1,000-2,887 feet) in elevation on moderate to very steep exposed bedrock outcrops and summits on south, southeast and west aspects. Substrates are very dry to mesic. Soils are poorly developed and may be entirely organic or sandy loam.
Global Environment: This red spruce woodland of the Northern Appalachians occurs primarily on acidic bedrock outcrops or summits. Soil development is restricted to crevices or sheltered areas interspersed with significant amounts of exposed bedrock. What soils are present are shallow, well-drained to excessively drained, acidic, coarse sands. Elevations of known examples range from near sea level at the coast to 305-760 m (1000-2500 feet) inland.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by woodlands with canopies dominated by *Picea rubens* often in association with lesser amounts of *Abies balsamea*, both species regenerating vigorously in the understory, often with *Betula papyrifera var. cordifolia, Acer rubrum*, and *Tsuga canadensis*. Shrub and herbaceous species are patchy. Shrub cover ranges from sparse to open and may include *Kalmia angustifolia, Nemopanthus mucronatus, Vaccinium angustifolium*, and *Vaccinium myrtilloides*. Herbaceous cover is sparse with no species exhibiting substantial cover or consistency. Nonvascular cover of moss and lichen species may be in excess of 70%.

Global Vegetation: The canopy is patchy and open, with areas of moderate canopy cover interspersed with areas of sparse vegetation and much open rock. Taken over a large area, woodland structure (25-60% canopy cover) is evident. Tall shrubs and herb are sparse. The dwarf-shrub layer is of variable cover, and may be locally extensive, as may bryoids. Canopy trees are primarily *Picea rubens* and *Abies balsamea*, with *Pinus strobus* occasionally codominant. Associated tree species include *Betula papyrifera var. papyrifera, Betula papyrifera var. cordifolia, Pinus rigida, Thuja occidentalis*, and *Picea mariana*. Typical tall shrubs are *Sorbus americana, Sorbus decora, Viburnum nudum var. cassinoides, Nemopanthus mucronatus, Photinia melanocarpa (= Aronia melanocarpa)*, or *Amelanchier* spp. *Morella pensylvanica (= Myrica pensylvanica)* and *Picea glauca* may be present in this community near the seacoast. The low heath layer is made up of *Vaccinium angustifolium, Vaccinium myrtilloides, Gaylussacia baccata*, and *Kalmia angustifolia*. Forbs and graminoids include *Deschampsia flexuosa, Danthonia spicata, Piptatherum pungens (= Oryzopsis pungens), Sibbaldiopsis tridentata, Solidago simplex var. randii*, and *Maianthemum canadense*. Bryoids include *Cladina* spp., *Pleurozium schreberi, Dicranum polysetum, Polytrichum juniperinum, Polytrichum piliferum*, and *Polytrichum commune*. Ground cover is sparse needle litter and exposed bedrock.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium angustifolium*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia angustifolia*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium angustifolium*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia angustifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Kalmia angustifolia*, *Picea rubens*, *Vaccinium angustifolium*

Global: *Kalmia angustifolia*, *Picea rubens*, *Vaccinium angustifolium*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Mar-2010). This community has a reasonably wide geographic distribution and ecological amplitude. Some occurrences are subject to degradation from recreation or hilltop development.

RELATED CONCEPTS

Global Similar Types:

- *Picea rubens / Kalmia latifolia - Menziesia pilosa* Woodland (CEGL006254)
- *Picea rubens / Ribes glandulosum* Woodland (CEGL006250)

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is scattered throughout the Northern Appalachian project area with known locations from Mount Cube and Mount Hayes in New Hampshire and Grafton West and Big Wilson Stream in Maine.
Global Range: This red spruce woodland occurs primarily on acidic bedrock outcrops or summits of the Northern Appalachians and ranges from New Brunswick, Canada, to Pennsylvania.
Nations: CA, US
States/Provinces: MA?, ME:S4, NB, NH, NS?, NY, PA, QC, VT
TNC Ecoregions: 60:C, 61:C, 63:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCP, 212Dc:CCC, 212Fa:CCC, M212Aa:CCP, M212Ab:CCP, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cd:CCC, M212Dc:CCC, M212Dd:CCP, M212De:CCC, M212Df:CCC, M212Ea:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians]); USFS (White Mountain); USFWS (Moosehorn)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WSFR
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 3 observation points; 27 accuracy assessment points): APPA.0768, APPA.0769, APPA.1581, APPA.1652, APPA.1774, APPA_AA_1649, APPA_AA_1714, APPA_AA_1754, APPA_AA_1793, APPA_AA_2004, APPA_AA_2185, APPA_AA_2345, APPA_AA_2382, APPA_AA_2483, APPA_AA_2493, APPA_AA_2499, APPA_AA_2507, APPA_AA_2552, APPA_AA_2644, APPA_AA_2670, APPA_AA_2828, APPA_AA_2864, APPA_AA_2888, APPA_AA_2950, APPA_AA_2966, APPA_AA_3062, APPA_AA_3153, APPA_AA_3170, APPA_AA_3195, APPA_AA_3233, APPA_AA_3266, APPA_AA_3274.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Hunt 1999, Lubinski et al. 2003, NAP pers. comm. 1998, Rawinski 1984a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

M159. Laurentian-Acadian Pine - Hardwood Forest & Woodland

G025. LAURENTIAN-ACADIAN PINE - OAK FOREST & WOODLAND

Group Summary Description: These dry-mesic to xeric pine forests are found across the northern Great Lakes and east to northern New England and Quebec. Typical occurrences are on coarse glacial deposits of sandy or loamy soils. Fire is an important natural disturbance. Stands are characterized by a pine overstory forming a patchy or continuous canopy, and a variable understory. A combination of *Pinus strobus, Pinus banksiana* (mostly in the Great Lakes region), and *Pinus resinosa* typically are the diagnostic overstory species. Hardwoods such as *Acer rubrum, Betula papyrifera, Populus grandidentata, Populus tremuloides, Quercus ellipsoidalis* (in the Great Lakes region), and *Quercus rubra* sometimes form a subcanopy; or *Quercus rubra* in particular may occasionally be an important canopy associate. The understory ranges from moderately herb- and shrub-rich to extremely poor. In the tall-shrub layer, the important species are *Amelanchier* spp. and *Corylus cornuta*. In the low-shrub layer, *Vaccinium angustifolium, Vaccinium myrtilloides, Diervilla lonicera, Gaultheria procumbens*, and *Linnaea borealis* are locally important. The herbaceous layer is variable, sometimes poorly developed and with more prominent cover of feathermosses and lichens, in other cases with an open herb layer, including *Aralia nudicaulis, Clintonia borealis, Cornus canadensis, Eurybia macrophylla, Maianthemum canadense, Pteridium aquilinum, Oryzopsis asperifolia, Streptopus lanceolatus (= Streptopus roseus)*, and *Trientalis borealis*.

A3238 *Pinus banksiana - Pinus resinosa - Quercus ellipsoidalis* Forest & Woodland Alliance

Alliance Summary Description: This alliance, found in New England and the Great Lakes region in the United States, as well as eastern temperate Canada, contains rocky or sandy pine barrens and woodlands on dry or shallow soils over bedrock or sandy outwash plains. It is typified by forests and woodlands dominated by *Pinus banksiana, Pinus resinosa*, and/or *Quercus ellipsoidalis*. Understory composition varies from heath-dominated to a mixture of graminoids, open rocky areas with lichens, and scrub oak. Stands are often fire-maintained.

[CEGL006041] *Pinus banksiana / Kalmia angustifolia - Vaccinium* spp. Woodland

Translated Name: **Jack Pine / Sheep Laurel - Blueberry species Woodland**
Common Name: **Jack Pine Heath Barrens**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Pine - Hardwood Forest & Woodland (M159)
Group	Laurentian-Acadian Pine - Oak Forest & Woodland (G025)
Alliance	*Pinus banksiana - Pinus resinosa - Quercus ellipsoidalis* Forest & Woodland Alliance (A3238)

Element Concept

Global Summary: The jack pine woodland of northern New England and the Canadian maritime provinces occurs sporadically on dry rocky summits, ridges, outcrops and lakeshores. Soil development is typically restricted to crevices or sheltered patches among the predominant exposed bedrock. Where they occur, soils are shallow, well-drained to excessively drained, dry, acidic, coarse sands. Elevations of known examples range from near sea level to 1220 m (4000 feet). The dominant vegetation features are the patchy and open canopy and the extensive dwarf-shrub layer. Tall shrubs and herbs are sparse. The bryoid layer often features large areas of reindeer lichens and drought-tolerant mosses. The ground cover is sparse needle litter and exposed bedrock. In the canopy, which ranges from 25-60% cover, *Pinus banksiana* is dominant. Less abundant conifers may include *Picea rubens, Picea mariana* (at coastal sites), *Pinus strobus*, or *Abies balsamea*. *Betula papyrifera var. papyrifera* and *Betula papyrifera var. cordifolia* may be present, but the deciduous canopy component is minor. Tall shrubs include *Sorbus americana, Viburnum nudum var. cassinoides, Nemopanthus mucronatus, Photinia melanocarpa (= Aronia melanocarpa)*, or *Amelanchier* spp. The low heath layer is composed of *Vaccinium angustifolium, Vaccinium myrtilloides, Gaylussacia baccata, Kalmia angustifolia*, and, near the coast, *Empetrum nigrum* and *Vaccinium vitis-idaea*. Forbs and graminoids include *Deschampsia flexuosa, Danthonia spicata, Sibbaldiopsis tridentata, Cornus canadensis, Trientalis borealis, Solidago simplex var. randii*, and *Maianthemum canadense*. The bryophyte layer is dominated by lichens such as *Cladina stellaris (= Cladonia alpestris), Cladina rangiferina (= Cladonia rangiferina), Rhizocarpon geographicum*, and *Umbilicaria* spp. Mosses include *Pleurozium schreberi, Polytrichum juniperinum*, and *Polytrichum piliferum*. This association is distinguished from more boreal jack pine woodlands (*Pinus banksiana - (Picea mariana, Pinus strobus) / Vaccinium* spp. Rocky Woodland (CEGL002483)) by the lack or low importance of *Picea mariana* (in this type, only rarely present in extreme coastal occurrences), from midwestern jack pine pavement barrens (*Pinus banksiana / Photinia melanocarpa / Xanthoparmelia* spp. Woodland (CEGL005045)) by its occurrence on igneous bedrock, and from midwestern jack pine-oak woodlands (*Pinus banksiana - (Pinus resinosa) - Quercus ellipsoidalis / Carex pensylvanica* Forest (CEGL002478)) by its bedrock, rather than sand plain, substrate. Its distinction from the Great Lakes *Pinus banksiana / Cladina* spp. Rock Outcrop Vegetation (CEGL002491) is based primarily on geography.

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This Jack pine community occurs at mid to high elevation of 550 to 1,190 m (1,800-3,900 feet) on mountain ridges.
Global Environment: The jack pine woodland of northern New England and the Canadian maritime provinces occurs sporadically on dry rocky summits, ridges, outcrops and lakeshores. Soil development is typically restricted to crevices or sheltered patches among the predominant exposed bedrock. Where they occur, soils are shallow, well-drained to excessively drained, dry, acidic, coarse sands. Elevations of known examples range from near sea level to 4000 feet.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: *Pinus banksiana* is dominant.
Global Vegetation: The dominant vegetation features are the patchy and open canopy and the extensive dwarf-shrub layer. Tall shrubs and herbs are sparse. The bryoid layer often features large areas of reindeer lichens and drought-tolerant mosses. The ground cover is sparse needle litter and exposed bedrock. In the canopy, which ranges from 25-60% cover, *Pinus banksiana* is dominant. Less abundant conifers may include *Picea rubens, Picea mariana* (at coastal sites), *Pinus strobus*, or *Abies balsamea*. *Betula papyrifera var. papyrifera* and *Betula papyrifera var. cordifolia* may be present, but the deciduous canopy component is minor. Tall shrubs include *Sorbus americana, Viburnum nudum var. cassinoides, Nemopanthus mucronatus, Photinia melanocarpa (= Aronia melanocarpa)*, or *Amelanchier* spp. The low heath layer is composed of *Vaccinium angustifolium, Vaccinium myrtilloides, Gaylussacia baccata, Kalmia angustifolia*, and, near the coast, *Empetrum nigrum* and *Vaccinium vitis-idaea*. Forbs and graminoids include *Deschampsia flexuosa, Danthonia spicata, Sibbaldiopsis tridentata, Cornus canadensis, Trientalis borealis, Solidago simplex var. randii*, and *Maianthemum canadense*. The bryophyte layer is dominated by lichens such as *Cladina stellaris (= Cladonia alpestris), Cladina rangiferina (= Cladonia rangiferina), Rhizocarpon geographicum*, and *Umbilicaria* spp. Mosses include *Pleurozium schreberi, Polytrichum juniperinum*, and *Polytrichum piliferum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus banksiana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Pinus banksiana*
Global:

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Pinus banksiana / Cladina* spp. Rock Outcrop Vegetation (CEGL002491)
- *Pinus banksiana / Photinia melanocarpa / Xanthoparmelia* spp. Woodland (CEGL005045)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This community occurs in the White Mountains of New Hampshire and was observed at Crawford Notch, New Hampshire.
Global Range: This jack pine woodland community occurs in northern New England and the Canadian maritime provinces.
Nations: CA, US
States/Provinces: ME:S3, NB, NH:S1, NS?, NY, PE?, QC:S3?
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): 212A:CP, 212B:CP, 212Ca:CCP, 212Cb:CCC, 212D:CC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCP, M212Ag:CCC, M212B:CP
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WJPR
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 accuracy assessment points): APPA_AA_1752, APPA_AA_3159.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): E. Largay and M. Russo

Global Description Author(s): S.C. Gawler
References: Baldwin 1961, Baldwin 1979, CDPNQ unpubl. data, Clayden and Bouchard 1983, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, Sperduto 2000a, Sperduto and Nichols 2004

A4127 *Pinus strobus - Pinus resinosa - Quercus rubra* Forest & Woodland Alliance

Alliance Summary Description: This alliance contains pine-dominated and mixed pine-oak forests and woodlands found in the upper Midwest and New England of the United States, and in eastern temperate Canada. Most examples are dominated by *Pinus strobus* or *Pinus resinosa*. Hardwood species such as *Quercus alba, Quercus rubra*, or *Populus tremuloides* are common associates and may be locally dominant in some areas. The shrub and understory layers vary from sparse to moderately dense. Some typical shrubs include *Acer spicatum, Cornus* spp., *Corylus cornuta, Kalmia latifolia*, and *Vaccinium* spp. Common herbaceous species include *Aralia nudicaulis, Eurybia macrophylla (= Aster macrophyllus), Gaultheria procumbens*, and *Maianthemum canadense*. Stands typically occur on mostly mesic and dry-mesic sites within glaciated landscapes. Soils are typically acidic and range from shallow to moderately deep. Fire and logging can heavily impact examples of this alliance.

[CEGL006253] *Pinus strobus - Pinus resinosa / Cornus canadensis* Forest

Translated Name: **Eastern White Pine - Red Pine / Bunchberry Dogwood Forest**
Common Name: **White Pine - Red Pine Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Pine - Hardwood Forest & Woodland (M159)
Group	Laurentian-Acadian Pine - Oak Forest & Woodland (G025)
Alliance	*Pinus strobus - Pinus resinosa - Quercus rubra* Forest & Woodland Alliance (A4127)

Element Concept

Global Summary: This dry pine forest is scattered across northern New England, New York, and adjacent Canada on very well-drained, coarse-textured, acidic soils. Substrates include sand and gravel deposits on flats, such as outwash sands, delta sands, eskers, kames, kame terraces, and dry lake sands. They also occur on upper hillslopes and low ridges, with shallow-to-bedrock soils. The canopy closure is usually 70-90%; shrubs are sparse, and the herb and bryoid layers are patchy, with overall cover generally well under 20% and often virtually absent. Needle accumulation and dry conditions are factors in the limited understory growth. The canopy is dominated by *Pinus strobus* and *Pinus resinosa*, with scattered minor associates including *Quercus rubra, Betula alleghaniensis, Abies balsamea, Picea rubens, Thuja occidentalis* (near the coast), and *Acer rubrum*. Shrubs include *Kalmia angustifolia, Viburnum nudum var. cassinoides (= Viburnum cassinoides), Vaccinium angustifolium, Vaccinium myrtilloides, Gaylussacia baccata, Amelanchier canadensis*, and *Acer pensylvanicum*. Characteristic herbs include *Pteridium aquilinum, Oryzopsis asperifolia, Mitchella repens, Maianthemum canadense, Gaultheria procumbens, Cornus canadensis, Trientalis borealis*, and *Clintonia borealis*. Where mosses occur, typical species include *Dicranum polysetum, Dicranum undulatum, Polytrichum juniperinum, Pleurozium schreberi*, and *Brachythecium* spp. This community probably requires periodic fires for maintenance.

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This dry pine forest is scattered across northern New England, New York, and adjacent Canada on very well-drained, coarse-textured, acidic soils. Substrates include sand and gravel deposits on flats, such as outwash sands, delta sands, eskers, kames, kame terraces, and dry lake sands. Stands also occur on upper hillslopes and low ridges, with shallow-to-bedrock soils.
Global Environment: This dry pine forest is scattered across northern New England, New York, and adjacent Canada on very well-drained, coarse-textured, acidic soils. Substrates include sand and gravel deposits on flats, such as outwash sands, delta sands, eskers, kames, kame terraces, and dry lake sands. They also occur on upper hillslopes and low ridges, with shallow-to-bedrock soils.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The canopy closure is usually 70-90%; shrubs are sparse, and the herb and bryoid layers are patchy, with overall cover generally well under 20% and often virtually absent. Needle accumulation and dry conditions are factors in the limited understory growth. The canopy is dominated by *Pinus strobus* and *Pinus resinosa*, with scattered minor associates, including *Quercus rubra, Betula alleghaniensis, Abies balsamea, Picea rubens, Thuja occidentalis* (near the coast), and *Acer rubrum*. Shrubs include *Kalmia angustifolia, Viburnum nudum var. cassinoides (= Viburnum cassinoides), Vaccinium angustifolium, Vaccinium myrtilloides, Gaylussacia baccata, Amelanchier canadensis*, and *Acer pensylvanicum*. Characteristic herbs include *Pteridium aquilinum, Oryzopsis asperifolia, Mitchella repens, Maianthemum canadense, Gaultheria procumbens, Cornus canadensis, Trientalis borealis*, and *Clintonia borealis*. Where mosses occur, typical species include *Dicranum polysetum, Dicranum undulatum, Polytrichum juniperinum, Pleurozium schreberi*, and *Brachythecium* spp.
Global Vegetation: The canopy closure is usually 70-90%; shrubs are sparse, and the herb and bryoid layers are patchy, with overall cover generally well under 20% and often virtually absent. Needle accumulation and dry conditions are factors in the limited understory growth. The canopy is dominated by *Pinus strobus* and *Pinus resinosa*, with scattered minor associates including *Quercus rubra, Betula alleghaniensis, Abies balsamea, Picea rubens, Thuja occidentalis* (near the coast), and *Acer rubrum*. Shrubs include *Kalmia angustifolia, Viburnum nudum var. cassinoides (= Viburnum cassinoides), Vaccinium angustifolium, Vaccinium myrtilloides, Gaylussacia baccata, Amelanchier canadensis*, and *Acer pensylvanicum*. Characteristic herbs include *Pteridium aquilinum, Oryzopsis asperifolia, Mitchella repens, Maianthemum canadense, Gaultheria procumbens, Cornus canadensis, Trientalis borealis*, and *Clintonia borealis*. Where mosses occur, typical species include *Dicranum polysetum, Dicranum undulatum, Polytrichum juniperinum, Pleurozium schreberi*, and *Brachythecium* spp.
Global Dynamics: This community probably requires periodic fires for maintenance.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus resinosa*, *Pinus strobus*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus resinosa*, *Pinus strobus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Pinus resinosa*, *Pinus strobus*
Global: *Pinus resinosa*, *Pinus strobus*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Pinus resinosa / Gaylussacia baccata - Vaccinium angustifolium* Woodland (CEGL006010)
- *Pinus strobus - Pinus resinosa - Pinus rigida* Forest (CEGL006259)
- *Pinus strobus - Tsuga canadensis - Picea rubens* Forest (CEGL006324)
- *Pinus strobus / Acer spicatum - Corylus cornuta* Forest (CEGL002445)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This community was observed in southern New Hampshire and northern Maine by the UMESC mapping team.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: This association is less mesic and more dependent on fire when compared to *Pinus strobus - Tsuga canadensis - Picea rubens* Forest (CEGL006324) and occurs farther north in a cooler climate than do mixed pine - oak forests or pitch pine woodland communities. *Picea rubens, Viburnum nudum var.*

cassinoides, Betula papyrifera, and *Vaccinium myrtilloides* differentiate this community from dry pine forests at lower latitudes. The nearly closed canopy and lack of a well-developed heath shrub layer distinguishes it from red pine woodlands, *Pinus resinosa / Gaylussacia baccata - Vaccinium angustifolium* Woodland (CEGL006010).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This community was observed in southern New Hampshire and northern Maine by the UMESC mapping team.
Global Range: This dry pine forest occurs in northern New England and adjacent Canada.
Nations: CA, US
States/Provinces: ME, NB, NH:S3, NS?, NY, QC:S4, VT
TNC Ecoregions: 60:?, 61:C, 63:C
USFS Ecoregions (1994/95): 212Ba:CPP, 212Bb:CPP, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 221Ae:CCC, 221Af:CCP, 221Al:CCC, M212Ab:CCC, M212Ac:CCC, M212Ae:CCC, M212Ag:CCC, M212Ba:CCC, M212Cb:CCC, M212Cc:CCC, M212D:CC, M212Ea:CCP
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FRWP
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (17 accuracy assessment points): APPA_AA_1631, APPA_AA_1637, APPA_AA_1668, APPA_AA_1742, APPA_AA_1864, APPA_AA_1991, APPA_AA_2001, APPA_AA_2062, APPA_AA_2105, APPA_AA_2146, APPA_AA_2147, APPA_AA_2158, APPA_AA_2775, APPA_AA_2814, APPA_AA_3064, APPA_AA_3265, APPA_AA_3296.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Curtis 1959, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, Heimburger 1934, Küchler 1956, Lubinski et al. 2003, Lundgren 1999a, Moore and Taylor 1927, Reschke 1990, Roman 1980, Sperduto 1994, Sperduto 2000a, Sperduto 2000b, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

M016. Southern & South-Central Oak - Pine Forest & Woodland

G601. CHINQUAPIN OAK - SHUMARD OAK - BLUE ASH ALKALINE FOREST & WOODLAND

Group Summary Description: This group encompasses relatively dry calcareous forests and woodlands of temperate eastern North America, especially the unglaciated forest region of the south-central United States, in which various combinations of *Fraxinus quadrangulata, Juniperus virginiana, Quercus muehlenbergii*, and/or *Quercus shumardii* are characteristic. Examples can occur on a variety of topographic and landscape positions, including ridgetops and upper and midslopes, or rarely on the Atlantic Coastal Plain where erosion has exposed Tertiary-aged shell deposits or limesands. Droughts, fires, soil depth, and/or topographic position can determine the relative mixture of deciduous hardwood versus evergreen trees. In the Southern Ridge and Valley region, the Central Basin of Tennessee, the escarpment of the Cumberland Plateau and other related areas, these forests may cover large areas; elsewhere, they occur as relatively small inclusions within a forest matrix of other oak and pine species.

A3274 *Fraxinus americana - Carya glabra - Juniperus virginiana* Piedmont-Appalachian Woodland Alliance

Alliance Summary Description: This alliance encompasses a variety of woodlands found in the upper Piedmont of Georgia, North Carolina, and Virginia, as well as in the adjacent Southern Blue Ridge that have *Carya glabra, Fraxinus americana*, and/or *Quercus* species (e.g., *Quercus alba, Quercus stellata*) as typical canopy dominants, although *Juniperus virginiana* may have significant coverage in some associations. Other minor canopy species vary with geography, but may include *Carya ovata, Carya pallida, Pinus virginiana, Quercus rubra var. rubra*, and *Ulmus alata*. Subcanopy and shrub species are variable among associations, but can include *Amelanchier sanguinea, Ceanothus americanus, Celtis tenuifolia, Cercis canadensis, Chionanthus virginicus, Crataegus* sp., *Hypericum prolificum, Juniperus virginiana var. virginiana, Lonicera flava, Ostrya virginiana, Philadelphus hirsutus, Physocarpus opulifolius, Ptelea trifoliata, Rhus aromatica var. aromatica, Rhus typhina, Rosa carolina, Spiraea betulifolia var. corymbosa, Symphoricarpos orbiculatus, Toxicodendron radicans, Vaccinium arboreum, Vaccinium*

pallidum, Vaccinium stamineum, Viburnum rafinesquianum (= var. rafinesquianum), and *Viburnum rufidulum*. Herbaceous species also vary among associations. Examples are often a physiognomic complex of woodland, grassland, and rock outcrops, often associated with granitic domes or rocky summits. Soils are circumneutral and derived from such base-rich rocks as greenstone, plagioclase-rich granite, hornblende gneiss, amphibole gneiss, limestones, or calcareous shales. Some associations have a nearly closed or locally closed canopy, and could in some cases as readily be considered forests, while others have an edaphically-maintained woodland physiognomy. Canopy closure is probably also dependent on natural disturbances (fire, ice and wind storms) as well as management and edaphic factors.

[CEGL003752] *Carya (glabra, alba) - Fraxinus americana - (Juniperus virginiana var. virginiana)* Woodland

Translated Name: **(Pignut Hickory, Mockernut Hickory) - White Ash - (Eastern Red-cedar) Woodland**
Common Name: **Montane Basic Hardwood - Red-cedar Woodland**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Chinquapin Oak - Shumard Oak - Blue Ash Alkaline Forest & Woodland (G601)
Alliance	*Fraxinus americana - Carya glabra - Juniperus virginiana* Piedmont-Appalachian Woodland Alliance (A3274)

Element Concept

Global Summary: These montane woodlands of the Southern Blue Ridge are currently known from the lower mountains of North Carolina and Georgia, at 750-1150 m (2500-3800 feet) elevation, on sites with biotite gneiss geology with veins of base-rich hornblende gneiss. They have open and stunted canopies (3-8 m tall), with or without gnarly *Juniperus virginiana var. virginiana* and various deciduous species, typically *Carya glabra, Fraxinus americana, Quercus prinus, Ostrya virginiana*, and *Chionanthus virginicus*. Occasionally, *Pinus virginiana* may be a component of the canopy mix. Occurrences are often physiognomic complexes of woodland, grassland, and rock outcropping, and are often associated with southern or eastern exposures on granitic domes or rocky summits. Some occurrences lack *Juniperus virginiana* but retain the same suite of species that are indicative of high base status rock. Shrubs are scattered or locally abundant and may include *Ptelea trifoliata, Physocarpus opulifolius, Hypericum prolificum, Vaccinium stamineum, Vaccinium pallidum, Lonicera flava, Amelanchier sanguinea*, and *Rosa carolina*. A dense, grassy herb layer can occur beneath the canopy or in open areas, interspersed with bare rock. Typical dominants include *Carex pensylvanica, Dichanthelium scoparium, Danthonia compressa, Danthonia sericea, Andropogon gyrans, Andropogon ternarius, Andropogon gerardii, Sorghastrum nutans, Schizachyrium scoparium var. scoparium, Aristida purpurascens*, and *Melica mutica*. Other herbaceous species can include *Dodecatheon meadia, Solidago nemoralis, Pycnanthemum curvipes, Pycnanthemum montanum, Hypericum punctatum, Hypericum gentianoides, Desmodium rotundifolium, Antennaria virginica, Piptochaetium avenaceum, Packera millefolia (= Senecio millefolium), Helianthus microcephalus, Claytonia virginica, Coreopsis major*, and *Coreopsis pubescens*. The steepest areas may have patches of *Sedum glaucophyllum, Houstonia longifolia*, and *Saxifraga michauxii*.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This middle- to lower-elevation hickory woodland generally occurs below 1,220 m (4,000 feet) elevation (but rarely up to 1,340 m [4,400 feet]). It is associated with mafic biotite gneiss geology with veins of base-rich hornblende gneiss. Sites are steep upper slopes and ridgetops (including bedrock outcrops) with southern and eastern aspects. Soils are dry to xeric well-drained sandy loam. The unvegetated surface is a mix of leaf litter, downed wood, exposed bedrock, large and small rocks, and bare soil in various amounts. Evidence of disturbance includes possible landslide, pine bark beetle damage, and wind/ice damage due to exposed position.
Global Environment: Occurrences are often physiognomic complexes of woodland, grassland, and rock outcropping, and are often associated with southern or eastern exposures on granitic domes or rocky summits. These woodlands are currently known from the lower mountains of North Carolina and Georgia at 750-1150 m (2500-3800 feet) elevation, on sites with biotite gneiss geology with veins of base-rich hornblende gneiss.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is composed of scattered *Carya glabra, Fraxinus americana, Quercus prinus, Ostrya virginiana*, and *Chionanthus virginicus*. *Juniperus virginiana* is frequent but not always present. Shrubs are scattered and may include *Ptelea trifoliata, Physocarpus opulifolius, Hypericum prolificum, Vaccinium corymbosum, Vaccinium stamineum, Vaccinium pallidum, Lonicera flava, Amelanchier sanguinea, Rosa carolina*, and *Toxicodendron radicans*. Graminoids dominate the herb layer which may be sparse or fairly abundant and include *Andropogon gerardii, Danthonia compressa, Deschampsia flexuosa, Dichanthelium acuminatum*, and *Schizachyrium scoparium*. This community also supports GA-state critically imperiled *Oxalis montana* and regional endemic *Croton elliottii*.
Global Vegetation: The open and stunted (3-5 m) canopy of stands is dominated by gnarly *Juniperus virginiana var. virginiana* or by various deciduous species, typically *Carya glabra, Fraxinus americana, Quercus prinus, Ostrya virginiana*, and *Chionanthus virginicus*. Occasionally, *Pinus virginiana* may be a component of the canopy mix. Shrubs are scattered or locally abundant and may include *Ptelea trifoliata, Physocarpus opulifolius, Hypericum prolificum, Vaccinium stamineum, Vaccinium pallidum, Lonicera flava, Amelanchier sanguinea*, and *Rosa carolina*. A dense, grassy herb layer can occur beneath the canopy or in open areas, interspersed with bare rock. Typical dominants include *Carex pensylvanica, Dichanthelium scoparium, Danthonia compressa, Danthonia sericea, Andropogon gyrans, Andropogon ternarius, Andropogon gerardii, Sorghastrum nutans, Schizachyrium scoparium var. scoparium, Aristida purpurascens*, and *Melica mutica*. Other herbaceous species include *Allium cernuum, Dodecatheon meadia, Solidago nemoralis, Solidago sphacelata, Pycnanthemum montanum, Pycnanthemum curvipes, Hypericum punctatum, Hypericum gentianoides, Desmodium rotundifolium, Antennaria virginica, Piptochaetium avenaceum, Packera millefolia (= Senecio millefolium), Helianthus microcephalus, Claytonia virginica, Coreopsis major*, and *Coreopsis pubescens*. The steepest areas may have patches of *Sedum glaucophyllum, Houstonia longifolia*, and *Saxifraga michauxii*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya glabra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium stamineum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Hypericum prolificum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana* var. *virginiana*
Tree canopy	Broad-leaved deciduous tree	*Carya glabra*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*, *Vaccinium stamineum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Hypericum prolificum*
Herb (field)	Graminoid	*Carex pensylvanica*, *Danthonia compressa*, *Dichanthelium scoparium*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Andropogon gerardii*, *Carya glabra*, *Dichanthelium acuminatum*, *Hypericum prolificum*, *Juniperus virginiana*, *Schizachyrium scoparium*, *Vaccinium stamineum*
Global: *Carya alba*, *Carya glabra*, *Fraxinus americana*, *Juniperus virginiana* var. *virginiana*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Croton elliottii* (G3, globally imperiled), *Oxalis montana* (G5, GA state-critically imperiled); **Invasive/Exotic Plants**: *Rumex acetosella* (Medium/Low)
Global: Vulnerable Plants: *Arabis patens* (G3), *Berberis canadensis* (G3), *Calystegia catesbeiana* (G3), *Carex biltmoreana* (G3), *Croton elliottii* (G3), *Krigia montana* (G3), *Packera millefolia* (G3), *Penstemon smallii* (G3), *Pycnanthemum curvipes* (G3), *Rudbeckia triloba* var. *pinnatiloba* (G5T3), *Rudbeckia triloba* var. *rupestris* (G5T3?), *Solidago simulans* (G2); **Other Plants**: *Coreopsis pubescens* var. *robusta* (G5?T3T5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (14-Dec-1998). This community is limited to regionally uncommon and small exposures of moderately nutrient-rich rock in the Southern Blue Ridge, and is thought to be inherently rare because of its unusual geology and topographic position. Total acreage of this community may be less than 1000 acres. Threats are few, although logging in adjacent areas can cause unnatural disturbance, along with alteration of light and seepage flow.

RELATED CONCEPTS

Global Similar Types:

- *Fraxinus americana - Carya glabra / Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland (CEGL003683)
- *Fraxinus americana - Carya glabra / Symphoricarpos orbiculatus - Rhus aromatica / Piptochaetium avenaceum* Woodland (CEGL003684) a related Piedmont type.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Soil chemistry data are not available but composition suggests a somewhat basic substrate. Tom Govus suspects the substrate is hornblende gneiss (Fleming and Patterson 2009a).
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: *Pinus virginiana* is common in one of the plots. This is possibly a variant of Montane Basic Hardwood - Red-cedar Woodland (CEGL003752) with *Pinus virginiana*, which sometimes occurs on Virginia mafic outcrops with the more characteristic *Carya, Fraxinus*, and *Juniperus* (Fleming and Patterson 2009a).
Global Classification Comments: Some sites grade into forests dominated by *Quercus prinus*. In an 1134-plot regional analysis for the Southern Appalachian portion of the Appalachian Trail, only three Georgia plots were classified as this type (Fleming and Patterson 2009a).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled along the AT in Georgia, including in the Chattahoochee National Forest.
Global Range: This community occurs in the Southern Blue Ridge of western North Carolina and Georgia.
Nations: US
States/Provinces: GA, NC
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): 221A:CC, M221Dc:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WMBH
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (3 plots; 3 observation points; 19 accuracy assessment points): APPA.0541, APPA.0546, APPA.0549, APPA.1050, APPA.1056, APPA.1058, APPA_AA_0095, APPA_AA_0117, APPA_AA_0198, APPA_AA_0276, APPA_AA_0299, APPA_AA_0343, APPA_AA_0398, APPA_AA_0464, APPA_AA_0465, APPA_AA_0544, APPA_AA_0553, APPA_AA_0658, APPA_AA_0682, APPA_AA_0716, APPA_AA_0992, APPA_AA_1090, APPA_AA_1260, APPA_AA_1277, APPA_AA_1422.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): T. Govus and G.P. Fleming
References: Dellinger 1992, Eyre 1980, Fleming and Patterson 2009a, Fleming et al. 2006, Peet et al. unpubl. data, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Small 1996, Southeastern Ecology Working Group n.d.*

G165. PIEDMONT-CENTRAL ATLANTIC COASTAL PLAIN OAK FOREST

Group Summary Description: Vegetation of this group encompasses both the prevailing upland oak and oak-hickory forests of the southern Piedmont, as well as the more open vegetation of more limited areas in the Piedmont where a particularly dense clay hardpan has developed over a range of typically mafic rocks, sometimes with interspersed areas of prairie- or glade-like herbaceous vegetation. In addition, it encompasses related oak-dominated forests of somewhat fire-sheltered dry to dry-mesic sites in the adjacent Mid-Atlantic and South Atlantic coastal plains from southeastern Virginia to Georgia. In general, high-quality and historic examples are typically dominated by combinations of upland *Quercus* spp., sometimes with *Pinus* spp. as a significant component, especially in the southern portions of the region. These forests occur in a variety of habitats and, under natural conditions, were the matrix vegetation type covering most of the landscape. Much of this group is currently composed of successional forests that have arisen after repeated cutting, clearing, and cultivation of original oak-hickory forests. Stands of these forests are dominated by combinations of upland *Quercus* spp., particularly *Quercus alba, Quercus coccinea, Quercus falcata, Quercus rubra, Quercus stellata*, and *Quercus velutina*, along with *Carya alba, Carya glabra*, and other *Carya* spp. Other common tree species include *Acer rubrum, Liquidambar styraciflua, Liriodendron tulipifera, Pinus echinata, Pinus taeda*, and *Pinus virginiana*.

A3293 *Quercus rubra - Quercus alba - Carya* spp. Piedmont Forest Alliance

Alliance Summary Description: These are dry-mesic to mesic upland oak forests dominated by *Quercus alba* and/or *Quercus rubra*, with or without *Carya* species, found in the southern Piedmont, the lower elevations of the Appalachian Mountains, the adjacent Ridge and Valley, and peripherally in the adjacent Upper East Gulf Coastal Plain of the southeastern United States. *Quercus alba* usually dominates, either alone or in combination with *Quercus falcata* (especially on drier sites), *Quercus rubra* (especially on moister sites), and sometimes *Quercus velutina*. *Carya* species (particularly *Carya alba, Carya glabra*, or *Carya ovata*) are typically common either in the canopy or subcanopy. Other associated species include *Acer leucoderme, Acer rubrum, Calycanthus floridus, Cornus florida, Fraxinus americana, Kalmia latifolia, Nyssa sylvatica, Ostrya virginiana, Oxydendrum arboreum, Pyrularia pubera*, and others. Stands are found on gentle to moderately steep slopes on uplands and on steep valley sides. The soils are moderately deep to deep and vary from silts to clays and loams. The parent material ranges from glaciated till to limestone, shale, sandstone and other bedrock types.

[CEGL007230] *Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest

Translated Name: **White Oak - (Northern Red Oak, Chestnut Oak) / Flame Azalea - (Bear Huckleberry) Forest**

Common Name: **Appalachian Montane Oak - Hickory Forest (Typic Acidic Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Piedmont-Central Atlantic Coastal Plain Oak Forest (G165)
Alliance	*Quercus rubra - Quercus alba - Carya* spp. Piedmont Forest Alliance (A3293)

ELEMENT CONCEPT

Global Summary: These forests occur in a wide elevational range, from 610 to 1372 m (2000-4500 feet), in the Southern Blue Ridge, Blue Ridge/Piedmont transition, and the higher ridges of the Cumberland Mountains and Ridge and Valley in southwestern Virginia. The type occurs generally on deep soils of broad ridgetops, exposed upper slopes and saddles, occurring less frequently on protected lower slopes, bottoms and coves. Stands of this deciduous forest association are dominated or codominated by *Quercus alba*, occurring with other *Quercus* species (*Quercus rubra, Quercus prinus, Quercus coccinea*). Associated species are characteristically montane and typical of acidic forests. This association lacks indicators of circumneutral soils and also lacks low-elevation dry-site species such as *Pinus echinata, Quercus falcata, Quercus stellata*, and *Quercus marilandica*. Species other than oaks that can be important in the canopy include *Carya alba, Carya glabra, Carya ovalis, Liriodendron tulipifera, Acer rubrum*, and *Magnolia fraseri*. Common species in the subcanopy/sapling strata include *Cornus florida, Acer rubrum, Carya* spp., *Liriodendron tulipifera, Magnolia fraseri, Nyssa sylvatica, Oxydendrum arboreum, Pinus strobus*, and *Halesia tetraptera*. Shrub cover is sparse to very dense and is often dominated by deciduous heaths. *Kalmia latifolia* and *Gaylussacia ursina* are usually present, but other shrub species can include *Euonymus*

americanus, Rhododendron calendulaceum, Vaccinium stamineum, Vaccinium pallidum, Viburnum acerifolium, Calycanthus floridus, Pyrularia pubera, Ilex montana, Halesia tetraptera, and *Hamamelis virginiana*. In the northern portion of the range of this association (northwestern North Carolina and southwestern Virginia), *Gaylussacia ursina* is frequently absent from the shrub layer. *Smilax glauca* and *Vitis rotundifolia* are common vines. The herbaceous stratum is sparse to moderate in coverage, but often rich in species, approaching the diversity but not the coverage of rich cove forests. Associated herbaceous species vary with elevation and soil moisture. Often there is a dominant fern stratum, with *Thelypteris noveboracensis* and *Polystichum acrostichoides* most typically dominant.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This montane acidic oak-hickory forest of the Southern Appalachians generally occurs on deep soils of broad ridgetops, exposed upper slopes and saddles, occurring less frequently on protected sites. Elevation averages 972 m (3,189 feet) in southwestern Virginia (south of the New River) and into the Southern Appalachians. It was sampled at two locations in this portion of the park. Sites are moderate to somewhat steep, lower to upper slopes and ridges with mostly southern aspects. Soils are dry-mesic well-drained loam and clay loam. The unvegetated surface is dominated by leaf litter with some downed wood and occasional large/small rocks. Evidence of disturbance includes past logging.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This oak-hickory forest is usually found at 610 to 1,370 m (2,000-4,500 feet) elevation, but can be found down to about 305 m (1,000 feet) in Georgia. It occurs on convex, warm-aspect, upper slopes and crests. Soils are generally dry-mesic, moderately well- to well-drained very acidic loam, sandy loam and clay loam. The unvegetated surface is dominated by leaf litter with some downed wood and rocks. Evidence of disturbance includes possible past logging and the presence of exotic plant species.
Global Environment: These forests occur in a wide elevational range, from 610 to 1370 m (2000-4500 feet), in the Southern Blue Ridge, the Blue Ridge/Piedmont transition, and the higher ridges of the Cumberland Mountains and Ridge and Valley in southwestern Virginia. The type occurs generally on deep soils of broad ridgetops, exposed upper slopes and saddles, occurring less frequent on protected sites, typically lower slopes, bottoms and coves. Twenty-four plots classified as this type in the Appalachian Trail project have a mean elevation of 1095 m (3592 feet) and occur mostly on convex, southwest-facing upper slopes and crests. Soil samples collected from these plots have a mean pH of 4.4, along with low calcium, magnesium, and total base saturation, and high iron and aluminum.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Quercus alba* often dominates the canopy with some combination of *Quercus prinus, Quercus velutina, Acer rubrum, Carya alba, Carya glabra, Carya ovalis*, and *Oxydendrum arboreum*. *Castanea dentata, Amelanchier arborea, Vaccinium pallidum*, and *Vaccinium stamineum* are usually present in the shrub layer. There is often a diverse herb layer that may include *Desmodium nudiflorum, Prenanthes altissima, Polygonatum biflorum, Potentilla canadensis, Uvularia perfoliata, Uvularia puberula*, and *Zizia trifoliata*.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: Stands have a mixed canopy, including *Quercus alba* (but often abundant), *Quercus rubra, Quercus prinus*, and *Quercus velutina*. Subcanopy trees include *Acer rubrum, Betula lenta, Sassafras albidum*, and *Oxydendrum arboreum*. Common shrubs include *Castanea dentata, Gaylussacia baccata, Ilex montana, Kalmia latifolia, Rhododendron calendulaceum, Vaccinium pallidum, Vaccinium corymbosum*, and *Vaccinium stamineum*. Herbs may be sparse to quite dense and dominated by acidic herbs and ferns. *Carex pensylvanica, Desmodium nudiflorum, Dioscorea quaternata, Galium latifolium, Goodyera pubescens, Medeola virginiana, Solidago arguta var. caroliniana, Solidago curtisii (= Solidago caesia var. curtisii), Uvularia puberula*, and *Viola hastata* are common. This community also supports GA-state imperiled *Prunus pensylvanica* and NC-state imperiled *Crataegus schuettei* and *Stenanthium gramineum var. micranthum*.
Global Vegetation: The canopies of stands of this association are dominated or codominated by *Quercus alba*, occurring with other *Quercus* species (*Quercus rubra, Quercus prinus, Quercus coccinea*). Species other than oaks that can be important in the canopy include *Carya alba, Carya glabra, Carya ovalis, Liriodendron tulipifera, Acer rubrum*, and *Magnolia fraseri*. Stands lack indicators of circumneutral soils and also lack low-elevation dry-site species such as *Pinus echinata, Quercus falcata, Quercus stellata*, and *Quercus marilandica*. Common species in the subcanopy/sapling strata include *Cornus florida, Acer rubrum, Carya* spp., *Liriodendron tulipifera, Magnolia fraseri, Nyssa sylvatica, Oxydendrum arboreum, Pinus strobus*, and *Halesia tetraptera*. Shrub cover is sparse to very dense, and is often dominated by deciduous heaths, including *Kalmia latifolia* and *Gaylussacia ursina*. Other shrub species can include *Euonymus americanus, Rhododendron calendulaceum, Vaccinium stamineum, Vaccinium*

pallidum, Viburnum acerifolium, Calycanthus floridus, Pyrularia pubera, Ilex montana, Halesia tetraptera, and *Hamamelis virginiana*. *Smilax glauca* and *Vitis rotundifolia* are common vines. The herbaceous stratum is sparse to moderate in coverage, but often rich in species, approaching that of rich cove forests (but with a different composition). Associated herbaceous species vary with elevation and soil moisture. Some of the more constant species include *Parthenocissus quinquefolia, Dioscorea quaternata, Dichanthelium* spp., *Carex pensylvanica, Chimaphila maculata, Desmodium nudiflorum, Goodyera pubescens, Maianthemum racemosum ssp. racemosum*, and *Trillium catesbaei*. Other species include *Dichanthelium laxiflorum, Oclemena acuminata (= Aster acuminatus), Eurybia divaricata (= Aster divaricatus), Galax urceolata, Galium latifolium, Lysimachia quadrifolia, Mitchella repens, Viola hastata, Uvularia puberula, Polygonatum biflorum, Solidago curtisii, Convallaria majuscula*, and *Melanthium parviflorum*. Often there is a dominant fern stratum, with *Thelypteris noveboracensis* and *Polystichum acrostichoides* most typically dominant. Other ferns include *Athyrium filix-femina ssp. asplenioides, Dennstaedtia punctilobula*, and *Dryopteris intermedia*.

Global Dynamics: Like many contemporary eastern oak forests, stands of this type in Virginia typically exhibit poor oak recruitment and an understory of *Acer rubrum* and other shade-tolerant mesophytic trees. This condition is generally considered symptomatic of long-term fire exclusion.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya alba*, *Carya glabra*, *Quercus alba*, *Quercus coccinea*, *Quercus prinus*, *Quercus rubra*
Tall shrub/sapling	Broad-leaved deciduous tree	*Amelanchier arborea*, *Castanea dentata*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Herb (field)	Flowering forb	*Desmodium nudiflorum*, *Polygonatum biflorum*, *Potentilla canadensis*, *Prenanthes altissima*, *Uvularia perfoliata*, *Uvularia puberula*, *Zizia trifoliata*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus alba*, *Quercus prinus*, *Quercus rubra*, *Quercus velutina*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula lenta*, *Oxydendrum arboreum*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Castanea dentata*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium stamineum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya alba*, *Carya glabra*, *Quercus alba*, *Quercus coccinea*, *Quercus prinus*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*, *Cornus florida*, *Oxydendrum arboreum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia ursina*
Herb (field)	Fern (Spore-bearing forb)	*Polystichum acrostichoides*, *Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Vaccinium stamineum*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Desmodium nudiflorum*, *Dioscorea quaternata*, *Kalmia latifolia*, *Sassafras albidum*, *Vaccinium stamineum*
Global: *Gaylussacia ursina*, *Kalmia latifolia*, *Quercus alba*, *Quercus prinus*, *Quercus rubra*, *Rhododendron calendulaceum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Castanea dentata* (G4, TN state-imperiled), *Crataegus schuettei* (G5?, NC state-imperiled), *Prunus pensylvanica* (G5, GA state-imperiled), *Stenanthium gramineum* var. *micranthum* (G4G5TNR, NC state-imperiled); **Invasive/Exotic Plants**: *Anthoxanthum odoratum* (invasive/exotic), *Berberis thunbergii* (High/Medium, invasive/exotic), *Elaeagnus umbellata* (High), *Ligustrum sinense* (High/Medium, invasive/exotic), *Lonicera japonica* (High/Medium, invasive/exotic), *Lonicera morrowii* (High/Medium, invasive/exotic), *Myosotis stricta* (invasive/exotic), *Rosa multiflora* (Medium/Low, invasive/exotic), *Rubus phoenicolasius* (Medium, invasive/exotic), *Stellaria graminea* (invasive/exotic), *Stellaria media* (Low, invasive/exotic), *Trifolium campestre* (invasive/exotic), *Trifolium repens* (Medium/Low, invasive/exotic), *Viburnum plicatum* (invasive/exotic), *Vicia sativa* ssp. *nigra* (invasive/exotic)
Global: Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Canoparmelia amabilis* (G1), *Carex lucorum* var. *austrolucorum* (G5T3T4), *Carex manhartii* (G3G4), *Penstemon smallii* (G3), *Robinia hispida* var. *kelseyi* (G4T1), *Sisyrinchium dichotomum* (G2), *Trillium rugelii* (G3), *Vaccinium hirsutum* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (22-Feb-2010). This is a broad-concept type, and while it may be subdivided in the future if analysis warrants this, it is widely distributed over the Southern Blue Ridge, the Blue Ridge/Piedmont transition, and the higher ridges of the Cumberland Mountains and Ridge and Valley in southwest Virginia, over a broad elevational range. It may form large patches at some sites. It is apparently secure, although fire suppression and insect pathogens represent ongoing stand-altering disturbances. It is not threatened or particularly vulnerable. Mature, high-quality stands are uncommon due to extensive past logging and more recent biotic disturbances.

RELATED CONCEPTS

Global Similar Types:
- *Acer rubrum var. rubrum - Betula lenta - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Ruderal Forest (CEGL008558)
- *Quercus alba / Kalmia latifolia* Forest (CEGL007295)
- *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267) is drier and less diverse, and occurs at somewhat lower elevations.
- *Quercus prinus - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest (CEGL008523) is a dry, Central Appalachian mixed oak forest; usually lacks significant *Quercus alba*.
- *Quercus rubra - Acer rubrum / Pyrularia pubera / Thelypteris noveboracensis* Forest (CEGL006192)
- *Quercus rubra - Quercus prinus - Magnolia (acuminata, fraseri) / Acer pensylvanicum* Forest (CEGL004817)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This is a strongly Southern Appalachian community, common in southwestern Virginia, and only documented north to Bland and Pulaski counties, Virginia (i.e., strictly south of the New River). Stands are possible in Giles and Craig counties, but the community does not occur anywhere on the Northern Blue Ridge north of Roanoke.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: In comparison to Central Appalachian Montane Oak - Hickory Forest (Acidic Type) (CEGL008516), this association (CEGL007230) is a much more acidic and less floristically diverse oak-hickory forest.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Mixed oak forest with substantial *Quercus alba* component, moderately low to high richness of shrubs and herbs. Soils are extremely acidic with low Ca, Mg and high Fe and Al. Plots in this analysis are strongly associated with convex, warm-aspect, upper slopes and crests.
Global Classification Comments: This association is meant to cover the typical acidic, oak-hickory forests of the Southern Blue Ridge Mountains. It has a broad concept, and there is potential for subdividing this type by moisture, elevation, or undergrowth. It can be distinguished from *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267) by higher species diversity and the presence of a substantial amount of *Quercus alba*. Twenty-four plots from Georgia, North Carolina, Tennessee, and southwestern Virginia were classified as this association in the Appalachian Trail vegetation mapping project (Fleming and Patterson 2009a). In 12 plots from this dataset, species richness ranges from 29 to 115 species per hectare, and averages 59 species per 1000-m2 plot.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This forest of the Southern Appalachians ranges from south of the New River in Virginia to Georgia. It was sampled in Smyth and Bland counties in Virginia, west of Dickeys Gap.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is scattered along and near the AT from Bland County, Virginia, south to Georgia. It was sampled in Georgia, including Springer Mountain and Tray Mountain; in North Carolina at Green Knob South (Great Smoky Mountains National Park) and Runaway Knob (Nantahala National Forest); in Tennessee, including north of Ekaneetlee Gap; and in Virginia at Bobby's Ridge, Feathercamp Ridge, French Broad River, Oteen, and Straight Mountain.
Global Range: This community is found in the Southern Blue Ridge, the Blue Ridge/Piedmont transition, and Central Appalachians of the eastern United States.
Nations: US
States/Provinces: GA, NC, SC, TN, VA:S3
TNC Ecoregions: 50:C, 51:C, 52:P, 59:C
USFS Ecoregions (1994/95): 231Ag:CCC, M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont)?, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAMO
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: The New River is the northernmost extent of this community in Virginia.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 plots; 4 accuracy assessment points): APPA.0607, APPA.1019, APPA_AA_0735, APPA_AA_0788, APPA_AA_1344, APPA_AA_1451.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (10 plots; 22 observation points; 30 accuracy assessment points): APPA.0020, APPA.0022, APPA.0082, APPA.0137, APPA.0149, APPA.0183, APPA.0252, APPA.0257, APPA.0298, APPA.0411, APPA.0598, APPA.0642, APPA.1029, APPA.1031, APPA.1032, APPA.1035, APPA.1037, APPA.1040, APPA.1043, APPA.1046, APPA.1048B, APPA.1049B, APPA.1053, APPA.1055, APPA.1059, APPA.1060, APPA.1061, APPA.1063, APPA.1065, APPA.1067, APPA.1067B, APPA.1099, APPA_AA_0041, APPA_AA_0135, APPA_AA_0206, APPA_AA_0227, APPA_AA_0231, APPA_AA_0277, APPA_AA_0301, APPA_AA_0302, APPA_AA_0303, APPA_AA_0346, APPA_AA_0540, APPA_AA_0608, APPA_AA_0675, APPA_AA_0703, APPA_AA_0746, APPA_AA_0748, APPA_AA_0768, APPA_AA_0789, APPA_AA_0950, APPA_AA_0980, APPA_AA_0996, APPA_AA_1112, APPA_AA_1120, APPA_AA_1163, APPA_AA_1197, APPA_AA_1206, APPA_AA_1267, APPA_AA_1314, APPA_AA_1383, APPA_AA_1419.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson, T. Govus and G. Fleming
References: Allard 1990, Ambrose 1990a, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Major et al. 1999, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Patterson 1994, Peet et al. unpubl. data, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, White 2003

[CEGL007233] *Quercus alba - Quercus rubra - Carya ovalis / Acer saccharum / Polystichum acrostichoides* Forest

Translated Name: **White Oak - Northern Red Oak - Red Hickory / Sugar Maple / Christmas Fern Forest**
Common Name: **Rich Low-Elevation Appalachian Oak - Hickory Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Piedmont-Central Atlantic Coastal Plain Oak Forest (G165)
Alliance	*Quercus rubra - Quercus alba - Carya* spp. Piedmont Forest Alliance (A3293)

ELEMENT CONCEPT

Global Summary: This is a dry-mesic to mesic, low-montane oak-hickory forest of the Ridge and Valley, Cumberland Mountains, and adjacent Southern Blue Ridge. It has moderately high species diversity, with a variable mixed overstory of *Quercus rubra, Quercus alba, Carya ovalis, Carya ovata, Carya alba, Liriodendron tulipifera* and, less frequently, *Carya cordiformis, Magnolia acuminata, Quercus velutina*, and *Quercus prinus*. The most characteristic subcanopy species are *Acer rubrum, Acer saccharum, Fraxinus americana, Sassafras albidum, Nyssa sylvatica, Oxydendrum arboreum, Ulmus rubra, Cornus florida*, and *Ostrya virginiana*. Shrubs of various heights are commonly present; these may include *Frangula caroliniana, Corylus cornuta, Corylus americana, Vaccinium stamineum, Cercis canadensis, Asimina triloba, Morus rubra*, and *Lindera benzoin*. The herb layer is often diverse; the most constant patch-dominants include *Polystichum acrostichoides, Desmodium nudiflorum, Amphicarpaea bracteata, Dichanthelium boscii, Actaea racemosa*, and *Ageratina altissima var. altissima*. Some other herbs include *Podophyllum peltatum, Maianthemum racemosum ssp. racemosum, Desmodium pauciflorum, Desmodium glutinosum, Galium circaezans, Uvularia perfoliata, Dioscorea quaternata, Arisaema triphyllum, Conopholis americana, Geranium maculatum, Solidago curtisii, Scutellaria elliptica, Brachyelytrum erectum, Eupatorium purpureum var. purpureum, Collinsonia canadensis*, and *Polymnia canadensis*. Many other mesophytic and dry-mesophytic herbs occur at low cover. The canopy is generally closed (>75% cover).

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This low-elevation oak-hickory forest is found below 700 m (2,297 feet) elevation and is more characteristic of the Ridge and Valley. Sites are steep to somewhat steep slopes with variable aspects and deep, well-drained clay loam and loam soils that are moderately calcareous. The unvegetated surface is dominated by leaf litter with occasional rocks and downed wood. Evidence of disturbance includes trails and wind/ice damage.

Global Environment: Most examples occur between 460 and 850 m (1500-2800 feet) (mean = 615 m [2018 feet]), with a few sites as low as 260 m (850 feet). It occupies a variety of sites, slope positions and aspects, most commonly northwestern to eastern. Most, if not all, sample sites for this type are underlain by sedimentary and metasedimentary rocks, including shale, metashale, siltstone, calcareous sandstone, and interbedded limestone and sandstone. Soil samples collected from plots have moderately high mean high calcium and magnesium, and manganese content.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is dominated by *Quercus alba, Carya ovata*, and *Carya alba*. *Quercus rubra* may be a dominant component of the canopy as well. Other species that may be present in the canopy are *Acer saccharum, Liriodendron tulipifera, Quercus velutina, Carya glabra, Fraxinus americana, Fagus grandifolia, Prunus serotina, Ulmus rubra*, and *Juglans nigra*. Shrubs are sparse but may include *Amelanchier arborea, Cercis canadensis, Cornus florida, Hamamelis virginiana, Rubus allegheniensis*, and *Viburnum acerifolium*. The herb layer can also be sparse or quite dense; common species include *Amphicarpaea bracteata, Desmodium nudiflorum, Dichanthelium boscii, Galium circaezans, Galium triflorum*, and *Polystichum acrostichoides*. *Parthenocissus quinquefolia* and *Smilax rotundifolia* are common vines.

Global Vegetation: This is a dry-mesic to mesic, low-montane oak-hickory forest with moderately high species diversity. It has a variable mixed overstory of *Quercus rubra, Quercus alba, Carya ovalis, Carya ovata, Carya alba, Liriodendron tulipifera* and, less frequently, *Carya cordiformis, Magnolia acuminata, Quercus velutina*, and *Quercus prinus*. Some stands may also include *Fagus grandifolia, Fraxinus americana, Pinus virginiana, Aesculus flava, Nyssa sylvatica, Quercus falcata, Quercus muehlenbergii, Tilia americana var. heterophylla, Pinus echinata, Pinus strobus, Prunus serotina, Quercus coccinea, Ulmus alata, Juglans nigra, Tsuga canadensis*, and *Ulmus rubra*. The canopy is generally closed (>75% cover). The most characteristic subcanopy species are *Acer rubrum, Acer saccharum, Fraxinus americana, Sassafras albidum, Nyssa sylvatica, Oxydendrum arboreum, Ulmus rubra, Cornus florida*, and *Ostrya virginiana*, with *Liquidambar styraciflua, Ulmus alata*, and *Prunus serotina* present in some stands. *Acer saccharum* and/or *Acer rubrum* typically strongly dominate the subcanopy. In the Tellico Pilot Project, *Acer saccharum* had a relative frequency value of >90% and an average canopy cover dominance of >25%. It is speculated that this high dominance is due to the mesic site conditions and lack of fire. Scrambling and low-

climbing vines of *Toxicodendron radicans* and *Smilax rotundifolia* are frequent. Shrubs of various heights are commonly present; these may include *Frangula caroliniana, Corylus cornuta, Corylus americana, Vaccinium stamineum, Cercis canadensis, Asimina triloba, Morus rubra*, and *Lindera benzoin*. The shrub and herbaceous layers tend to have a percent cover of >25%. The herb layer is often diverse; the most constant patch-dominants include *Polystichum acrostichoides, Desmodium nudiflorum, Amphicarpaea bracteata, Dichanthelium boscii, Actaea racemosa*, and *Ageratina altissima var. altissima*. Other herbs that can be important in some stands include *Podophyllum peltatum, Maianthemum racemosum ssp. racemosum, Desmodium pauciflorum, Desmodium glutinosum, Galium circaezans, Uvularia perfoliata, Dioscorea quaternata, Arisaema triphyllum, Conopholis americana, Geranium maculatum, Solidago curtisii, Scutellaria elliptica, Brachyelytrum erectum, Eupatorium purpureum var. purpureum, Collinsonia canadensis*, and *Polymnia canadensis*.

A stand on the western edge of the Blue Ridge (Cherokee National Forest, Tennessee, M221Dd418, Dry Branch #1) contains *Quercus alba, Carya ovata, Fraxinus americana, Quercus rubra, Aesculus flava, Juniperus virginiana var. virginiana, Juglans nigra*, and *Quercus stellata* in the canopy; *Ostrya virginiana, Cercis canadensis, Ulmus rubra, Fraxinus americana, Ulmus alata, Quercus prinus*, and *Juniperus virginiana var. virginiana* in the subcanopy; *Frangula caroliniana* as a tall shrub; *Symphoricarpos orbiculatus* and *Vaccinium stamineum* in the low-shrub stratum; *Parthenocissus quinquefolia* as a woody vine; and *Bromus pubescens, Elymus hystrix, Carex* sp., *Carex pensylvanica, Sedum ternatum, Asplenium platyneuron, Hybanthus concolor, Carex communis, Dichanthelium boscii (= Panicum boscii), Asplenium resiliens, Symphyotrichum undulatum (= Aster undulatus), Dioscorea quaternata, Solidago caesia, Galium circaezans, Antennaria plantaginifolia, Pellaea atropurpurea, Verbesina occidentalis, Scutellaria elliptica, Arabis* sp., *Agrimonia* sp., *Geum* sp., *Eurybia divaricata (= Aster divaricatus), Conyza canadensis, Hepatica nobilis var. obtusa, Maianthemum racemosum, Monarda fistulosa, Sanicula canadensis, Solidago erecta (= Solidago speciosa var. erecta), Viola x palmata*, and *Thalictrum* sp. as herbs.

Global Dynamics: Disturbances from fires and mudslides were observed in many of the Tellico Pilot Project sites of this type. Mesic site conditions can limit fire disturbance. Without disturbance this community may develop into an *Acer saccharum* or *Acer rubrum* forest type, as the subcanopy is strongly dominated by one or both of those species.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya alba*, *Carya ovata*, *Quercus alba*
Herb (field)	Liana	*Parthenocissus quinquefolia*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Carya alba*, *Carya ovata*
Tree canopy	Broad-leaved deciduous tree	*Carya glabra*, *Liriodendron tulipifera*, *Quercus alba*
Tree subcanopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fraxinus americana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Carya alba*, *Carya glabra*, *Carya ovata*, *Liriodendron tulipifera*, *Parthenocissus quinquefolia*, *Polystichum acrostichoides*, *Quercus alba*
Global: *Acer saccharum*, *Carya ovalis*, *Fagus grandifolia*, *Polystichum acrostichoides*, *Quercus alba*, *Quercus rubra*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Castanea dentata* (G4, TN state-imperiled), *Trillium luteum* (G4, TN state-imperiled)
Global: Vulnerable Plants: *Scutellaria pseudoserrata* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (14-Jan-2000). This is not an inherently rare forest type. It is presumed to be relatively common throughout its known range. It is at least a moderately widespread type, although its full range is not known. It occurs on a variety of aspects and elevations, and it is not restricted to any highly specific geologic substrates. It is poorly documented through EOs, and not much data are available on the specific condition of examples of this type. Some stands have been impacted by removal of more valuable timber species and loss of

herbaceous species diversity from the disturbance effects of logging. In all probability, most examples which are not on public land have been repeatedly logged and their composition altered thereby. Remaining unprotected examples are threatened by timber removal, conversion to other managed forest types, and/or development into residential or commercial real estate. The Grank was formerly G3G5. Changing this to G4 helps to clarify its status.

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharum - Quercus muehlenbergii / Cercis canadensis* Forest (CEGL006017) is a drier association found to the North and East.
- *Quercus alba - Quercus prinus - Carya glabra / Cornus florida / Vaccinium pallidum* Forest (CEGL008515) is a drier, more acidic oak-hickory forest of the Central Appalachian / Ridge and Valley region.
- *Quercus alba - Quercus rubra - Carya alba / Cornus florida* Acidic Forest (CEGL002067)
- *Quercus alba - Quercus rubra - Carya ovata / Cercis canadensis - Juniperus virginiana var. virginiana* Forest (CEGL007240) is a related drier forest association.
- *Quercus alba - Quercus rubra - Carya ovata* Glaciated Forest (CEGL002068) is an equivalent of glaciated landscapes of the Midwest.
- *Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest (CEGL007692) is a more montane oak-hickory forest of the Southern Blue Ridge; occurs at higher elevations and has a pronounced component of mesophytic montane species absent from CEGL007233.
- *Quercus alba - Quercus velutina - Carya (ovata, alba) - Pinus* sp. Forest (CEGL007231)
- *Quercus prinus - Quercus rubra - Carya* spp. *- Fraxinus americana / Solidago sphacelata* Forest (CEGL008549)
- *Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest (CEGL006125) has a more northeasterly distribution.
- *Quercus rubra - Acer saccharum / Ostrya virginiana / Cardamine concatenata* Forest (CEGL008517) is a very similar forest that has a more northern distribution; could be considered the Central Appalachian analogue of CEGL007233.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Plots in this group are distributed at low elevations of the Southern Blue Ridge and in the Ridge and Valley and Cumberland Mountains. The samples represent a fairly species-rich oak-hickory forest that occurs from about 250 to 850 m (850-2,800 feet) elevation. Soil chemistry data indicate that substrates are moderately calcareous. Habitats appear to be dry-mesic to almost mesic, and many low-elevation plants are frequent or common in this group.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: This is the matrix forest over large areas of Cumberland Gap NHP. At the time that vegetation mapping project was done, those plots were assigned to Appalachian Montane Oak - Hickory Forest (Rich Type) (CEGL007692), but this analysis does not support that assignment.
Global Classification Comments: This is primarily a type of the Ridge and Valley and Cumberlands (Alabama to southwestern Virginia), but it also occurs on metasedimentary substrates at low elevations on the western flank of the Blue Ridge, in northern Georgia, Tennessee, and extreme western North Carolina (Hot Springs Window). There is at least one occurrence in the upper Piedmont of Georgia. Occurrences in Kentucky and West Virginia are likely. The range of this association (CEGL007233) barely overlaps that of *Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest (CEGL007692), and where it does, it is separated from the latter by elevation and soils (G. Fleming pers. comm. 2009, Fleming and Patterson 2009a).

This association was originally described from the Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County; 26 stands sampled) as the *Quercus alba - Carya ovata - Carya alba* Forest, where it was recorded from slopes with northwestern, northern and eastern aspects at elevations from 250 to 300 m (820-1000 feet). The high dominance of *Acer saccharum* in the subcanopy of some stands is thought to be due to the mesic site conditions combined with lack of fire. Twenty-five plots from a wider geographic range were classified as this association in the Appalachian Trail classification project (Fleming and Patterson 2009a). More information is needed on the variability of this community across its range. Described from the Ridge and Valley of Tennessee, the concept is generally applied to forests in the southern Cumberlands and adjacent Southern Blue Ridge.

This is an unglaciated equivalent of a Midwestern element of glaciated landscapes, *Quercus alba - Quercus rubra - Carya ovata* Glaciated Forest (CEGL002068) of Indiana, Illinois, and Missouri north to Ontario. A related drier forest association is *Quercus alba - Quercus rubra - Carya ovata / Cercis canadensis - Juniperus virginiana*

var. virginiana Forest (CEGL007240). It may also be similar to some limestone forests in Virginia's Ridge and Valley (*Acer saccharum var. saccharum - Quercus rubra - Carya [glabra, ovata] / Ageratina altissima* Forest (Fleming 1999)) (G. Fleming pers. comm.). In addition, the association has been identified in the far western edge of the Great Smoky Mountains National Park at a southerly aspect at about 570 m (1870 feet) in elevation.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community occurs in several spots along low-elevation stretches of the trail; widely distributed. It was sampled at Nolichucky River in Pisgah National Forest and elsewhere in Tennessee.
Global Range: This is primarily a type of the Ridge and Valley and Cumberlands from Alabama to southwestern Virginia, but it also occurs at low elevations on the western flank of the Blue Ridge, in northern Georgia, Tennessee, and extreme western North Carolina (Hot Springs Window). There is at least one occurrence in the upper Piedmont of Georgia. Occurrences in Kentucky and West Virginia are likely.
Nations: US
States/Provinces: AL, GA, KY, TN, VA:S3?
TNC Ecoregions: 44:?, 50:C, 51:C, 52:C, 59:C
USFS Ecoregions (1994/95): 221Ha:CCC, 221Hc:CCC, 221He:CCC, 221Ja:CCP, 221Jb:CCC, 222Eb:PPP, 231Ad:CCC, 231Cc:CCC, 231Dc:CCC, M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: DOE (Oak Ridge); NPS (Appalachian Trail [Southern Blue Ridge], Chickamauga-Chattanooga, Cumberland Gap, Great Smoky Mountains, Russell Cave); TVA (Tellico); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Jefferson, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAMO
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (3 plots): APPA.0163, APPA.0585, APPA.0614.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): M. Andreu, M. Tukman, M. Pyne and G. Fleming
References: Allard 1990, Andreu and Tukman 1995, Andreu and Tukman 1995*, Eyre 1980, Fleming 1999, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data, Pyne 1994, Rawinski 1992, Schmalzer and DeSelm 1982, Schotz et al. 2006, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, White 2006

[CEGL007692] *Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest

Translated Name: **White Oak - Northern Red Oak - Chestnut Oak / Richweed - Mayapple Forest**
Common Name: **Appalachian Montane Oak - Hickory Forest (Rich Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Piedmont-Central Atlantic Coastal Plain Oak Forest (G165)
Alliance	*Quercus rubra - Quercus alba - Carya* spp. Piedmont Forest Alliance (A3293)

ELEMENT CONCEPT

Global Summary: This association includes forests dominated by *Quercus alba, Quercus velutina, Quercus rubra*, or *Carya glabra, Carya alba*, or *Carya ovalis*, occurring over circumneutral soils in the Southern Blue Ridge and adjacent inner Piedmont. These forests can occur across a broad elevation range (530-1375 m [1750-4500 feet]) in exposed topographic settings (upper slopes), as well as on more protected sites (edges of coves). Presumed upper Piedmont examples may be at lower elevations (e.g., below 305 m [1000 feet]). Other species that can be important in the canopy include *Quercus coccinea, Quercus prinus*, and occasionally *Liriodendron tulipifera* where large gaps in the canopy have allowed for its generation On some sites, species more typical of "cove forests," such as *Fraxinus americana* or *Magnolia acuminata*, may form a very minor component. *Oxydendrum arboreum* and *Cornus florida* are common in the subcanopy. Heath species (*Rhododendron maximum* or *Kalmia latifolia*) are absent or very minor in the shrub stratum. On very high-base status soils, *Philadelphus hirsutus* or *Lindera benzoin* may be in the shrub

stratum. The herbaceous stratum can be quite diverse and is characterized by mesic herbs and species associated with circumneutral soils, such as *Podophyllum peltatum, Arisaema triphyllum, Amphicarpaea bracteata, Adiantum pedatum, Collinsonia canadensis, Asplenium platyneuron, Brachyelytrum erectum, Actaea racemosa (= Cimicifuga racemosa), Caulophyllum thalictroides, Sanguinaria canadensis, Tradescantia subaspera, Euphorbia purpurea, Phegopteris hexagonoptera, Polystichum acrostichoides, Athyrium filix-femina ssp. asplenioides, Dennstaedtia punctilobula*, and *Dryopteris intermedia*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This mid- to high-elevation rich oak-hickory forest is found on deep, basic soils from about 610 to 1,370 m (2,000-4,500 feet). Sites range from gentle to steep, mid and upper slopes and ridgetops with variable aspects. Soils are dry-mesic to mesic, moderately well- to well-drained loam. The unvegetated surface is dominated by leaf litter with occasional rocks and downed wood. Evidence of disturbance includes past logging, trails, wind/ice damage, and the presence of a few exotic plant species.

Global Environment: This association includes forests codominated by *Quercus alba*, occurring over nutrient-rich soils in the Southern Blue Ridge and adjacent Piedmont. These forests can occur across a broad elevational range, from 610 to 1372 m (2000-4500 feet), and can occur in exposed topographic settings (upper slopes and broad ridgetops), as well as on more protected sites (edges of coves). Presumed upper Piedmont examples may be at lower elevations (e.g., below 305 m [1000 feet]). Soils collected from plots of this association are strongly acidic with high organic matter content, but have higher magnesium and calcium levels than most other Southern Appalachian soils (Fleming and Patterson 2009a).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is dominated by *Quercus alba* (25-75%), often mixed with other *Quercus* spp., including *Quercus velutina, Quercus prinus*, and/or *Quercus rubra*, with *Carya glabra, Carya alba*, and/or *Carya ovalis, Liriodendron tulipifera*, and lacking abundant *Fraxinus americana*. Shrub layers are relatively sparse but may include *Rubus allegheniensis, Ilex montana*, and *Toxicodendron radicans*. The well-developed, diverse herbaceous layer includes species such as *Ageratina altissima, Amphicarpaea bracteata, Arisaema triphyllum, Actaea racemosa (= Cimicifuga racemosa), Collinsonia canadensis, Dennstaedtia punctilobula, Eupatorium purpureum, Laportea canadensis, Podophyllum peltatum, Solidago curtisii (= Solidago caesia var. curtisii), Thelypteris noveboracensis*, and *Viola sororia*. This community also supports TN-state critically imperiled *Melanthium virginicum* and GA-state imperiled *Stachys latidens* and *Triosteum aurantiacum*.

Global Vegetation: This association includes forests dominated by *Quercus alba*. Other species that can be important in the canopy include *Quercus rubra, Quercus coccinea, Quercus prinus, Quercus velutina, Carya glabra*, and *Carya alba*. On some sites, species more typical of "cove forests," such as *Fraxinus americana* or *Magnolia acuminata*, may form a very minor component. *Oxydendrum arboreum* and *Cornus florida* are common in the subcanopy. Heath species (*Rhododendron maximum* or *Kalmia latifolia*) are absent or very minor in the shrub stratum. On very high-base status soils, *Philadelphus hirsutus* or *Lindera benzoin* may be in the shrub stratum. Other woody species may include *Cercis canadensis, Viburnum acerifolium*, and *Ulmus alata*. The herbaceous stratum can be quite diverse and is characterized by mesic herbs and species associated with circumneutral soils, such as *Podophyllum peltatum, Arisaema triphyllum, Amphicarpaea bracteata, Adiantum pedatum, Collinsonia canadensis, Asplenium platyneuron, Actaea racemosa (= Cimicifuga racemosa), Caulophyllum thalictroides, Sanguinaria canadensis, Tradescantia subaspera, Euphorbia purpurea, Phegopteris hexagonoptera, Polystichum acrostichoides, Athyrium filix-femina ssp. asplenioides, Brachyelytrum erectum, Dennstaedtia punctilobula*, and *Dryopteris intermedia*. A stand included here from Chilhowee Mountain in the Cherokee National Forest also includes *Ageratina altissima var. altissima, Arabis canadensis, Aristolochia serpentaria, Asplenium platyneuron, Desmodium nudiflorum, Hepatica nobilis var. obtusa, Monarda fistulosa, Sanicula canadensis, Scutellaria elliptica, Silene stellata, Smallanthus uvedalius, Solidago curtisii (= Solidago lancifolia), Solidago simplex var. spathulata (= Solidago spathulata), Spigelia marilandica, Tradescantia subaspera*, and *Uvularia perfoliata*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya ovalis*, *Quercus alba*, *Quercus rubra*
Herb (field)	Flowering forb	*Collinsonia canadensis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya alba*, *Carya glabra*, *Quercus alba*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Cornus florida*, *Oxydendrum arboreum*
Herb (field)	Flowering forb	*Amphicarpaea bracteata*, *Arisaema triphyllum*, *Podophyllum peltatum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Ageratina altissima*, *Arisaema triphyllum*, *Carya ovalis*, *Collinsonia canadensis*, *Liriodendron tulipifera*, *Podophyllum peltatum*, *Quercus alba*, *Quercus rubra*, *Toxicodendron radicans*
Global: *Actaea racemosa*, *Adiantum pedatum*, *Amphicarpaea bracteata*, *Arisaema triphyllum*, *Caulophyllum thalictroides*, *Collinsonia canadensis*, *Podophyllum peltatum*, *Quercus alba*, *Sanguinaria canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Castanea dentata* (G4, TN state-imperiled), *Melanthium virginicum* (G5, TN state-critically imperiled), *Stachys latidens* (G4G5, GA state-imperiled), *Triosteum aurantiacum* (G5, GA state-imperiled); **Invasive/Exotic Plants**: *Stellaria media* (Low)
Global: Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Berberis canadensis* (G3), *Carex manhartii* (G3G4), *Carex radfordii* (G3), *Coreopsis latifolia* (G3), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Helianthus glaucophyllus* (G3G4), *Prosartes maculata* (G3G4), *Silene ovata* (G3, Southern Blue Ridge endemic), *Sisyrinchium dichotomum* (G2), *Trillium rugelii* (G3), *Trillium simile* (G3), *Tsuga caroliniana* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (17-May-2002). This montane oak-hickory forest is naturally limited to richer sites in the Southern Blue Ridge mountains and adjacent inner Piedmont. Later successional, unaltered occurrences are rare. Some stands have been impacted by removal of more valuable timber species (e.g., *Quercus alba*, other *Quercus* species) and the loss of herbaceous species diversity from the disturbance effects of logging.

RELATED CONCEPTS

Global Similar Types:

- *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / (Magnolia tripetala)* Forest (CEGL005222) is a mixed mesophytic forest of rich coves and lower slopes; lacks a significant oak component.
- *Quercus alba - Quercus rubra - Carya ovalis / Acer saccharum / Polystichum acrostichoides* Forest (CEGL007233) occurs at lower elevations, primarily in the Cumberlands and Southern Ridge and Valley; contains numerous low-elevation species absent from CEGL007692.
- *Quercus rubra - Acer rubrum / Pyrularia pubera / Thelypteris noveboracensis* Forest (CEGL006192) is a more acidic, montane oak forest.
- *Quercus rubra - Carya ovata - Fraxinus americana / Actaea racemosa - Hydrophyllum virginianum* Forest (CEGL008518) is similar but more northern in distribution; could be considered the Central Appalachian analogue of CEGL007692.
- *Quercus rubra - Tilia americana var. heterophylla - (Halesia tetraptera var. monticola) / Collinsonia canadensis - Prosartes lanuginosa* Forest (CEGL007878) is strongly dominated by *Quercus rubra* and is typically associated with middle-slope sites with high surficial rock cover.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Southern Appalachian montane oak-hickory forests that have a lush cover of mesophytic forbs. This association intergrades with higher-elevation oak forests.
Global Classification Comments: This association was originally defined based on occurrence information in the North Carolina Blue Ridge. More information is needed to better describe and define this association and its geographic distribution. Additional data on apparent occurrences have been collected in the Chattahoochee and

Cherokee national forests. In a regional analysis for the Appalachian Trail project and a follow-up comparative analysis with *Quercus rubra - Tilia americana var. heterophylla - Halesia tetraptera var. monticola / Collinsonia canadensis - Tradescantia subaspera* Forest (CEGL007878), 31 plots from Georgia, North Carolina, and Tennessee were classified as this type (Fleming and Patterson 2009a). The most constant and abundant species in these plots are *Quercus alba, Quercus rubra, Carya glabra, Liriodendron tulipifera, Acer rubrum, Fraxinus americana, Betula lenta, Magnolia acuminata, Castanea dentata, Cornus florida, Toxicodendron radicans, Smilax rotundifolia, Collinsonia canadensis, Actaea racemosa, Amphicarpaea bracteata, Maianthemum racemosum ssp. racemosum, Solidago curtisii, Polystichum acrostichoides, Eurybia divaricata*, and *Desmodium nudiflorum*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is found south of the Roanoke River in the Southern Appalachians. It was sampled on Chattahoochee National Forest and elsewhere in Georgia, North Carolina and Tennessee.
Global Range: This community occurs in the Southern Blue Ridge and adjacent inner Piedmont of the Carolinas, Georgia, and Tennessee in the eastern United States.
Nations: US
States/Provinces: GA, NC, SC, TN
TNC Ecoregions: 51:C, 52:C
USFS Ecoregions (1994/95): 231Ad:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAMO
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (9 plots; 13 observation points; 26 accuracy assessment points): APPA.0542, APPA.0547, APPA.0556, APPA.0561, APPA.0633, APPA.0635, APPA.0638, APPA.0640, APPA.0641, APPA.1033, APPA.1034, APPA.1036, APPA.1036B, APPA.1039, APPA.1047, APPA.1048, APPA.1052, APPA.1057, APPA.1066, APPA.1071, APPA.1098, APPA.1137, APPA_AA_0003, APPA_AA_0027, APPA_AA_0211, APPA_AA_0214, APPA_AA_0310, APPA_AA_0418, APPA_AA_0479, APPA_AA_0576, APPA_AA_0630, APPA_AA_0696, APPA_AA_0795, APPA_AA_0851, APPA_AA_0865, APPA_AA_0967, APPA_AA_1001, APPA_AA_1034, APPA_AA_1187, APPA_AA_1201, APPA_AA_1209, APPA_AA_1381, APPA_AA_1476, APPA_AA_1493, APPA_AA_1530, APPA_AA_1532, APPA_AA_1608, APPA_AA_1609.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): M.P. Schafale, T. Govus and R. White
References: Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 1998b, Schafale 1998b*, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data

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[CEGL006192] *Quercus rubra - Acer rubrum / Pyrularia pubera / Thelypteris noveboracensis* Forest

Translated Name: **Northern Red Oak - Red Maple / Buffalo-nut / New York Fern Forest**
Common Name: **Appalachian Montane Oak - Hickory Forest (Red Oak Type)**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Piedmont-Central Atlantic Coastal Plain Oak Forest (G165)
Alliance	*Quercus rubra* - *Quercus alba* - *Carya* spp. Piedmont Forest Alliance (A3293)

ELEMENT CONCEPT

Global Summary: This association includes *Quercus rubra* forests at intermediate elevations (mostly below 1067 m [3500 feet], ranging from 610-1220 m [2000-4000 feet]) occurring in the Southern Blue Ridge Escarpment, the Smoky Mountains and the Southern Blue Ridge. It may possibly range into adjacent areas of the Cumberland Plateau. These forests occur on mostly northern to eastern and southeastern, mid to upper, moderately steep slopes of intermediate exposure over acidic soils. The canopy is dominated by *Quercus rubra*, often with other oaks and

Acer rubrum and/or *Liriodendron tulipifera* codominating. Other minor canopy species may include *Betula lenta, Carya alba, Carya glabra, Halesia tetraptera, Quercus alba, Quercus prinus*, and *Magnolia fraseri*. In some examples, hickories are sparse or absent. The subcanopy and sapling strata include the canopy species, as well as *Halesia tetraptera, Betula lenta, Tsuga canadensis, Cornus florida, Acer pensylvanicum*, and *Oxydendrum arboreum*. The shrub stratum is typically sparse but may have local dominance by *Gaylussacia ursina* or *Rhododendron maximum*. Herbaceous cover is sparse to moderate but can be species-rich. Ferns can be locally dominant, typically *Thelypteris noveboracensis* and *Athyrium filix-femina ssp. asplenioides*. This forest is distinguished from High Elevation Red Oak forests[see associations in *Quercus rubra - Quercus alba* Montane Forest Alliance (A3116)] by lack of species such as *Betula alleghaniensis, Ilex montana, Vaccinium simulatum*, and by lacking abundant *Hamamelis virginiana*, as well as its occurrence at generally lower elevations. It is also characterized by having a more mixed oak composition (versus nearly monospecific *Quercus rubra*). In the Southern Blue Ridge Escarpment region, these montane oak-hickory forests seem to occupy environments intermediate between more-protected forests dominated by *Quercus alba* and drier more-exposed *Quercus prinus* forests.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This oak-hickory forest is found below 1,220 m (4,000 feet) elevation on somewhat steep mid to upper slopes with any aspect. Soils are mesic, well-drained loam, silt loam and sandy loam. The unvegetated surface is dominated by leaf litter with some downed wood. No evidence of disturbance was reported.

Global Environment: This association includes *Quercus rubra* forests at intermediate elevations (mostly below 1065 m [3500 feet], ranging from 610-1220 m [2000-4000 feet]) in the Southern Blue Ridge Escarpment to the Cumberlands and Southern Ridge and Valley (455-1005 m [1500-3300 feet]), the Smoky Mountains and the Southern Blue Ridge, and may possibly range into adjacent areas of the Cumberland Plateau. These forests occur on mostly northern to eastern and southeastern, mid to upper, moderately steep slopes of intermediate exposure over acidic soils. In the Southern Blue Ridge Escarpment region, these montane oak - hickory forests seem to occupy environments intermediate between more protected forests dominated by *Quercus alba* and drier, more exposed *Quercus prinus* forests.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is dominated by *Quercus rubra* and may include *Acer rubrum, Carya ovalis, Carya ovata, Liriodendron tulipifera, Quercus alba*, and *Quercus prinus*. Shrubs are sparse by may include *Magnolia acuminata, Pyrularia pubera*, and *Gaylussacia ursina*. The sparse to moderate herb layer is often dominated by ferns, including *Dennstaedtia punctilobula, Polystichum acrostichoides*, and *Thelypteris noveboracensis*. This community also supports NC-state imperiled *Eupatorium steelei* and TN-state imperiled *Brachyelytrum septentrionale*.

Global Vegetation: The canopy is dominated by *Quercus rubra*, often with other oaks and *Acer rubrum* and/or *Liriodendron tulipifera* codominating. Other minor canopy species may include *Betula lenta, Carya alba, Carya glabra, Halesia tetraptera, Quercus prinus*, and *Magnolia fraseri*. In some examples, hickories are sparse or absent. The subcanopy and sapling strata include the canopy species, as well as *Halesia tetraptera, Quercus alba, Betula lenta, Tsuga canadensis, Cornus florida, Acer pensylvanicum*, and *Oxydendrum arboreum*. The shrub stratum is typically sparse but may have local dominance by *Gaylussacia ursina* or *Rhododendron maximum*. Other typical species in the shrub stratum include *Castanea dentata, Calycanthus floridus, Pyrularia pubera, Rhododendron calendulaceum, Vaccinium corymbosum*, and *Viburnum acerifolium*. In the northernmost range of this association (northwestern North Carolina), *Calycanthus floridus* and *Gaylussacia ursina* are usually absent from the shrub layer. Herbaceous cover is sparse to moderate but can be species rich. Ferns can be locally dominant, typically *Thelypteris noveboracensis* and *Athyrium filix-femina ssp. asplenioides*. Other typical species include *Eurybia divaricata (= Aster divaricatus), Carex* spp. (e.g., *Carex aestivalis, Carex debilis, Carex digitalis, Carex laxiflora var. laxiflora, Carex pensylvanica), Chimaphila maculata (= var. maculata), Desmodium nudiflorum, Dioscorea quaternata, Eupatorium purpureum, Galium latifolium, Galax urceolata, Goodyera pubescens, Houstonia purpurea var. purpurea, Lysimachia quadrifolia, Maianthemum racemosum ssp. racemosum, Medeola virginiana, Polygonatum biflorum, Polystichum acrostichoides, Solidago curtisii (= Solidago caesia var. curtisii)*, and *Uvularia puberula*. Common vines are *Smilax rotundifolia, Smilax glauca*, and *Vitis aestivalis*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra*
Tree subcanopy	Broad-leaved deciduous tree	*Halesia tetraptera* var. *monticola*, *Oxydendrum arboreum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Calycanthus floridus*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia ursina*
Herb (field)	Flowering forb	*Galax urceolata*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Pyrularia pubera*, *Quercus rubra*, *Thelypteris noveboracensis*
Global: *Calycanthus floridus*, *Pyrularia pubera*, *Quercus rubra*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Brachyelytrum aristosum* (G5, TN state-imperiled), *Castanea dentata* (G4, TN state-imperiled), *Eupatorium steelei* (G4, NC state-imperiled)
Global: Vulnerable Plants: *Tsuga caroliniana* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (3-Jan-2000). This community is uncommon but secure within its range. It is often overlooked in surveys or not recognized as distinct, thus it is much more common than the number of documented occurrences suggests. Resolution of taxonomic issues that distinguish this community from similar associations may lead to a range extension.

RELATED CONCEPTS

Global Similar Types:

- *Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest (CEGL007230) contains more than 50% *Quercus alba* in the canopy.
- *Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest (CEGL007692) is usually dominated by *Quercus rubra, Quercus alba, Quercus velutina*, and/or *Carya* spp. but is generally not very high in fern cover and generally more diverse than CEGL006192.
- *Quercus rubra - Quercus prinus - Magnolia (acuminata, fraseri) / Acer pensylvanicum* Forest (CEGL004817) occurs in the northern part of the Southern Appalachians and is a mixed red oak - chestnut oak forest; is otherwise similar to CEGL006192 and could be considered a northern analogue of it.
- *Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis)* Forest (CEGL007300) is a high-elevation forest.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This community is much less species-rich than Appalachian Montane Oak - Hickory Forest (Rich Type) (CEGL007692). This group represents more-or-less mesic *Quercus rubra*-dominated forests occurring at elevations lower than high-elevation red oak types, from about 600 to 1,200 m (2,100-4,000 feet). It appears to be confined to the southern part of the Southern Appalachians, where high rainfall and microclimatic conditions may favor the dispersal of *Quercus rubra* forests to lower elevations than further north. This type is absent from southwestern Virginia, where similar red oak - chestnut oak vegetation occupies a comparable environmental niche.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: The NVC global description attributes this association to a large geographic area and says it is often overlooked and much more common than documented occurrences suggest. The association seems uncommon along and near the AT.
Global Classification Comments: This association was originally defined from the Chattooga Basin Project (S. Simon pers. comm.) and later refined with information from the Great Smoky Mountains. Global name and concept may need revision as more information becomes available. This association may be a subset of the more broadly defined *Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest (CEGL007230) but is distinguished by the dominance of *Quercus rubra*, its generally protected topographic setting, and may represent areas formerly dominated by *Quercus rubra* and *Castanea dentata*.

In a Southern Appalachian regional analysis (1134 plots) for the Appalachian Trail project, only nine North Carolina and Tennessee plots were classified as this type (Fleming and Patterson 2009a). This analysis confirms that this type does not reach Virginia, and suggests that its range is concentrated in the higher, more southern part of the Southern Appalachians (Great Smoky Mountains and Nantahala Mountains), where high rainfall and microclimatic conditions may favor the dispersal of *Quercus rubra* forests to lower elevations than further north. The most constant and abundant species in these plots are *Quercus rubra, Acer rubrum, Dioscorea quaternata, Thelypteris noveboracensis, Carya glabra, Acer pensylvanicum, Oxydendrum arboreum, Smilax rotundifolia, Gaylussacia ursina, Halesia tetraptera var. monticola, Rhododendron calendulaceum*, and *Castanea dentata*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled in the Great Smoky Mountains and Nantahala Mountains; it appears to be rather rare in the AT corridor.
Global Range: This association is found in the Southern Blue Ridge Escarpment and Cumberlands/Southern Ridge and Valley, the Smoky Mountains and the Southern Blue Ridge, and may possibly range into adjacent areas of the Cumberland Plateau.
Nations: US
States/Provinces: GA, KY, NC, SC, TN
TNC Ecoregions: 50:C, 51:C
USFS Ecoregions (1994/95): M221Cc:CCC, M221Ce:CCC, M221Dc:CCP, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Nantahala, Pisgah, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAMO
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 8 observation points; 16 accuracy assessment points): APPA.0175, APPA.1027, APPA.1042, APPA.1070, APPA.1072, APPA.1085, APPA.1089, APPA.1090, APPA.1115, APPA_AA_0080, APPA_AA_0256, APPA_AA_0326, APPA_AA_0354, APPA_AA_0474, APPA_AA_0555, APPA_AA_1084, APPA_AA_1088, APPA_AA_1326, APPA_AA_1336, APPA_AA_1386, APPA_AA_1392, APPA_AA_1412, APPA_AA_1483, APPA_AA_1528, APPA_AA_1561.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson, T. Govus and R. White
References: Allard 1990, Ambrose 1990a, Fleming and Patterson 2009a, Nelson 1986, Peet et al. unpubl. data, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Simon pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, White 2003, White 2006

G012. SHORTLEAF PINE - OAK FOREST & WOODLAND

Group Summary Description: This group encompasses forests and woodlands of the interior plateaus, Appalachians, Piedmont, Ozark-Ouachita, and upper coastal plain regions (north of the primary range of *Pinus palustris* in the coastal plains) in which *Pinus echinata* is the canopy dominant (or at least an important component). Examples can occur on a variety of topographic and landscape positions, including ridgetops, upper and midslopes, as well as lower elevations (generally below 700 m [2300 feet]) in the Southern Appalachians such as mountain valleys, as well as on rolling uplands in the Upper East Gulf Coastal Plain. Examples occur on a variety of acidic soils or bedrock types. Stands may be codominated by *Quercus* spp., *Carya* spp., and other hardwoods, with the varying proportion of pine versus hardwood depending on management (both commercial forestry and ecological management), particularly time since fire. Although examples of this group occur throughout this broad area, there is considerable local variation in their extent in the landscape and in their structure and composition. In more open

stands (such as ones in naturally drier regions or ones which have experienced more recent/frequent fire), the understory is characterized by *Andropogon gerardii, Schizachyrium scoparium*, and other prairie graminoid elements. In the lower elevations of the Southern Appalachians, and under current conditions, stands are dominated by *Pinus echinata* or *Pinus virginiana*. *Pinus rigida* may sometimes be present. Stands found outside of the coastal plains in which *Pinus palustris* is a component are also included here. Hardwoods are sometimes abundant, especially dry-site oaks such as *Quercus falcata, Quercus prinus, Quercus stellata*, and *Quercus coccinea*, but also *Carya glabra* and other hickories. The shrub layer may be well-developed, with *Vaccinium pallidum, Gaylussacia baccata*, or other acid-tolerant species being most characteristic. Herbs are usually sparse but may include *Pityopsis graminifolia* and *Tephrosia virginiana*. There is some regional variation in composition across the range of this group, with examples in the Ozark-Ouachita area and the upper coastal plain lacking *Pinus rigida, Pinus virginiana*, and *Quercus prinus*. In the upper coastal plains, where fire is more frequent, stands of vegetation affiliated with this group may develop a relatively pure and open canopy of *Pinus echinata* with scattered overstory trees and an herbaceous-dominated understory, but such examples are rare on the modern landscape unless maintained by ecological management. More typical are examples in which *Quercus* spp., *Carya* spp., *Liquidambar styraciflua, Liriodendron tulipifera, Acer* spp., and *Nyssa sylvatica* have become prominent in the midstory and overstory and in which herbaceous patches are rare.

A3269 *Pinus echinata - Pinus pungens - Quercus prinus* Appalachian Woodland Alliance

Alliance Summary Description: This Appalachian shortleaf pine - oak forest alliance is found in the Southern Blue Ridge and adjacent regions, including the Piedmont, Ridge and Valley, Central Appalachians and the Interior Low Plateau from Alabama and Georgia north and east to Kentucky, Virginia, the Carolinas, and possibly West Virginia. Stands of this alliance are typically dominated by *Pinus echinata* with dry-site oaks and other hardwoods. The typical oaks include *Quercus coccinea, Quercus prinus, Quercus stellata*, and/or *Quercus velutina*. Some stands may contain *Quercus falcata*. Other hardwoods may include *Acer rubrum, Carya glabra, Carya pallida, Cornus florida, Ilex opaca var. opaca, Nyssa sylvatica*, and/or *Oxydendrum arboreum*. The shrub layer is typically dominated by *Vaccinium pallidum*. Other shrubs include *Castanea pumila, Gaylussacia baccata, Gaylussacia ursina, Kalmia latifolia, Rhododendron calendulaceum, Rhododendron minus, Vaccinium arboreum*, and *Vaccinium stamineum*. The most frequent native grasses are *Danthonia spicata, Piptochaetium avenaceum*, and *Schizachyrium scoparium*. Typical forbs include *Antennaria plantaginifolia, Coreopsis major, Helianthus microcephalus, Pityopsis graminifolia var. latifolia, Symphyotrichum concolor*, and *Symphyotrichum patens*. These forests typically occur on exposed, rocky ridges and upper, convex slopes, as well as more protected sites. Species composition varies with bedrock geology, aspect, and degree of exposure.

[CEGL008500] *Pinus virginiana - (Pinus rigida, Pinus pungens) / Schizachyrium scoparium* Forest

Translated Name: **Virginia Pine - (Pitch Pine, Table Mountain Pine) / Little Bluestem Forest**
Common Name: **Appalachian Low-Elevation Mixed Pine / Little Bluestem Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Shortleaf Pine - Oak Forest & Woodland (G012)
Alliance	*Pinus echinata - Pinus pungens - Quercus prinus* Appalachian Woodland Alliance (A3269)

Element Concept

Global Summary: This community includes primarily *Pinus virginiana*-dominated vegetation of low-elevation ridges and steep slopes, occurring in the transition zone between the Southern Blue Ridge and Piedmont / Cumberlands and Southern Ridge and Valley, from eastern Tennessee, western North Carolina, western South Carolina and northern Georgia. It occurs on thin soils over a variety of rocky substrates, including quartzite, sandstone, phyllite, and others. The canopy varies from open to closed and may be solely dominated by *Pinus virginiana* or in some cases *Pinus rigida*, or an admixture of other species, including *Pinus pungens, Pinus echinata, Pinus rigida, Quercus coccinea, Quercus prinus*, and *Quercus velutina*. An open midstory of often stunted hardwoods, including *Quercus marilandica, Quercus falcata, Oxydendrum arboreum*, and *Acer rubrum*, may also be present. The open shrub layer typically includes *Vaccinium pallidum* and may include other members of the

Ericaceae, including *Vaccinium arboreum, Vaccinium stamineum, Gaylussacia dumosa, Kalmia latifolia, Vaccinium hirsutum, Gaultheria procumbens*, and *Epigaea repens*. The structure of the herbaceous layer is variable, but may provide up to 75% cover. It is dominated by *Schizachyrium scoparium*. Other characteristic herbaceous components include *Clitoria mariana, Coreopsis major, Dichanthelium commutatum, Eurybia surculosa, Sericocarpus asteroides, Sericocarpus linifolius, Silphium compositum, Solidago odora, Solidago speciosa, Sorghastrum nutans*, and *Tephrosia virginiana*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This rare, dry, acidic mixed pine-oak woodland was sampled at four locations in the park and is found below 610 m (2,000 feet) elevation. Sites range from somewhat steep to very steep slopes and rock outcrops with mostly southern aspects. Soils are shallow, very dry, well-drained sandy loam occurring on various acidic sedimentary rocks (but not shale). The unvegetated surface consists of large and small rocks, exposed bedrock and usually has a dense needle litter layer along with downed wood and bare soil. No evidence of disturbance was reported. These exposed sites are subject to wind and ice damage.

Global Environment: Stands of this forest occur on low-elevation ridges, steep slopes, and other exposed sites along the transition between the Southern Blue Ridge and Piedmont / Cumberlands and Southern Ridge and Valley, from eastern Tennessee, western North Carolina, western South Carolina and northern Georgia. They are found on thin soils over a variety of rocky substrates including quartzite, sandstone, phyllite, and others.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy and subcanopy are primarily dominated by *Pinus virginiana* but may be made up of a mix of various pines and oaks, including *Pinus rigida, Pinus pungens, Pinus echinata, Pinus strobus, Quercus coccinea, Quercus falcata, Quercus prinus*, and/or *Quercus rubra*. The shrub layers are dominated by *Kalmia latifolia, Vaccinium pallidum*, and *Vaccinium stamineum*. Dry woodland herbs include species such as *Schizachyrium scoparium, Solidago odora, Tephrosia virginiana, Chimaphila maculata, Coreopsis major, Galax urceolata, Gaultheria procumbens, Hieracium venosum, Houstonia longifolia*, and *Pityopsis graminifolia var. latifolia*.

Global Vegetation: The canopy varies from open to closed and may be solely dominated by *Pinus virginiana* or *Pinus rigida* or an admixture of other species, including *Pinus pungens, Pinus echinata, Pinus rigida, Quercus coccinea, Quercus prinus*, and *Quercus velutina*. An open midstory of often stunted hardwoods, including *Quercus marilandica, Quercus falcata, Oxydendrum arboreum*, and *Acer rubrum*, may also be present. The open shrub layer typically includes *Vaccinium pallidum* and may include other members of the Ericaceae, such as *Vaccinium arboreum, Vaccinium stamineum, Gaylussacia dumosa, Kalmia latifolia, Vaccinium hirsutum, Gaultheria procumbens*, and *Epigaea repens*. The structure of the herbaceous layer is variable but may provide up to 75% cover. It is dominated by *Schizachyrium scoparium*. Other characteristic herbaceous components include *Clitoria mariana, Coreopsis major, Dichanthelium commutatum, Eurybia surculosa, Sericocarpus asteroides, Sericocarpus linifolius, Silphium compositum, Solidago odora, Solidago speciosa, Sorghastrum nutans*, and *Tephrosia virginiana*.

Global Dynamics: The open canopy and diverse understory of this community can be the result of management, edaphic factors, or natural disturbances. While *Pinus virginiana* is a fire-intolerant species, many species found in examples of this community are fire-adapted or thrive in open, sunny habitats.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia latifolia*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus rigida*, *Pinus virginiana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Herb (field)	Graminoid	*Schizachyrium scoparium*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Coreopsis major*, *Kalmia latifolia*, *Pinus virginiana*, *Vaccinium pallidum*, *Vaccinium stamineum*

Global:

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Selaginella tortipila* (G3, Southern Appalachian endemic), *Vaccinium hirsutum* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (3-Sep-2002). This xeric evergreen forest community is restricted to ridges, xeric slopes, and other sites with favorable conditions for pines. It will be maintained on sites where these local soil conditions, topographic extremes, or occasional fire function to retard hardwood invasion. Infestations of southern pine beetle (*Dendroctonus frontalis*) can cause mortality of canopy trees. The grass-dominated herbaceous layer may deteriorate without fire.

RELATED CONCEPTS

Global Similar Types:

- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: *Pinus virginiana* is a very fire-intolerant tree that would quickly be replaced by *Pinus rigida* and other fire-tolerant species under a regime of frequent fire.
Global Classification Comments: This community is described from the Chattahoochee and Cherokee national forests and along the Nantahala Gorge in Swain County, North Carolina. It is differentiated from the similar *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119) by the more open canopy and understory and the dense, grass-dominated herbaceous layer. In the Appalachian Trail project (Fleming and Patterson 2009a), these two associations emerged as distinct in ordination and cluster analysis. In the most typical examples of this association (e.g., CHER.17, CHAT.76, and 020-05-0362), over 50% of the total species composition is herbaceous plants.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled in Nantahala National Forest (Nantahala Gorge) and Pisgah National Forest (Lovers Leap), North Carolina. Examples are scattered in the southern part of the Southern Appalachians.
Global Range: This community occurs primarily in the transition zone between the Southern Blue Ridge and Piedmont / Cumberlands and Southern Ridge and Valley, from eastern Tennessee, western North Carolina, western South Carolina and northern Georgia.
Nations: US
States/Provinces: AL?, GA, NC, SC?, TN
TNC Ecoregions: 50:?, 51:C, 52:C
USFS Ecoregions (1994/95): 231Ad:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WMDP
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (4 plots; 4 accuracy assessment points): APPA.0148, APPA.0166, APPA.0612, APPA.0622, APPA_AA_0332, APPA_AA_1256, APPA_AA_1509, APPA_AA_1517.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo
Global Description Author(s): J. Teague, T. Govus and K.D. Patterson
References: Ambrose 1990a, Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Pyne 1994, Schafale 2012, Schafale and Weakley 1990, Schotz pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

[CEGL007119] *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest

Translated Name: **Virginia Pine - (Pitch Pine, Shortleaf Pine) - (Chestnut Oak) / Blue Ridge Blueberry Forest**
Common Name: **Appalachian Low-Elevation Mixed Pine / Blue Ridge Blueberry Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Shortleaf Pine - Oak Forest & Woodland (G012)
Alliance	*Pinus echinata - Pinus pungens - Quercus prinus* Appalachian Woodland Alliance (A3269)

Element Concept

Global Summary: This community includes *Pinus virginiana*-dominated forests of low-elevation ridges and steep upper slopes, occurring primarily in the Appalachian provinces of the eastern United States, from southwestern Virginia, south and west to northern Georgia and northern Alabama. This community occurs on narrow ridges, steep slopes, and other topographic positions with high solar exposure, over shallow, infertile soils. This mainly evergreen forest is often of low stature, with a somewhat open to closed canopy, sparse to very dense shrub cover dominated by ericaceous species, and a sparse herb stratum. *Pinus virginiana* is the canopy dominant throughout the range of the type. In some parts of the range, other *Pinus* species may be significant canopy associates, as well as dry-site *Quercus* species (e.g., *Quercus prinus, Quercus coccinea*). Deciduous species may form a subcanopy or sapling stratum, particularly in areas where fire has been excluded. Common shrub dominants include *Vaccinium pallidum, Vaccinium stamineum, Gaylussacia baccata*, and *Kalmia latifolia*. Herbs vary with geography but are typical of infertile, xeric habitats. Some typical herbs in this forest are *Baptisia tinctoria, Chimaphila maculata, Dichanthelium commutatum, Epigaea repens, Euphorbia corollata, Galax urceolata, Gaultheria procumbens, Hypoxis hirsuta, Iris verna, Pityopsis graminifolia var. latifolia, Pteridium aquilinum var. latiusculum*, and *Schizachyrium scoparium*.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This low-elevation mixed pitch pine - Virginia pine / blueberry forest occurs on narrow ridges and knobs, steep upper slopes, bluff and clifftops below 850 m (2,800 feet) elevation. It is found on less disturbed soils and with historic disturbance by fire or logging without plowing. It was sampled on a steep southwest-facing upper slope. The soil is a dry, well-drained sandy loam. The unvegetated surface is dominated by leaf litter with some exposed bedrock, large and small rocks, downed wood and bare soil. No evidence of disturbance was reported.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This dry, later-successional pine forest (disturbed more than 25 years ago) is typically found on various acidic sedimentary rocks, in edaphically stressful habitats below 610 m (2,000 feet) elevation. One site was sampled in the Southern Blue Ridge project area in North Carolina on a gentle south-facing midslope with dry, well-drained sandy loam soil. The unvegetated surface contains needle leaf litter with small amounts of exposed bedrock, large/small rocks and bare soil.

Global Environment: Stands of this forest occur on narrow ridges and knobs, steep upper slopes, bluff and cliff tops, and other exposed sites throughout the range of the type. The community is found primarily on south-, southeast- or southwest-facing aspects on excessively drained, shallow soils. In the Blue Ridge Escarpment region, the western margin of the Blue Ridge, and west into the Ridge and Valley and Cumberland Mountains, this xeric forest occurs on convex slopes and ridges below 850 m (2800 feet) elevation, over soils classed as Inceptisols, typically Lithic Dystrochrepts originating from sandstone, shale and other noncalcareous parent material. Occurrences in rugged parts of the western Piedmont are also likely. Its environmental situation in the western Alleghenies is not known. In the Interior Low Plateau of Kentucky, Tennessee, and Indiana, this association occurs in edaphically extreme situations, including bluff tops and narrow ridges in thin soils weathered from relatively acidic caprocks with southern and western aspects, as well as other similar slopes, over cherty limestone, siltstones, sandstones, and shales. In particular, in the Knobstone Escarpment Subsection (a few Indiana counties just north of Louisville, Kentucky), it occurs in gladelike situations on steep slopes with thin soils. Along the edges of cliff tops, there is usually a narrow zone of exposed bedrock pavement and patches of very shallow soil, but soils become progressively deeper back from the cliff edge. At least in West Virginia, portions of the stands along the cliff edge are likely to be edaphic climax communities, but farther back from the edge, they are likely to be successional following fire.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is dominated by *Pinus virginiana, Pinus rigida*, and/or *Pinus echinata* typically with *Quercus prinus*. *Acer rubrum, Nyssa sylvatica*, and *Sassafras albidum* occur in the subcanopy. *Vaccinium pallidum, Kalmia latifolia*, and *Gaylussacia baccata* dominate the low-shrub layer. Herbaceous cover is very sparse.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This dry pine forest is dominated primarily by *Pinus virginiana* with admixtures of *Pinus echinata* and/or *Pinus rigida*. Additional tree species may include *Quercus prinus, Acer rubrum, Nyssa sylvatica, Quercus alba*, and *Quercus velutina*. Ericaceous shrubs dominate, primarily *Vaccinium pallidum*, but can also include *Gaylussacia baccata, Gaylussacia ursina*, and *Kalmia latifolia*. There is very little herbaceous cover.

Global Vegetation: This community is a needle-leaved evergreen forest with a usually somewhat open (occasionally closed) canopy. The canopy is typically short (<20 m) with tree height and canopy cover decreasing with increasing severity of the microsite. A deciduous subcanopy may be present. The shrub layers can be sparse but are more often dense to very dense and are composed of tall and short shrubs, predominantly ericaceous species. Herb cover is sparse, and leaf litter often dominates the ground layer. *Pinus virginiana* is the canopy dominant throughout the range of the type. In the Southern Appalachians and Southern Ridge and Valley it may occur with mixes of *Pinus rigida, Pinus echinata*, or *Pinus strobus*. Within its range, *Pinus pungens* may be present as a very minor component. Regeneration of *Pinus virginiana* is concentrated along cliff edges and tends to drop off inward from the edge. Small stems of *Quercus prinus, Quercus coccinea, Acer rubrum, Nyssa sylvatica*, and *Oxydendrum arboreum* are common in the subcanopy and sapling strata and may occur in the canopy as well. In the Southern Blue Ridge/Piedmont and Southern Blue Ridge/Ridge and Valley transition regions, *Quercus marilandica, Quercus falcata*, and *Quercus stellata* can be deciduous components. Common shrub dominants include *Vaccinium pallidum, Vaccinium stamineum, Gaylussacia baccata*, and *Kalmia latifolia*. Other typical shrubs can include *Gaylussacia ursina, Kalmia latifolia, Sassafras albidum*, and *Vaccinium hirsutum* (southwestern North Carolina and southeastern Tennessee only). *Smilax glauca* and *Smilax rotundifolia* can be common vines. In the sparse herb layer, characteristic species from the Southern Blue Ridge and Southern Ridge and Valley include *Baptisia tinctoria, Chimaphila maculata, Dichanthelium commutatum, Danthonia spicata, Epigaea repens, Euphorbia corollata, Galax urceolata, Gaultheria procumbens, Hypoxis hirsuta, Iris verna, Pityopsis graminifolia var. latifolia, Pteridium aquilinum var. latiusculum*, and *Schizachyrium scoparium*. Typical herbs from examples in the western portion of the range (Interior Low Plateau) include *Antennaria plantaginifolia, Antennaria solitaria, Carex albicans var. albicans (= Carex artitecta), Danthonia spicata, Dichanthelium dichotomum, Lespedeza violacea (= Lespedeza intermedia), Hieracium gronovii, Hieracium venosum, Krigia biflora, Solidago erecta*, and *Tephrosia virginiana* (M. Homoya pers. comm. 1999). In some of these examples *Opuntia humifusa, Calamagrostis porteri ssp. insperata*, and *Solidago squarrosa* may occur locally. Nonvascular plants have not been documented rangewide; West Virginia examples have identified lichen species including *Cladonia caroliniana, Cladonia squamosa, Cladina rangiferina (= Cladonia rangiferina), Cladonia pyxidata, Umbilicaria mammulata, Lasallia papulosa, Lasallia pensylvanica, Xanthoparmelia plittii, Xanthoparmelia conspersa*, and *Flavoparmelia caperata*, and moss species including *Leucobryum glaucum, Leucobryum albidum, Polytrichum juniperinum, Dicranum scoparium, Dicranum spurium, Dicranum condensatum, Hypnum imponens*, and *Thuidium delicatulum*. In Indiana's Knobstone Escarpment, this community provides habitat for that state's only endemic vascular plant, *Penstemon deamii*.

Global Dynamics: This xeric, evergreen forest community will be maintained on sites where local soil conditions and topographic extremes function to retard hardwood invasion. Although *Pinus virginiana* can become established by seed following fire, the trees are thin-barked and are easily killed by fire. Repeated burning is likely to select for *Pinus rigida* at the expense of *Pinus virginiana*. Infestations of southern pine beetle (*Dendroctonus frontalis*) can cause mortality of canopy trees. Examples affected by southern pine beetle in the Great Smoky Mountains can have up to 80-90% standing dead pine. This forest is also susceptible to damage by fire and has been found to be particularly sensitive to ozone, which causes foliar damage of *Pinus virginiana* (Burns and Honkala 1990a).

This community may occur as early- to late-successional stands. On sites where local soil conditions or topographic extremes retard succession and maintain pine dominance indefinitely, this community is considered a topo-edaphic climax. Other occurrences may be successional to forests with mixed deciduous-evergreen canopies dominated by mixtures of *Pinus (pungens, rigida, virginiana, echinata)* and *Quercus (coccinea, prinus)* species.

Throughout most of its range, this community occurs as linear features along ridgetops and may be adjacent to or grade into xeric forests dominated by *Quercus coccinea* or *Quercus prinus* or more mesic forests dominated by *Quercus alba, Quercus rubra, Quercus velutina, Carya glabra*, and *Carya alba*. In the Interior Low Plateau, individual stands can be small in size, occurring in a matrix of *Quercus prinus* or *Quercus prinus - Quercus alba*

forest (e.g., *Quercus prinus / Smilax* spp. Forest (CEGL005022) or *Quercus prinus - Quercus (alba, coccinea) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023)), but in more edaphically extreme circumstances.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus rigida*, *Pinus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium pallidum*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus rigida*, *Pinus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Nyssa sylvatica*, *Quercus prinus*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium pallidum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus rigida*, *Pinus virginiana*
Tree canopy	Broad-leaved deciduous tree	*Quercus coccinea* var. *coccinea*, *Quercus prinus*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium pallidum*, *Vaccinium stamineum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Pinus virginiana*, *Sassafras albidum*, *Vaccinium pallidum*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Nyssa sylvatica*, *Pinus rigida*, *Pinus virginiana*, *Quercus prinus*, *Vaccinium pallidum*

Global: *Cladonia caroliniana*, *Comptonia peregrina*, *Epigaea repens*, *Gaultheria procumbens*, *Leucobryum glaucum*, *Oxydendrum arboreum*, *Pinus virginiana*, *Pteridium aquilinum*, *Sassafras albidum*, *Schizachyrium scoparium* var. *scoparium*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Buckleya distichophylla* (G3), *Calamagrostis porteri* ssp. *insperata* (G4T3), *Coreopsis latifolia* (G3), *Coreopsis pulchra* (G2, Cumberland Plateau endemic), *Cuscuta harperi* (G2G3), *Diervilla rivularis* (G3), *Gaylussacia brachycera* (G3), *Helianthus longifolius* (G3, rare Cumberland Plateau endemic), *Penstemon deamii* (G1, IN endemic), *Rudbeckia heliopsidis* (G2), *Sabatia capitata* (G2, Cumberland Plateau endemic), *Talinum mengesii* (G3), *Thermopsis villosa* (G3?), *Vaccinium hirsutum* (G3); **Other Plants**: *Cleistes bifaria* (G4?), *Danthonia spicata* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (20-May-2011). This xeric evergreen forest community will be maintained on sites where local soil conditions, topographic extremes, or occasional fire function to retard hardwood invasion. Although not rare (more than 300 occurrences rangewide are estimated), this vegetation is threatened by infestations of southern pine beetle (*Dendroctonus frontalis*) that can cause mortality of canopy trees. Examples affected by southern pine beetle in the Great Smoky Mountains can have up to 80-90% standing dead pine. Infestations are wide-ranging and include most of the range of this association, and with fire suppression, killed stands convert to different vegetation over time. This vegetation is also threatened by climate change because higher temperatures exacerbate southern pine beetle infestations.

RELATED CONCEPTS

Global Similar Types:

- *Pinus (pungens, rigida) - Quercus prinus / (Quercus ilicifolia) / Gaylussacia baccata* Woodland (CEGL004996)
- *Pinus echinata - Quercus prinus - Quercus (coccinea, velutina)* Forest (CEGL004761)
- *Pinus echinata* Ruderal Forest (CEGL006327)
- *Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland (CEGL007097)

- *Pinus virginiana - (Pinus rigida) - Nyssa sylvatica / Xanthorhiza simplicissima / Euphorbia corollata* Forest (CEGL006624)
- *Pinus virginiana - (Pinus rigida, Pinus pungens) / Schizachyrium scoparium* Forest (CEGL008500) has a more open structure with relatively well-developed herbaceous stratum, often graminoid-dominated.
- *Pinus virginiana - Quercus falcata - Carya pallida* Forest (CEGL006354)
- *Pinus virginiana / Quercus marilandica* Serpentine Ruderal Forest (CEGL006266)
- *Pinus virginiana* Ruderal Forest (CEGL002591) is distinguished from this community by differences in land-use history; CEGL002591 exists in flat to moderately sloping land that was heavily plowed in the recent past (10-60 years), whereas this community is generally a product of less disturbed soils and more historic disturbance by fire or logging without plowing.
- *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271)
- *Quercus prinus - Quercus (alba, coccinea) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: See Global Comments.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This dry pine forest has a closed canopy with a more diverse structure and species composition than other pine communities.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: *Pinus virginiana* is a very fire-intolerant tree that would quickly be replaced by *Pinus rigida* and other fire-tolerant species under a regime of frequent fire.
Global Classification Comments: In Indiana examples, the substrate is primarily a matrix of acidic siltstone, shale, and sandstone. Rarely are cliffs formed; instead the setting is mostly very steep slopes with high hills and deep ravines. This association also includes vegetation from the transition between the Cumberland Plateau / Southern Ridge and Valley and the Upper East Gulf Coastal Plain in Alabama. Though located in the Coastal Plain, these occurrences are physiographically and floristically similar to this montane association. Related vegetation in Virginia has been treated as several associations within the Central Appalachian Shale Barren and Mountain / Piedmont Acidic Woodlands ecological groups (Fleming and Patterson 2011a).

Early-successional vegetation associated with old fields, old pastures, clearcuts, and burned or eroded areas and dominated by *Pinus virginiana* is classified as *Pinus virginiana* Ruderal Forest (CEGL002591). Appalachian xeric oak forests with similar floristics, but with a mainly deciduous canopy, are classed in *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271). Appalachian shale forests and woodlands with *Pinus virginiana* occur on steep, shaley slopes and have stunted canopies and sparse herb and shrub strata, characterized by species adapted to shaley substrates. These shale communities are classed in *Pinus virginiana - Quercus prinus* Acidic Shale Woodland Alliance (A3312). In 13 plots from the Southern Blue Ridge, species with ≥54% constancy and at least 10% mean cover are *Pinus virginiana, Vaccinium pallidum, Quercus prinus, Oxydendrum arboreum, Acer rubrum, Quercus coccinea, Nyssa sylvatica, Pinus rigida, Gaylussacia baccata*, and *Gaylussacia ursina*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from southwestern Virginia, south and west through the Ridge and Valley, Blue Ridge, and Cumberland Plateau to northern Georgia and Alabama. It was sampled in the Frogtown area of Clarke County, Virginia.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Xeric pine forest ranging throughout the Southern Appalachians and parts of the Central Appalachians, Interior Low Plateau, and Piedmont. This community was sampled at Tyre Knob in Nantahala National Forest, North Carolina.
Global Range: This community occurs primarily in the Appalachian region of the United States, ranging from southwestern Virginia, south and west through the Ridge and Valley, Blue Ridge, and Cumberland Plateau to northern Georgia and Alabama, extending westward to scattered areas in the Interior Low Plateau and eastward into the upper Piedmont. It is recorded from the states of Georgia, North Carolina, South Carolina, Tennessee, Kentucky, Pennsylvania, Indiana, Ohio, Maryland, and West Virginia.
Nations: US
States/Provinces: AL, GA, IN, KY, NC, OH, SC, TN, WV:S2
TNC Ecoregions: 43:C, 44:C, 49:C, 50:C, 51:C, 52:C, 59:C, 61:P

USFS Ecoregions (1994/95): 221Ea:CC?, 221Eb:CCC, 221Ec:CCC, 221Ed:CCP, 221Ef:CCC, 221Eg:CCC, 221Ha:CCC, 221Hc:CCC, 221He:CCC, 221Ja:CCC, 221Jb:CCC, 222Da:CCC, 222Dc:CCC, 222Dg:CCC, 222Dj:CCC, 222Eg:CCC, 222Ej:CCC, 222El:CCC, 222En:CCC, 222Eo:CCC, 222Fd:CCC, 222Ff:CCC, 231Aa:CCC, 231Ab:CCC, 231Ae:CCC, 231Bc:CCC, 231Cc:CCC, 231Cd:CCC, 231Da:CCC, 231Dc:CCC, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Bb:CCC, M221Bd:CCP, M221Be:CCP, M221Ca:CCC, M221Cb:CCC, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Chickamauga-Chattanooga, Gauley River, Great Smoky Mountains, Kennesaw Mountain, Kings Mountain?, Little River Canyon, Mammoth Cave, New River Gorge, Obed River); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Land Between the Lakes?, Nantahala, Pisgah, Sumter, Sumter (Mountains), Talladega, Talladega (Oakmulgee), Talladega (Talladega), Wayne)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WMDP
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (17 accuracy assessment points): APPA_AA_0019, APPA_AA_0039, APPA_AA_0096, APPA_AA_0228, APPA_AA_0295, APPA_AA_0300, APPA_AA_0315, APPA_AA_0404, APPA_AA_0567, APPA_AA_0713, APPA_AA_0745, APPA_AA_1099, APPA_AA_1172, APPA_AA_1226, APPA_AA_1257, APPA_AA_1369, APPA_AA_1491.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 observation point; 4 accuracy assessment points): APPA.0136, APPA_AA_0159, APPA_AA_0913, APPA_AA_1213, APPA_AA_1512.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson, R. White and S.C. Gawler
References: Allard 1990, Ambrose 1990a, Barden 1977, Burns and Honkala 1990a, CAP pers. comm. 1998, Cooper 1963, Core 1966, Evans 1991, Evans et al. 2009, Eyre 1980, Faller 1975, Fike 1999, Fleming and Patterson 2011a, Gan 2004, Gettman 1974, Harrison 2004, Harrison 2011, Homoya et al. 1988, Homoya pers. comm., Malter 1977, Maxwell 2006, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, ONHD unpubl. data, Patterson et al. 1999, Peet et al. unpubl. data, Pyne 1994, Pyne et al. 2010, Racine 1966, Rawinski 1992, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Schmalzer and DeSelm 1982, Schotz et al. 2008, Schotz pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Vanderhorst 2002b, Vanderhorst et al. 2007, Vanderhorst et al. 2010, WVNHP unpubl. data b, Walton et al. 1997, White and Govus 2005, Whittaker 1956

G159. SOUTH-CENTRAL INTERIOR OAK FOREST & WOODLAND

Group Summary Description: This group represents the dry-mesic hardwood forests that cover much of the landscape in a band of unglaciated terrain, between about 34°N latitude and 38°N latitude, extending west of the Appalachians, including the unglaciated part of the Interior Low Plateau, the Upper East Gulf Coastal Plain and Crowley's Ridge, and extending into the Ozarks and Ouachitas of Arkansas, Missouri and Oklahoma. A number of different *Quercus* species (including *Quercus alba, Quercus rubra, Quercus falcata, Quercus velutina* or *Quercus stellata, Quercus marilandica*, and *Quercus coccinea*) may dominate stands of this group, with *Carya* species also prominent, including *Carya alba, Carya glabra, Carya ovata, Carya pallida*, and others. East of the Mississippi River, in some drier examples on more acidic substrates, *Quercus prinus* is typical, reflecting relations with similar Appalachian forest groups further to the east. *Quercus alba* may also be present but not necessarily dominant, but will typically exhibit dominance in the submesic to dry-mesic examples, possibly with *Quercus falcata* and/or *Quercus velutina*. In addition, *Quercus coccinea, Quercus marilandica*, and/or *Quercus stellata* will also share dominance or be prominent in many of the drier examples. *Quercus muehlenbergii, Quercus pagoda*, and/or *Quercus shumardii* may appear in examples with high base status. Under current conditions, the understories are typically shrub- and small tree-dominated, with the typical species varying with aspect, soil, and moisture relations. More open canopies and grass-dominated understories may have been more prevalent prior to the mid-twentieth century, when open grazing and surface fires were more common. In the Interior Low Plateaus, the range of this group is generally consistent with the "Western Mesophytic" Forest region of Braun (1950), Keever (1971), and Greller (1988). Examples are typically found along ridgetops and slopes of various aspects. The floristic expression of different associations included in this group varies considerably with aspect and soil type. The associations range

along a moisture gradient from submesic to dry. The submesic to dry-mesic expressions tend to be found on mid slopes with northerly to easterly aspects, and the dry expressions on southerly to westerly aspects and on narrow ridges. Parent material can range from calcareous to acidic with very shallow, well- to excessively well-drained soils in the dry expressions and moderately well-drained soils in the submesic to dry-mesic ones. The canopy closure of this group ranges from closed to somewhat open in the dry examples. On Crowley's Ridge, the vegetation is very distinctive from that of the adjacent alluvial plain, and the sites occur on distinct slopes that rise above the alluvial plain surface. Occurrences of this group generally comprise dry-mesic forests that occupy west-facing slopes and narrow, "finger" ridgetops in a highly dissected landscape. Historically, these examples may have been more open under conditions of more frequent fire. In the Ozarks and Ouachitas, soils are typically moderately to well-drained and more fertile than those associated with oak woodlands. Wind, drought, lightning, and occasional fires can influence vegetation of this group.

A3289 *Quercus prinus - Quercus falcata* Forest Alliance

Alliance Summary Description: These are dry-mesic to mesic forests dominated or codominated by *Quercus prinus* with other *Quercus* species, found in a broad band from the Chesapeake Bay region, through the southern Piedmont of the Carolinas and Georgia, the Cumberlands/Ridge and Valley of Tennessee, Kentucky, and Alabama, and the Interior Low Plateau of Illinois, Indiana, and Ohio, marginally ranging into the adjacent Gulf Coastal Plain. *Quercus prinus* is typically the leading dominant in these forests, but other common canopy species can include *Acer rubrum, Carya alba, Carya glabra, Carya ovalis, Carya ovata, Carya pallida, Fagus grandifolia, Liriodendron tulipifera, Nyssa sylvatica, Pinus strobus, Quercus alba, Quercus coccinea, Quercus falcata, Quercus rubra*, and *Quercus velutina*. The subcanopy often contains *Cornus florida* and *Oxydendrum arboreum*. The ground flora varies depending on available light, moisture and soil nutrients but can be quite diverse, especially in associations with sparse shrub cover. In the Cumberland Plateau and other areas, forests in this alliance have replaced forests once dominated by *Castanea dentata* and often have chestnut sprouts in the understory. This represents the southern portion of the range of *Quercus prinus* exclusive of the Southern Blue Ridge region. Stands found within that region are only known from lower elevations (760-1035 m [2500-3400 feet]), on moderately sheltered low ridges and slopes, flats and valleys. Stands of this alliance are generally known from upper slopes, draws and gorge slopes in the Cumberland Plateau, and from upper to middle, dry-mesic slopes in the Piedmont. Some associations at least apparently occur on mafic or circumneutral substrates.

[CEGL007720] *Quercus prinus - Juniperus virginiana - (Pinus virginiana) / Philadelphus hirsutus - Celtis occidentalis* Woodland

Translated Name: **Chestnut Oak - Eastern Red-cedar - (Virginia Pine) / Streambank Mock Orange - Common Hackberry**
Woodland
Common Name: **Blue Ridge Calcareous Shale Slope Woodland**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	South-Central Interior Oak Forest & Woodland (G159)
Alliance	*Quercus prinus - Quercus falcata* Forest Alliance (A3289)

ELEMENT CONCEPT

Global Summary: These mixed or deciduous, edaphically-maintained woodlands are known from the Southern Blue Ridge of North Carolina, Tennessee, and Virginia, possibly ranging into the adjacent Ridge and Valley and Cumberland Mountains. They occur as small-patch openings on steep slopes, below 915 m (3000 feet) elevation, over outcrops of moderately calcareous shales, siltstones and sandstones. Habitats are extremely steep and rocky, with some parts mantled by thin soil over bedrock, and other parts covered by loose gravel-sized shale fragments. Trees are sparse and stunted, generally 2-10 m tall. Primary species include *Quercus prinus, Juniperus virginiana var. virginiana, Pinus virginiana*, and *Acer rubrum*. Some stands have *Carya glabra, Carya ovata, Carya carolinae-septentrionalis, Fraxinus americana, Quercus rubra, Ulmus alata*, and *Acer saccharum* as important canopy associates. Shrubs include *Philadelphus hirsutus, Ostrya virginiana, Cercis canadensis var. canadensis, Celtis occidentalis, Celtis tenuifolia, Acer leucoderme, Cornus florida, Staphylea trifolia, Chionanthus virginicus, Ulmus rubra, Ptelea trifoliata, Symphoricarpos orbiculatus*, and *Rhus copallinum var. latifolia*. *Toxicodendron radicans*

ssp. radicans and *Parthenocissus quinquefolia* are common scrambling vines. Herbs include *Sedum ternatum, Solidago* spp., *Danthonia sericea, Danthonia spicata, Andropogon virginicus, Carex pensylvanica, Paronychia argyrocoma, Selaginella rupestris, Houstonia longifolia (= var. compacta), Amsonia tabernaemontana, Dichanthelium boscii, Muhlenbergia tenuifolia, Packera obovata (= Senecio obovatus), Asclepias quadrifolia, Erigeron pulchellus, Polygala paucifolia, Arabis laevigata, Campanula divaricata*, and *Aristolochia serpentaria*. Some openings are very grassy and include species such as *Sorghastrum nutans, Andropogon gerardii, Muhlenbergia capillaris, Panicum* sp., *Coreopsis major, Baptisia tinctoria, Lechea racemulosa, Liatris* sp., and *Penstemon* sp. Additional herbs from stands assigned here from the Ocoee River Gorge (Tennessee) include *Chasmanthium latifolium, Solidago sphacelata, Carex purpurifera*, and *Symphyotrichum oblongifolium (= Aster oblongifolius)* (these dominant to frequent), as well as *Asplenium platyneuron, Carex laxiflora, Carex pensylvanica, Cheilanthes lanosa, Dichanthelium* sp., *Euphorbia corollata, Geum* sp., *Heuchera* sp., *Oxalis grandis, Rudbeckia triloba, Sedum nevii, Senna marilandica, Tradescantia* sp., *Verbesina occidentalis*, and *Verbesina virginica*.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This small-patch, rocky chestnut oak woodland generally occurs on calcareous shale at middle to lower elevations below 1,220 m (4,000 feet) (but rarely up to 1,340 m [4,400 feet]). The sampled site is a somewhat steep, north-facing upper slope with well-drained soil. The unvegetated surface is dominated by leaf litter with large rocks. Evidence of disturbance includes wind/ice damage from its exposed position.

Global Environment: This community is associated with steep slopes of the Southern Blue Ridge, below 915 m (3000 feet) elevation, over outcrops of moderately calcareous shales, siltstones and sandstones. Habitats are extremely steep and rocky, with some parts mantled by thin soil over bedrock, and other parts covered by loose gravel-sized shale fragments. Known stands are located on slopes fronting rivers and large streams, where downcutting over geological time has resulted in continual mass-wasting of the relatively soft shales. Quantitative soil chemistry data are not available, but the presence of some obligate nutrient-demanding species (e.g., *Philadelphus hirsutus, Acer leucoderme, Packera obovata, Solidago sphacelata*) and a conspicuous absence of ericaceous shrubs at every site is indicative of at least moderately calcareous soils. At the Virginia site, on a steep, southwest-facing sideslope along Whitetop Laurel Creek, calciphilic species tend to be concentrated on the lower, more erosive soils of the occurrence, and less common on more stable, upper slopes where bases have probably been leached. Bedrock is mapped as the Unicoi Formation, which here consists of conglomeratic sandstone and phyllite, with minor interbedded basalt. Numerous shaley-appearing outcrops and loose boulders cover about 50% of the slope where this community occurs. About 30% of the remaining surface substrate consists of exposed, dark-colored, clay-loam mineral soil with substantial coverage by mosses and lichens.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This is a deciduous or mostly deciduous small-patch, rocky woodland that occurs on calcareous shale, and is typically dominated by *Quercus prinus, Juniperus virginiana var. virginiana, Pinus virginiana*, and *Acer rubrum*. Some stands have *Carya glabra, Carya ovata, Carya carolinae-septentrionalis*, and *Fraxinus americana*. Typical shrubs include *Philadelphus hirsutus* and *Ostrya virginiana*. Other shrubs and small trees may include *Acer leucoderme, Cornus florida, Celtis tenuifolia, Staphylea trifolia, Cercis canadensis, Chionanthus virginicus, Ulmus rubra, Ptelea trifoliata*, and *Symphoricarpos orbiculatus*.

Global Vegetation: Trees are sparse and stunted, generally 2-10 m tall. Primary species include *Quercus prinus, Juniperus virginiana var. virginiana, Pinus virginiana*, and *Acer rubrum*. Some stands have *Carya glabra, Carya ovata, Carya carolinae-septentrionalis, Fraxinus americana, Quercus rubra, Ulmus alata*, and *Acer saccharum* as important canopy associates. Shrubs include *Philadelphus hirsutus, Ostrya virginiana, Cercis canadensis var. canadensis, Celtis occidentalis, Celtis tenuifolia, Acer leucoderme, Cornus florida, Staphylea trifolia, Chionanthus virginicus, Ulmus rubra, Ptelea trifoliata, Symphoricarpos orbiculatus*, and *Rhus copallinum var. latifolia*. *Toxicodendron radicans ssp. radicans* and *Parthenocissus quinquefolia* are common. Herbs include *Sedum ternatum, Solidago* spp., *Danthonia sericea, Danthonia spicata, Andropogon virginicus, Carex pensylvanica, Paronychia argyrocoma, Selaginella rupestris, Houstonia longifolia (= var. compacta), Amsonia tabernaemontana, Dichanthelium boscii, Muhlenbergia tenuifolia, Packera obovata (= Senecio obovatus), Asclepias quadrifolia, Erigeron pulchellus, Polygala paucifolia, Arabis laevigata, Campanula divaricata*, and *Aristolochia serpentaria*. Some openings are very grassy, and include species such as *Sorghastrum nutans, Andropogon gerardii, Muhlenbergia capillaris, Panicum* sp., *Coreopsis major, Baptisia tinctoria, Lechea racemulosa, Liatris* sp., and *Penstemon* sp. Additional herbs from stands assigned here from the Ocoee River Gorge (Tennessee) include *Chasmanthium latifolium, Solidago sphacelata, Carex purpurifera*, and *Symphyotrichum oblongifolium (= Aster*

oblongifolius) (these dominant to frequent), as well as *Asplenium platyneuron, Carex laxiflora, Carex pensylvanica, Cheilanthes lanosa, Dichanthelium* sp., *Euphorbia corollata, Geum* sp., *Heuchera* sp., *Oxalis grandis, Rudbeckia triloba, Sedum nevii, Senna marilandica, Tradescantia* sp., *Verbesina occidentalis*, and *Verbesina virginica*.

Stands included here from shale slopes above the French Broad River (Cherokee National Forest, Tennessee) are open stands on "sub-calcareous" shales. The vegetation has an open canopy of *Quercus prinus* with scattered examples of other woody plants. Other trees include *Ostrya virginiana, Ulmus alata, Quercus rubra, Carya pallida*, and *Pinus virginiana*. These are primarily deciduous stands, but with some pine. The stand in Virginia is a deciduous, apparently edaphically-maintained woodland dominated by stunted (6-10 m tall) *Quercus prinus* and *Carya glabra*, with less common associates of *Fraxinus americana, Carya ovata, Quercus rubra*, and *Acer saccharum*. Shrub cover varies from moderately to very dense and is dominated by patchy thickets of *Philadelphus hirsutus*. Associated small trees and shrubs include *Ostrya virginiana* and *Amelanchier arborea*. The herb layer is sparse on the steeper, more erosive slopes, becoming denser and more grass-dominated on the stabilized upper slope.

Global Dynamics: This community appears to be edaphically-maintained, but may also be maintained by periodic fires. The exotic grass *Microstegium vimineum* can be invasive in stands of this association.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya glabra*, *Fraxinus americana*, *Ostrya virginiana*, *Quercus prinus*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Philadelphus hirsutus*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya glabra*, *Fraxinus americana*, *Ostrya virginiana*, *Quercus prinus*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Philadelphus hirsutus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Carya glabra*, *Fraxinus americana*, *Ostrya virginiana*, *Philadelphus hirsutus*, *Quercus prinus*

Global: *Acer rubrum*, *Celtis occidentalis*, *Juniperus virginiana*, *Philadelphus hirsutus*, *Pinus virginiana*, *Quercus prinus*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Pycnanthemum curvipes* (G3), *Sedum nevii* (G3), *Thaspium pinnatifidum* (G2G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (24-Feb-2010). This Southern Blue Ridge shale woodland community is limited in occurrence to steep river-fronting slopes with moderately calcareous, exposed and eroding shale. This community appears to be edaphically-maintained, but may also be maintained by periodic fires. Fewer than 10 occurrences totaling less than 1000 acres are known. Threats are few, although logging in adjacent areas can cause unnatural disturbance or downslope erosion, along with alteration of light levels.

RELATED CONCEPTS

Global Similar Types:

- *Pinus virginiana / Vaccinium pallidum / Schizachyrium scoparium - Carex pensylvanica* Woodland (CEGL003624)
- *Quercus prinus - Pinus virginiana - (Pinus pungens) / Schizachyrium scoparium - Dichanthelium depauperatum* Woodland (CEGL008540)

CLASSIFICATION

Status: Standard

Classification Confidence: 3 - Weak

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This community was sampled once in APPA in Virginia on the slopes of Whitetop Laurel Creek.

Global Classification Comments: In a regional analysis for the Southern Appalachian portion of the Appalachian Trail (Fleming and Patterson 2009a), a small group of three plots was determined to be conceptually and floristically

consistent with this association. All three plots were formerly assigned to the all-deciduous type (former *Carya glabra - Fraxinus americana - Quercus prinus / Ostrya virginiana / Philadelphus hirsutus* Woodland (CEGL004995)), and a decision was made to merge that type into this one.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled in Virginia on the slopes of Whitetop Laurel Creek.
Global Range: This shale woodland is limited to the Southern Blue Ridge of North Carolina, Tennessee, and Virginia. Known stands are from the Hot Springs Window in North Carolina, the French Broad River and Ocoee River Gorge in Tennessee, and along Whitetop Laurel Creek near Damascus, Virginia.
Nations: US
States/Provinces: NC, TN, VA:S1
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Ce:C??, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot): APPA.0378.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A.S. Weakley and G.P. Fleming
References: Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

1.B.3. Temperate Flooded & Swamp Forest

1.B.3.Na. Eastern North American-Great Plains Flooded & Swamp Forest

M029. Central Hardwood Floodplain Forest

G652. Silver Maple - Green Ash - Sycamore Floodplain Forest

Group Summary Description: This group includes floodplain forests in the central and eastern United States and into southern Ontario, Canada. Stands are dominated by broad-leaved deciduous trees with a closed to moderately open canopy. Typical dominants include a combination of *Acer rubrum, Acer saccharinum, Acer saccharum, Fraxinus pennsylvanica, Platanus occidentalis, Populus deltoides*, and *Quercus macrocarpa*. This group occurs on sloping ridges, terraces, natural levees, or higher elevations that border rivers or streams. Examples occur on well-drained to poorly drained alluvial soils ranging from sands to clay. Sites are infrequently to frequently flooded.

A3710 *Acer saccharinum - Populus deltoides* Floodplain Forest Alliance

Alliance Summary Description: This alliance contains floodplain forests of major rivers in the central midwestern United States and in southern Ontario and southern Quebec, Canada, where *Acer saccharinum* and *Populus deltoides* are generally dominant. Other tree associates include *Celtis occidentalis, Ulmus americana, Acer negundo, Fraxinus pennsylvanica, Ulmus rubra, Betula nigra*, and *Salix nigra*. Stands occur on well-drained, sandy soils, on infrequently flooded bottomlands, on levees, and on deep silts on stabilized sites along larger rivers and lake margins.

[CEGL006147] *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Floodplain Forest

Translated Name: **Silver Maple - (Eastern Cottonwood) / Ostrich Fern - Canadian Woodnettle Floodplain Forest**
Common Name: **Silver Maple Floodplain Levee Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Green Ash - Sycamore Floodplain Forest (G652)
Alliance	*Acer saccharinum - Populus deltoides* Floodplain Forest Alliance (A3710)

Element Concept

Global Summary: These are silver maple floodplain forests along major rivers in the temperate northeastern United States. They occur on the deep, alluvial, silty to somewhat coarse soils of point bars, levees, and adjacent terraces of medium to large, high-energy and moderate-gradient rivers with heavy erosion and sedimentation, and are subjected to spring flooding. The more-or-less closed canopy is high and arching, and the dominant below-canopy feature is the lush and extensive herb layer, with ferns especially prominent. Shrubs are scattered and the overall shrub cover is low. Bryoids are very minor. The canopy is strongly dominated by *Acer saccharinum*. Other trees may be locally common, or scattered, including *Populus deltoides, Quercus rubra, Acer negundo, Ulmus rubra, Juglans nigra, Fraxinus americana*, and *Fraxinus pennsylvanica*. *Populus deltoides* tends to be characteristic of the siltier soils and levees within these forests. Typical shrubs include *Lindera benzoin, Cornus amomum, Sambucus canadensis*, and potentially invasive non-native *Lonicera* spp., *Rosa multiflora*, or *Ligustrum vulgare*. Vines such as *Vitis riparia* are common at some sites. The dominant herbs are *Matteuccia struthiopteris* and *Laportea canadensis*. Associated herbs include *Elymus riparius, Elymus virginicus, Amphicarpaea bracteata, Ageratina altissima (= Eupatorium rugosum), Arisaema triphyllum, Circaea lutetiana, Thalictrum pubescens, Onoclea sensibilis*, and *Polygonum virginianum (= Tovara virginiana)*. Particularly in the southern portions of this type's range, non-native herbs such as *Alliaria petiolata, Allium vineale, Ranunculus ficaria*, and *Microstegium vimineum* may essentially replace the native herbs. This association is distinguished from the related *Acer saccharinum / Onoclea sensibilis - Boehmeria cylindrica* Floodplain Forest (CEGL006176) by its greater abundance of *Matteuccia struthiopteris* relative to

Onoclea sensibilis and its better-drained soils. Flood duration is usually shorter in the ostrich fern type. It is distinguished from floodplain forests to the south by the absence (or only very rare presence) of *Platanus occidentalis* and *Celtis occidentalis*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This silver maple floodplain forest occurs on the deep, alluvial, silty to somewhat coarse soils of point bars, levees, and adjacent terraces of medium to large, high-energy and moderate-gradient rivers. It was sampled at two locations in the Central Appalachian project area. The sites are seasonally flooded bottomlands with moderately well-drained silty clay and sandy loam soil. Evidence of disturbance includes possible past clearing, road and railroad development, and the presence of exotic plant species.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: This silver maple floodplain forest is generally associated with coarser soils and a relatively shorter flood duration. It ranges from New England south to Pennsylvania and Maryland.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: These silver maple floodplain forests are found along major rivers in the temperate northeastern United States. They occur on the deep, alluvial, silty to somewhat coarse soils of point bars, levees, and adjacent terraces of medium to large, high-energy and moderate-gradient rivers with heavy erosion and sedimentation, and are subjected to spring flooding.
Global Environment: These are silver maple floodplain forests along major rivers in the temperate northeastern United States. They occur on the deep, alluvial, silty to somewhat coarse soils of point bars, levees, and adjacent terraces of medium to large, high-energy and moderate-gradient rivers with heavy erosion and sedimentation, and are subjected to spring flooding.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is dominated by high and arching *Acer saccharinum* with or without *Populus deltoides*. *Acer negundo, Ulmus rubra*, and *Fraxinus pennsylvanica* may be common in the canopy and subcanopy. The shrub layer is sparse but *Lindera benzoin* is often present. *Toxicodendron radicans* is a dominant vine. The lush herb layer includes *Boehmeria cylindrica, Impatiens* spp., *Laportea canadensis, Matteuccia struthiopteris*, and *Leersia oryzoides* along with invasive exotics such as *Alliaria petiolata, Lysimachia nummularia*, and *Microstegium vimineum*.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This floodplain forest is dominated by *Acer saccharinum* in the canopy with *Matteuccia struthiopteris* or *Laportea canadensis* prominent in the understory.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The more-or-less closed canopy is high and arching, and the dominant below-canopy feature is the lush and extensive herb layer, with ferns especially prominent. Shrubs are scattered and the overall shrub cover is low. Bryoids are very minor. The canopy is strongly dominated by *Acer saccharinum*. Other trees may be locally common, or scattered, including *Populus deltoides, Quercus rubra, Acer negundo, Ulmus rubra, Juglans nigra, Fraxinus americana*, and *Fraxinus pennsylvanica*. *Populus deltoides* tends to be characteristic of the siltier soils and levees within these forests. Typical shrubs include *Lindera benzoin, Cornus amomum, Sambucus canadensis*, and potentially invasive non-native *Lonicera* spp., *Rosa multiflora*, or *Ligustrum vulgare*. Vines such as *Vitis riparia* are common at some sites. The dominant herbs are *Matteuccia struthiopteris* and *Laportea canadensis*. Associated herbs include *Elymus riparius, Elymus virginicus, Amphicarpaea bracteata, Ageratina altissima (= Eupatorium rugosum), Arisaema triphyllum, Circaea lutetiana, Thalictrum pubescens, Onoclea sensibilis*, and *Polygonum virginianum (= Tovara virginiana)*. Particularly in the southern portions of this type's range, non-native herbs such as *Alliaria petiolata, Allium vineale, Ranunculus ficaria*, and *Microstegium vimineum* may essentially replace the native herbs.
Global Vegetation: The more-or-less closed canopy is high and arching, and the dominant below-canopy feature is the lush and extensive herb layer, with ferns especially prominent. Shrubs are scattered and the overall shrub cover is low. Bryoids are very minor. The canopy is strongly dominated by *Acer saccharinum*. Other trees may be locally common, or scattered, including *Populus deltoides, Quercus rubra, Acer negundo, Ulmus rubra, Juglans nigra, Fraxinus americana*, and *Fraxinus pennsylvanica*. *Populus deltoides* tends to be characteristic of the siltier soils and levees within these forests. Typical shrubs include *Lindera benzoin, Cornus amomum, Sambucus canadensis*, and potentially invasive non-native *Lonicera* spp., *Rosa multiflora*, or *Ligustrum vulgare*. Vines such as *Vitis riparia* are common at some sites. The dominant herbs are *Matteuccia struthiopteris* and *Laportea canadensis*. Associated herbs include *Elymus riparius, Elymus virginicus, Amphicarpaea bracteata, Ageratina altissima (= Eupatorium rugosum), Arisaema triphyllum, Circaea lutetiana, Thalictrum pubescens, Onoclea sensibilis*, and *Polygonum virginianum (= Tovara virginiana)*. Particularly in the southern portions of this type's range, non-native herbs such

as *Alliaria petiolata, Allium vineale, Ranunculus ficaria*, and *Microstegium vimineum* may essentially replace the native herbs.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Short shrub/sapling	Liana	*Toxicodendron radicans*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Herb (field)	Flowering forb	*Laportea canadensis*
Herb (field)	Fern (Spore-bearing forb)	*Matteuccia struthiopteris*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Cornus amomum*, *Lindera benzoin*, *Sambucus canadensis*
Herb (field)	Flowering forb	*Laportea canadensis*
Herb (field)	Fern (Spore-bearing forb)	*Matteuccia struthiopteris*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Cornus amomum*, *Lindera benzoin*, *Sambucus canadensis*
Herb (field)	Flowering forb	*Laportea canadensis*
Herb (field)	Fern (Spore-bearing forb)	*Matteuccia struthiopteris*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer saccharinum*, *Boehmeria cylindrica*
Appalachian National Scenic Trail (Lower New England Project Area): *Acer saccharinum*, *Laportea canadensis*, *Matteuccia struthiopteris*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer saccharinum*, *Cornus amomum*, *Laportea canadensis*, *Lindera benzoin*, *Matteuccia struthiopteris*
Global: *Acer saccharinum*, *Cornus amomum*, *Laportea canadensis*, *Lindera benzoin*, *Matteuccia struthiopteris*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Lysimachia nummularia* (Medium/Low), *Microstegium vimineum* (High/Medium), *Poa pratensis* (Medium), *Polygonum hydropiper*, *Polygonum persicaria*, *Rosa multiflora* (Medium/Low), *Rumex obtusifolius*
Global: Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Allium vineale* (Medium/Insignificant), *Ligustrum vulgare* (High/Medium), *Microstegium vimineum* (High/Medium), *Ranunculus ficaria* (Medium/Low), *Rosa multiflora* (Medium/Low); **Other Plants**: *Populus deltoides* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (14-Feb-2012). Despite its wide range and low state ranks, high-quality examples of this type are relatively uncommon. Major threats include invasive species.

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Floodplain Forest (CEGL006217)
- *Acer saccharinum - Fraxinus pennsylvanica - Ulmus americana* Floodplain Forest (CEGL002586) midwestern counterpart.
- *Acer saccharinum / Onoclea sensibilis - Boehmeria cylindrica* Floodplain Forest (CEGL006176)
- *Acer saccharinum* Floodplain Forest [Placeholder] (CEGL007304)

- *Acer saccharum* - *Fraxinus* spp. - *Tilia americana / Matteuccia struthiopteris* - *Ageratina altissima* Floodplain Forest (CEGL006114)
- *Platanus occidentalis* - *Fraxinus pennsylvanica* Floodplain Forest (CEGL006036)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed by the mapping reconnaissance team in Massachusetts during the summer of 2012.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This community was not observed, but placed in a map class with Silver Maple Floodplain Bottom Forest (Sensitive Fern Type) (CEGL006176) (observed).
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: Two variations in the herb flora have been described (NHNHI 2002). In the ostrich fern variant, *Matteuccia struthiopteris* is more abundant than *Laportea canadensis, Ageratina altissima*, and *Impatiens* spp. are often abundant, and *Toxicodendron radicans* and *Boehmeria cylindrica* are infrequent. In the wood nettle variant, *Laportea canadensis* exceeds *Matteuccia struthiopteris* in abundance, and *Toxicodendron radicans, Leersia virginica, Boehmeria cylindrica*, and *Cinna arundinacea* are more frequent and abundant.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from New England south to Pennsylvania and possibly Maryland. It was sampled in Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed by the UMESC mapping reconnaissance team in Massachusetts during the summer of 2012.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association may possibly occur in the Northern Appalachian project area, but no plots or observation points were collected.
Global Range: This association occurs in the northeastern United States from New Hampshire, Vermont, and New York south to Connecticut and Pennsylvania and possibly Maryland.
Nations: CA?, US
States/Provinces: CT, MA, MD?, NH:S2, NJ, NY, PA, QC?, VT:S3
TNC Ecoregions: 48:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Ga:CCC, 221Ak:CCC, 221Bc:CCC, 221D:C?, 222Ic:CCC, M212Ad:CCP, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cd:CCC, M212De:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Saratoga); USFWS (Great Meadows?, Montezuma)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FMHF
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed by the UMESC mapping reconnaissance team in Massachusetts during the summer of 2012 and during accuracy assessment.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: This community was not observed, but placed in a map class with Silver Maple Floodplain Bottom Forest (Sensitive Fern Type) (CEGL006176) (observed).
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 1 observation point; 8 accuracy assessment points): APPA.0103, APPA.1225, APPA_AA_0100, APPA_AA_0139, APPA_AA_0327, APPA_AA_0417, APPA_AA_0793, APPA_AA_0919, APPA_AA_1033, APPA_AA_1458.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 accuracy assessment points): APPA_AA_1843, APPA_AA_2324, APPA_AA_2988, APPA_AA_3259.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay

Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: Breden et al. 2001, CDPNQ unpubl. data, Cowardin et al. 1979, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Enser 1993, Eyre 1980, Fike 1999, Metzler 1984, Metzler and Barrett 1982, Metzler and Barrett 2001, Metzler and Barrett 2004, Metzler and Barrett 2006, Metzler and Damman 1985, NAP pers. comm. 1998, NRCS 2004a, Overlease 1987, Sperduto 2000b, Sperduto and Crowley 2002a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zimmerman 2011k, Zimmerman et al. 2012

[CEGL002586] *Acer saccharinum - Fraxinus pennsylvanica - Ulmus americana* Floodplain Forest

Translated Name: **Silver Maple - Green Ash - American Elm Floodplain Forest**
Common Name: **Midwestern Silver Maple - Elm Floodplain Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Green Ash - Sycamore Floodplain Forest (G652)
Alliance	*Acer saccharinum - Populus deltoides* Floodplain Forest Alliance (A3710)

Element Concept

Global Summary: This silver maple - green ash - elm - cottonwood forest is found throughout the midwestern United States and parts of the eastern United States. Stands occur on medium to large, regularly flooded floodplains. The canopy cover is more-or-less closed and dominated by *Acer saccharinum, Fraxinus pennsylvanica, Ulmus americana*, and *Populus deltoides*. Associated species may include *Ulmus rubra, Acer negundo, Salix nigra, Celtis occidentalis*, and *Carya cordiformis*. More southward, *Platanus occidentalis* and *Betula nigra* may occur. The shrub and sapling layer is often open (<25% cover). Species that may be present include *Sambucus canadensis, Rubus occidentalis*, or *Lindera benzoin*. Woody and herbaceous vines can be prominent, including among the woody vines *Parthenocissus quinquefolia, Toxicodendron radicans*, and *Vitis riparia*. Herbaceous vine species include *Apios americana, Amphicarpaea bracteata*, and *Echinocystis lobata*. Herbaceous grasses, forbs, and ferns dominate the ground layer, including *Symphyotrichum lateriflorum (= Aster lateriflorus), Boehmeria cylindrica, Erythronium americanum, Solidago gigantea, Cinna arundinacea, Leersia virginica, Elymus virginicus, Impatiens pallida, Laportea canadensis, Matteuccia struthiopteris, Onoclea sensibilis, Pilea pumila, Urtica dioica*, and others. A variety of exotics may be present, including *Lysimachia* spp., *Microstegium vimineum, Polygonum cuspidatum, Rosa multiflora*, and *Lonicera japonica*.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: Silver maple forest restricted to Delaware Water Gap National Recreation Area in the Lower New England project area.
Global Environment: This community occurs on terraces of medium to larger rivers. Soils may be well-drained and sandy, more loamy on infrequently flooded bottomlands and levees, or deep silts on stabilized sites of terraces along larger rivers. It appears to be favored by deposition of deep sandy sediments by low-energy floodwaters. The community may form small linear patches among other floodplain associations or be locally extensive. The structure and composition of the type is influenced by the flooding regime. Floods leave river-deposited debris on the forest floor, ice scars on trees, and abandoned channels that retain water at or above the level of the main river channel.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Acer negundo* may be a canopy associate but not dominant; *Platanus occidentalis* and *Betula nigra* codominant in canopy; additional canopy associates include *Ulmus americana, Ulmus rubra, Salix nigra, Celtis occidentalis, Carya cordiformis, Juglans nigra, Fraxinus pennsylvanica*, and occasionally *Halesia tetraptera*. The shrub and sapling layer is often open (<25% cover). Woody and herbaceous vines can be prominent. Grasses, forbs, and ferns dominate the ground layer.
Global Vegetation: The canopy cover is more-or-less closed and dominated by *Acer saccharinum, Fraxinus pennsylvanica, Ulmus americana*, and *Populus deltoides*. Associated species may include *Ulmus rubra, Acer negundo, Salix nigra, Celtis occidentalis*, and *Carya cordiformis*. More southward, *Platanus occidentalis* and *Betula nigra* may occur. The shrub and sapling layer is often open (<25% cover). Species that may be present include *Sambucus canadensis, Rubus occidentalis*, or *Lindera benzoin*. Woody and herbaceous vines can be prominent,

including among the woody vines *Parthenocissus quinquefolia, Toxicodendron radicans*, and *Vitis riparia*. Herbaceous vine species include *Apios americana, Amphicarpaea bracteata*, and *Echinocystis lobata*. Grasses, forbs, and ferns dominate the ground layer, including various combinations of *Symphyotrichum lateriflorum (= Aster lateriflorus), Boehmeria cylindrica, Chasmanthium latifolium, Cryptotaenia canadensis, Erythronium americanum, Solidago gigantea, Cinna arundinacea, Leersia virginica, Elymus virginicus, Helianthus* sp., *Impatiens capensis, Impatiens pallida, Laportea canadensis, Matteuccia struthiopteris, Menispermum canadense, Onoclea sensibilis, Pilea pumila, Polygonum virginianum, Rudbeckia laciniata, Verbesina alternifolia, Urtica dioica*, and others. A variety of exotics may be present, including *Lysimachia* spp., *Microstegium vimineum, Glechoma hederacea, Polygonum cuspidatum, Rosa multiflora*, and *Lonicera japonica*. Anderson (1996) notes that *Celtis occidentalis, Gleditsia triacanthos*, and *Aesculus glabra* may be more common along the calcareous streams of western Ohio.

Global Dynamics: The structure and composition of the type are influenced by the flooding regime, which is typically an annual flooding of relatively brief duration (several weeks), but may be absent in dry years or extensive during flash-flood years. Floods leave river-deposited debris on the forest floor, ice scars on trees, and abandoned channels that retain water at or above the level of the main river channel. Anderson (1996) describes the successional characteristics of many of the tree species in this type.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Tree subcanopy	Broad-leaved deciduous tree	*Acer negundo*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Herb (field)	Liana	*Parthenocissus quinquefolia*, *Toxicodendron radicans*
Herb (field)	Graminoid	*Leersia virginica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer negundo*, *Acer saccharinum*
Global: *Acer negundo*, *Acer saccharinum*, *Alliaria petiolata*, *Conium maculatum*, *Elymus virginicus*, *Glechoma hederacea*, *Humulus japonicus*, *Populus deltoides*, *Urtica dioica* ssp. *gracilis*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Conium maculatum* (Medium/Low), *Glechoma hederacea* (Low), *Humulus japonicus* (Medium/Low), *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum cuspidatum* (High/Medium), *Rosa multiflora* (Medium/Low); **Other Plants**: *Matteuccia struthiopteris* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (3-Oct-1996). There has been significant conversion of stands to agriculture, hydrologic modifications due to river dams, etc., and siltation caused by modified flooding regimes.

RELATED CONCEPTS

Global Similar Types:

- *Acer (rubrum, saccharinum) - Fraxinus* spp. - *Ulmus americana* Swamp Forest (CEGL005038) grades into this community in backwater swamps.
- *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Floodplain Forest (CEGL006147) is somewhat more northern, lacking *Platanus* and *Betula nigra*.
- *Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Floodplain Forest (CEGL006217)
- *Acer saccharinum - Betula nigra / Cephalanthus occidentalis* Floodplain Forest (CEGL007810)
- *Acer saccharinum - Celtis laevigata - Carya illinoinensis* Floodplain Forest (CEGL002431) is more southern.
- *Acer saccharinum* Floodplain Forest [Placeholder] (CEGL007304)
- *Fagus grandifolia - Quercus* spp. - *Acer rubrum - Juglans nigra* Floodplain Forest (CEGL005014) in the eastern part of its range on the mesic side.
- *Fraxinus nigra - Acer saccharinum* Upper Great Lakes Floodplain Forest (CEGL005488)

- *Fraxinus pennsylvanica - Ulmus americana - (Acer negundo, Tilia americana)* Great Plains Floodplain Forest (CEGL005400)
- *Fraxinus pennsylvanica - Ulmus* spp. - *Celtis occidentalis* Floodplain Forest (CEGL002014)
- *Platanus occidentalis - Acer saccharinum - Juglans nigra - Ulmus rubra* Floodplain Forest (CEGL007334) may overlap in southern parts of the range of CEGL002586.
- *Populus deltoides - Salix nigra - Acer saccharinum* Floodplain Forest (CEGL002018) grades into this community on the wetter side.
- *Quercus macrocarpa - Quercus bicolor - Carya laciniosa / Leersia* spp. - *Cinna* spp. Floodplain Forest (CEGL002098)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was mapped during the Delaware Water Gap National Recreation Area project. It was not observed within the APPA corridor in the project area; however, it is included in the classification to be comprehensive should the association be identified in the APPA corridor during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type (CEGL002586) includes stands where *Acer saccharinum* represents the majority of trees (>50% cover or basal area?). This type is most clearly expressed on medium to larger rivers, but occurs on higher flooded terraces. Compare with *Populus deltoides - Salix nigra - Acer saccharinum* Floodplain Forest (CEGL002018) (which also occurs on medium to large rivers but on more recently scoured sand bars and the inner most active part of the floodplain) and *Fraxinus pennsylvanica - Celtis occidentalis - Tilia americana - (Quercus macrocarpa)* Floodplain Forest (CEGL002081) (which occurs on the terraces of small to large river terraces). To some degree this type is more northern, separable from the more southern type *Acer saccharinum - Celtis laevigata - Carya illinoinensis* Floodplain Forest (CEGL002431), but this distinction is not yet well resolved. In the southern parts of its range, this type may overlap with *Platanus occidentalis - Acer saccharinum - Juglans nigra - Ulmus rubra* Floodplain Forest (CEGL007334), but that type is generally a higher terrace, small stream type. Compare this type with SAF cover type 62 (Eyre 1980). In Minnesota stands with less than either 50% cottonwood or silver maple and not in northwestern Minnesota tend to occur here (i.e., a mixed floodplain forest), as do silver maple stands with a supercanopy of cottonwoods. In southwestern Minnesota, stands with swamp white oak belong with *Quercus macrocarpa - Quercus bicolor - Carya laciniosa / Leersia* spp. - *Cinna* spp. Floodplain Forest (CEGL002098). *Fraxinus pennsylvanica* is a typical codominant in this type. In Wisconsin, this type may better be named *Acer saccharinum - Fraxinus pennsylvanica - Betula nigra* Forest (E. Epstein pers. comm. 1999).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community occurs in Delaware Water Gap National Recreation Area.
Global Range: This association is found throughout the midwestern United States and in the mid-Atlantic region of the eastern United States, ranging from Delaware, New Jersey, and Pennsylvania west to Minnesota, and south to Arkansas.
Nations: CA, US
States/Provinces: AR, DE, IA:SU, IL, IN, KY, MI, MN, MO, NJ, NY, OH, ON, PA, QC?, TN, WI:S3, WV:S3S4
TNC Ecoregions: 35:C, 36:C, 37:C, 38:C, 40:?, 42:C, 43:P, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fc:CCC, 212Hb:CCC, 212He:CCC, 212Hm:CCC, 212Ht:CCP, 212Hv:CCC, 212Hw:CCP, 212Hx:CCP, 212Hy:CCP, 212Ja:CCC, 212Je:CCC, 212Jf:CCC, 212Jj:CC?, 212Jl:CCC, 212Js:CCC, 212Ka:CC?, 212Kb:CCC, 212Mb:CPP, 212Na:CC?, 212Nb:CCP, 212Nc:CCC, 212Nd:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Ea:CCC, 221Ec:CCC, 221Ed:CCC, 221Ef:CCC, 221Fa:CCC, 222Aj:CCC, 222An:CCC, 222Ap:CCC, 222Aq:CCC, 222Ch:CCC, 222Db:CCC, 222Dc:CCP, 222De:CCC, 222Df:CCP, 222Ei:CPP, 222Ek:CPP, 222El:CPP, 222Em:CPP, 222Fa:CCP, 222Fb:CCC, 222Fc:CCP, 222Fd:CCP, 222Fe:CCP, 222Ff:CCP, 222Ga:CCC, 222Gb:CCC, 222Gc:CCC, 222Gd:CCP, 222Ge:CCC, 222Ha:CCC, 222Hb:CCC, 222Hc:CCC, 222Hf:CCC, 222If:CCC, 222Jb:CCC, 222Jh:CCC, 222Ji:CCC, 222Jj:CCC, 222Ka:CCC, 222Kb:CCC, 222Kd:CCC, 222Kf:CCC, 222Kg:CCC, 222Kh:CCC, 222Kj:CCP, 222Lc:CCC, 222Ld:CCC, 222Lf:CCC, 222Ma:CCC, 222Mb:CCC, 222Mc:CCC, 222Md:CCC, 222Me:CCC, 232Ac:CCC, 234Aa:CC?, 234Am:CCC, 234An:CCC, 251Ba:CCC, 251Be:CCC, 251Cc:CCC, 251Cd:CCC, 251Cf:CCC, 251Dd:CCP, 251De:CCC, 251Df:CCC, 251Dg:CCC, 251Dh:CCC, 251Eb:CCC, M221Cb:CCC

Federal Lands: NPS (Appalachian Trail [Lower New England], Buffalo River, Cuyahoga Valley, Delaware Water Gap, Effigy Mounds, Indiana Dunes, Mississippi, New River Gorge, Saint Croix, Upper Delaware); USFS (Chequamegon, Chequamegon-Nicolet, Chippewa, Hoosier, Huron-Manistee, Huron?, Manistee, Nicolet?, Ozark?, Wayne); USFWS (Erie, Ohio River Islands)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FMEF
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: Occurs outside the APPA corridor in Delaware Water Gap National Recreation Area.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 accuracy assessment points): APPA_AA_1981, APPA_AA_3261.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): D. Faber-Langendoen, L.A. Sneddon, E. Largay and S.C. Gawler
References: Anderson 1996, CAP pers. comm. 1998, CDPNQ unpubl. data, Chapman et al. 1989, Coxe 2009, Edinger et al. 2002, Eyre 1980, Faber-Langendoen 2001, Fike 1999, Homoya et al. 1988, Hop et al. 2005, Hop et al. 2009, INAI n.d., Kost et al. 2007, MNNHP 1993, Midwestern Ecology Working Group n.d.*, Minnesota DNR 2005a, Nelson 1985, Nelson 2010, ONHD unpubl. data, Perles et al. 2007, Perles et al. 2008, Podniesinski and Wagner 2002, TDNH unpubl. data, Vanderhorst et al. 2007, WNHI 2011, WNHI unpubl. data, WPC and TNC 2002, WVNHP unpubl. data b, Walton et al. 1996, White and Madany 1978, Zimmerman 2011k, Zimmerman et al. 2012

[CEGL006629] *Salix nigra - (Populus deltoides)* Floodplain Forest

Translated Name: **Black Willow - (Eastern Cottonwood) Floodplain Forest**
Common Name: **Eastern Black Willow Floodplain Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Green Ash - Sycamore Floodplain Forest (G652)
Alliance	*Acer saccharinum - Populus deltoides* Floodplain Forest Alliance (A3710)

ELEMENT CONCEPT

Global Summary: Stands occur on the banks of small to large low-gradient rivers where they are a component of point bar succession. The vegetation is a closed-canopy forest dominated by *Salix nigra*. Associates include *Platanus occidentalis* and *Populus deltoides*. Surface water is present for brief periods during the growing season, but the water table usually lies well below soil surface.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: No data available.
Global Environment: Stands occur on the banks of small to large low-gradient rivers where they are a component of point bar succession.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The floodplain forest vegetation is a closed-canopy forest dominated by *Salix nigra*. *Populus deltoides* is a primary canopy associate.
Global Vegetation: The vegetation is a closed-canopy floodplain forest dominated by *Salix nigra*. *Populus deltoides* is a primary canopy associate.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Platanus occidentalis*, *Populus deltoides*, *Salix nigra*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Salix nigra*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Salix nigra*
Global: *Salix nigra*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (7-May-2013).

RELATED CONCEPTS

Global Similar Types:
- *Salix nigra* Central Floodplain Forest (CEGL002103)
- *Salix nigra* Ozark Floodplain Forest (CEGL007092)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed by the UMESC mapping team just below Great Falls, CT during map reconnaissance. No observation points or plots were collected.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: More plot and observation point data is needed to complete the full vegetation and environmental descriptions for this community.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: Observed within the Appalachian Trail corridor in CT.
Global Range: The black willow forest type is found widely, but sporadically across the northeastern United States, ranging from DE north to Massachusetts.
Nations: US
States/Provinces: CT, DE
TNC Ecoregions: 61:C
USFS Ecoregions (1994/95): 221Db:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FFAW
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 accuracy assessment points): APPA_AA_1952, APPA_AA_2007, APPA_AA_2084.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): E. Largay
References: Eastern Ecology Working Group n.d.*

G673. SILVER MAPLE - SUGARBERRY - SWEETGUM FLOODPLAIN FOREST

Group Summary Description: Stands of these floodplain forests are dominated by some combination of *Acer saccharinum, Betula nigra, Celtis laevigata, Fraxinus pennsylvanica, Liquidambar styraciflua, Liriodendron tulipifera, Platanus occidentalis*, and *Ulmus americana*. Other species that may be present include *Acer negundo*. This complex and widespread group is found in a broad band in the northeastern and middle parts of the eastern United States from southern New England and the Ontario lakeplains of New York south and west through the Interior Low Plateau of Ohio, Indiana, Illinois and Kentucky to the Ozarks of Arkansas and Missouri.

A3697 *Acer saccharinum - Acer negundo* Appalachian-Piedmont Floodplain Forest Alliance

Alliance Summary Description: This alliance contains floodplain forests where *Acer saccharinum* is prevalent. Other tree associates include *Acer negundo, Betula nigra, Fraxinus pennsylvanica, Platanus occidentalis, Populus deltoides, Quercus palustris, Salix nigra, Ulmus americana*, and *Ulmus rubra*. Common shrub species include *Alnus serrulata, Asimina triloba, Cephalanthus occidentalis, Ilex decidua*, and *Lindera benzoin*. Characteristic herbs include *Boehmeria cylindrica, Impatiens capensis, Laportea canadensis, Leersia lenticularis, Matteuccia struthiopteris, Onoclea sensibilis, Pilea pumila*, and others. This alliance occurs along major rivers in the Piedmont, Central Appalachians, and Chesapeake Bay regions from Maryland and Virginia north to Pennsylvania and New Jersey.

[CEGL006217] *Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Floodplain Forest

Translated Name: **Silver Maple - Box-elder / White Snakeroot - Canadian Woodnettle - (Virginia Wildrye) Floodplain Forest**

Common Name: **Piedmont-Central Appalachian Silver Maple Floodplain Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Sugarberry - Sweetgum Floodplain Forest (G673)
Alliance	*Acer saccharinum - Acer negundo* Appalachian-Piedmont Floodplain Forest Alliance (A3697)

Element Concept

Global Summary: This is a forested community of large river floodplains in the Mid-Atlantic states of Maryland, Virginia, West Virginia, and Pennsylvania. These forests occupy banks and first bottoms of major rivers with nutrient-rich silt loams, sand loams, and sands that are temporarily inundated, annually or less often, in major flood events. Canopies are closed and dominated by *Acer saccharinum*, with *Acer negundo* dominating a subcanopy layer. Other minor overstory and understory associates include *Populus deltoides, Celtis occidentalis, Fraxinus pennsylvanica, Ulmus americana*, and *Juglans nigra*. The shrub layer ranges from sparse to dense but is usually dominated by *Lindera benzoin*. Characteristic species of the herb layer are *Ageratina altissima, Laportea canadensis, Impatiens pallida, Viola sororia, Leersia virginica, Verbesina alternifolia, Urtica dioica ssp. dioica, Elymus virginicus, Elymus riparius, Geum canadense, Pilea pumila, Rudbeckia laciniata*, and *Cryptotaenia canadensis*. Vines of *Toxicodendron radicans* and *Parthenocissus quinquefolia* are common. Early-successional stands are usually strongly dominated by even-aged *Acer saccharinum*.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This silver maple forest is restricted to large river floodplains, where it occurs on first bottoms and banks immediately adjacent to the river. It was sampled at two locations in the Central Appalachian project area. One site is a seasonally flooded alluvial terrace with well-drained sand soil. The unvegetated surface is dominated by exposed sand with some leaf litter and downed wood. Evidence of disturbance includes the presence of exotic plant species.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This silver maple forest is restricted to large river floodplains, where it occurs on first bottoms and banks immediately adjacent to the river. Its range overlaps between the Central Appalachian project area and Lower New England project area from Maryland north to Massachusetts. Sites are seasonally or temporarily flooded alluvial terraces and floodplains. Soils are somewhat to very poorly drained clay, loam and sand. The unvegetated surface consists of leaf litter, with lesser amounts of downed wood, large rocks, and/or bare soil. Evidence of disturbance includes alterations to hydrology, period flooding, erosion, grazing/browsing, and the presence of exotic plants.

Global Environment: This community is restricted to large river floodplains, where it occurs on first bottoms and banks immediately adjacent to the river. Sites are usually well-drained to moderately well-drained. Soils are nutrient-rich with textures ranging from silt loams to sandy loams and occasionally sands. Habitats are temporarily inundated, annually or less often, in major flood events. In the Potomac Gorge, the average flood-return interval was from about 0.5 to 2.5 years (Lea 2000).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is dominated by *Acer saccharinum*, occasionally with *Platanus occidentalis* codominating. *Acer negundo* dominates the subcanopy layer. Other minor overstory and understory associates include *Populus deltoides, Celtis occidentalis, Fraxinus pennsylvanica, Ulmus americana*, and *Juglans nigra*. *Lindera benzoin* is dominant in the shrub layer. Characteristic species of the herb layer are *Ageratina altissima, Laportea canadensis, Impatiens pallida, Viola sororia, Leersia virginica, Verbesina alternifolia*, and others. Exotic species, particularly *Microstegium vimineum*, can be a problem in these naturally-disturbed sites.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These early-successional stands are usually strongly dominated by even-aged *Acer saccharinum*. *Acer negundo* is codominant in the subcanopy and/or canopy. *Lindera benzoin* is the dominant short shrub. Characteristic and/or abundant species of the herb layer are *Boehmeria cylindrica, Laportea canadensis, Impatiens pallida, Leersia virginica, Onoclea sensibilis, Elymus virginicus*, and the invasive exotic Microstegium vimineum. In addition, this community supports NY state-critically imperiled *Carex bullata*.

Global Vegetation: This community is a closed forest typically dominated by *Acer saccharinum*, with *Acer negundo* dominating a subcanopy layer. Along the Potomac, particularly on sandier sites, *Platanus occidentalis* may codominate the canopy layer. Minor overstory and understory associates include *Populus deltoides, Celtis occidentalis, Fraxinus pennsylvanica, Ulmus americana*, and *Juglans nigra*. At topographically lower sites, the shrub layer is often sparse; on higher surfaces, it may be moderately dense, with *Lindera benzoin* usually the dominant species. Characteristic species of the herb layer are *Ageratina altissima, Laportea canadensis, Impatiens pallida, Viola sororia, Leersia virginica, Verbesina alternifolia, Urtica dioica ssp. dioica, Elymus virginicus, Elymus riparius, Geum canadense, Pilea pumila, Rudbeckia laciniata*, and *Cryptotaenia canadensis*. Vines of *Toxicodendron radicans* and *Parthenocissus quinquefolia* are common. Invasive introduced species such as *Alliaria petiolata, Stellaria media, Microstegium vimineum, Glechoma hederacea, Urtica dioica ssp. dioica*, and *Humulus japonicus* are often rampant in this vegetation type. Early-successional stands are assigned to the same type and are usually strongly dominated by even-aged *Acer saccharinum*.

Global Dynamics: Early-successional stands are usually strongly dominated by even-aged *Acer saccharinum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Tree subcanopy	Broad-leaved deciduous tree	*Acer negundo*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Flowering forb	*Laportea canadensis*
Herb (field)	Graminoid	*Microstegium vimineum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Tree subcanopy	Broad-leaved deciduous tree	*Acer negundo*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer negundo*, *Acer saccharinum*, *Ageratina altissima*, *Laportea canadensis*, *Leersia virginica*, *Lindera benzoin*

Appalachian National Scenic Trail (Lower New England Project Area): *Acer saccharinum*, *Boehmeria cylindrica*, *Laportea canadensis*, *Leersia virginica*, *Lindera benzoin*, *Microstegium vimineum*, *Onoclea sensibilis*

Global: *Acer negundo*, *Acer saccharinum*, *Ageratina altissima*, *Cryptotaenia canadensis*, *Elymus riparius*, *Elymus virginicus*, *Geum canadense*, *Impatiens pallida*, *Laportea canadensis*, *Leersia virginica*, *Lindera benzoin*, *Parthenocissus quinquefolia*, *Pilea pumila*, *Rudbeckia laciniata*, *Toxicodendron radicans*, *Urtica dioica*, *Verbesina alternifolia*, *Viola sororia*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Commelina communis*, *Conium maculatum* (Medium/Low), *Hedera helix* (High/Medium), *Microstegium vimineum* (High/Medium)
Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Carex bullata* (G5, NY state-critically imperiled); **Invasive/Exotic Plants**: *Acer platanoides* (High/Medium), *Alliaria petiolata* (High/Medium), *Berberis thunbergii* (High/Medium), *Hesperis matronalis* (Medium/Low), *Iris pseudacorus* (High/Medium), *Lonicera morrowii* (High/Medium), *Lysimachia nummularia* (Medium/Low), *Microstegium vimineum* (High/Medium), *Polygonum cuspidatum* (High/Medium), *Rosa multiflora* (Medium/Low)
Global: Invasive/Exotic Plants: *Urtica dioica*

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (24-Jan-2005). The type is not rare but has a restricted geographic range, is confined to larger rivers in the Mid-Atlantic region, and is subject to continuing degradation by invasive species.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Floodplain Forest (CEGL006147)
- *Acer saccharinum - Fraxinus pennsylvanica - Ulmus americana* Floodplain Forest (CEGL002586)
- *Acer saccharinum* Floodplain Forest [Placeholder] (CEGL007304)
- *Platanus occidentalis - Acer negundo - Juglans nigra / Asimina triloba / Mertensia virginica* Floodplain Forest (CEGL004073)
- *Platanus occidentalis - Acer saccharinum - Juglans nigra - Ulmus rubra* Floodplain Forest (CEGL007334)
- *Platanus occidentalis - Fraxinus pennsylvanica - Acer negundo / Sanicula odorata - Elymus virginicus* Floodplain Forest (CEGL006475)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type was defined through analysis of 41 plot samples from Virginia and Maryland and through consultation with ecologists from those states and West Virginia. It has also been confirmed for Pennsylvania by ecologists in that state. Data analysis supports the decision to split this unit from the more broadly defined USNVC unit *Acer saccharinum - Fraxinus pennsylvanica - Ulmus americana* Floodplain Forest (CEGL002586).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is found on floodplains of major Mid-Atlantic rivers in New Jersey, Maryland, West Virginia, Virginia and Pennsylvania. It was sampled in Maryland near the C&O Canal along the Potomac River and in Monroe County, Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Housatonic River Floodplain Natural Heritage Site in Massachusetts, at Pochuck Creek in New Jersey, and at Wallkill River in New York.
Global Range: This community occurs on floodplains of major Mid-Atlantic rivers, including the Potomac, Shenandoah, James, Rappahannock, Monocacy, and Susquehanna, extending north to Massachusetts.
Nations: US
States/Provinces: DC, MA, MD:S4, NJ, NY, PA, VA:S4, WV
TNC Ecoregions: 52:C, 58:C, 59:C, 61:C
USFS Ecoregions (1994/95): 222Db:CCC, 231Ae:CCC, 231Ak:CCC, 231Al:CCC, 231An:CCC, 231Ap:CCC, 232Ad:CCC, 232Br:CCC, M221Aa:CCC, M221Ab:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Blue Ridge Parkway, C&O Canal, Fredericksburg-Spotsylvania, George Washington Parkway, Harpers Ferry, Monocacy, National Capital-East); USFS (George Washington); USFWS (National Conservation Training Center)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FMHF
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 2 observation points; 16 accuracy assessment points): APPA.0661, APPA.1226, APPA.1329, APPA_AA_0108, APPA_AA_0112, APPA_AA_0200, APPA_AA_0335, APPA_AA_0373, APPA_AA_0660, APPA_AA_0869, APPA_AA_0916, APPA_AA_0946, APPA_AA_0988, APPA_AA_1043, APPA_AA_1077, APPA_AA_1158, APPA_AA_1183, APPA_AA_1246, APPA_AA_1262.

Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 plots; 2 accuracy assessment points): APPA.0048, APPA.0913, APPA.0914, APPA.0918, APPA_AA_1780, APPA_AA_3278.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and K.D. Patterson
References: Eastern Ecology Working Group n.d., Fleming 2002b, Fleming 2007, Fleming and Coulling 2001, Fleming and Patterson 2003, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming pers. comm., Fowells 1965, Harrison 2004, Harrison 2011, Lea 2000, Lea 2004, Patterson 2008e, Podniesinski and Wagner 2002, Taverna and Patterson 2008, Thomson et al. 1999, VDNH 2003, VDNH 2003*, Vanderhorst 2000b

A3699 *Betula nigra - Platanus occidentalis* Appalachian-Piedmont Floodplain Forest Alliance

Alliance Summary Description: These forests are dominated by *Betula nigra* and *Platanus occidentalis* with a variety of other canopy species, including *Acer negundo, Acer saccharinum, Celtis laevigata, Liquidambar styraciflua, Liriodendron tulipifera, Populus deltoides*, and *Salix nigra*. The subcanopy or tall-shrub strata may include *Cornus florida* and *Carpinus caroliniana*, along with *Acer rubrum, Carya* spp., *Ilex opaca, Prunus serotina*, and *Ulmus alata*. The shrub layer is often sparse with such species as *Asimina triloba, Crataegus marshallii, Crataegus viridis*, and *Lindera benzoin* present. Vines include *Berchemia scandens, Bignonia capreolata, Campsis radicans, Parthenocissus quinquefolia, Toxicodendron radicans*, and *Vitis rotundifolia*. Herbaceous species include *Arundinaria gigantea, Boehmeria cylindrica, Chasmanthium latifolium (= Uniola latifolia), Elymus hystrix, Impatiens capensis, Pilea pumila, Podophyllum peltatum*, and *Stellaria pubera*. These forests are found in riverfronts areas from the Alleghany Plateau of Pennsylvania east through the Appalachians of West Virginia and Virginia, south to the Piedmont of the Carolinas and Georgia and north to New York and New Jersey. These riverfronts experience frequent, repeated, natural disturbance in the form of flooding. They occur more frequently on sandy soils than on heavier soils, and their most characteristic location is on levees. The soils are deep and well-drained with low organic matter content and are most commonly of the Orders Inceptisol and Entisol.

[CEGL003896] *Platanus occidentalis - Betula nigra - Salix (caroliniana, nigra)* Floodplain Forest

Translated Name: **American Sycamore - River Birch - (Coastal Plain Willow, Black Willow) Floodplain Forest**
Common Name: **Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Sugarberry - Sweetgum Floodplain Forest (G673)
Alliance	*Betula nigra - Platanus occidentalis* Appalachian-Piedmont Floodplain Forest Alliance (A3699)

ELEMENT CONCEPT

Global Summary: This early-successional woodland community of coarse-textured (cobbly / bouldery) to fine-textured (silty or muddy) depositional bars and islands occurs along rivers and large streams in the High Allegheny Plateau, Central Appalachians, and Lower New England ecoregions. It is subject to relatively frequent and powerful flooding and ice-scouring and has a highly variable physiognomy. It is dominated by stunted, usually battered and flood-trained trees (varying from <5 to >10 m tall) of *Platanus occidentalis* and *Betula nigra*. *Salix caroliniana* and

Salix nigra are dominant or codominant in a minority of stands. Other floodplain trees, particularly *Acer saccharinum* and *Fraxinus pennsylvanica*, may occur as minor associates. Shrub associates include *Cornus amomum, Salix sericea, Alnus serrulata*, and sometimes *Cephalanthus occidentalis* or *Physocarpus opulifolius*. The herbaceous layer ranges from sparse to moderately dense. Characteristic herbs include *Apocynum cannabinum, Polygonum virginianum, Polygonum hydropiper, Polygonum pensylvanicum, Polygonum hydropiperoides, Polygonum sagittatum, Polygonum pensylvanicum, Eupatorium serotinum, Asclepias incarnata, Pilea pumila, Hypericum* spp., *Bidens* spp., *Phalaris arundinacea, Dichanthelium clandestinum, Leersia virginica, Panicum virgatum*, and *Justicia americana*. Vines such as *Vitis riparia* and *Toxicodendron radicans* are often found throughout this association. Exotics such as *Lythrum salicaria, Microstegium vimineum, Polygonum cuspidatum, Coronilla varia*, and *Rosa multiflora* are frequent invaders.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This early-successional sycamore - birch floodplain community occurs on coarse-textured (cobbly / bouldery) to fine-textured (silty or muddy) depositional bars and islands occurring along rivers and large streams. It was sampled on a temporarily flooded gravel scour bar of the Potomac River at Harpers Ferry in Maryland. The area receives periodic scouring during flooding events. The soil is moderately well-drained sand. The unvegetated surface is dominated by small rocks with some downed wood. Exotic plants are common in this floodplain community.

Global Environment: This is an early-successional community of coarse-textured or fine-textured depositional bars and islands subject to frequent flooding. Two environmental / floristic variants of this type have been recognized across the upper Potomac River drainage: one occurring on cobbly and bouldery depositional bars and islands along high-gradient river stretches subject to frequent, high-energy flooding and ice-scouring; the other occurring on low, frequently flooded, muddy depositional bars and shorelines in relatively low-gradient (alluvial process control) river reaches. In the high-gradient variant, soils are usually sandy, periodically droughty when exposed, and tightly packed in a matrix of cobbles or boulders. In the low-gradient variant, soils have a significant silt component and are poorly drained even after long periods of exposure. Soils collected from plots of both variants were circumneutral (pH 7.0 to 7.2), with high calcium levels and 100% total base saturation.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This early-successional community is composed of stunted and often battered and flood-trained *Platanus occidentalis* and *Betula nigra* trees (varying from less than 5 m tall to >10 m tall). *Acer saccharinum* and *Fraxinus pennsylvanica* can be minor associates in the canopy. There is a dense shrub layer with *Salix* spp. and *Cephalanthus occidentalis*. *Hibiscus laevis* is dominant in the herb layer along with *Chamaesyce humistrata, Eupatorium serotinum*, and *Acalypha rhomboidea*. Invasive exotics are common.

Global Vegetation: The physiognomy of this community is extremely variable, with recently disturbed stands often having the stature of shrublands, and older stands attaining more of a woodland form. The vegetation is dominated by stunted and often battered and flood-trained trees (varying from less than 5 m tall to >10 m tall) of *Platanus occidentalis* and *Betula nigra*. *Salix caroliniana* and *Salix nigra* are dominant or codominant in a minority of stands. Other floodplain trees, particularly *Acer saccharinum* and *Fraxinus pennsylvanica*, may occur as minor associates. Shrub associates include *Cornus amomum, Salix sericea, Alnus serrulata*, and sometimes *Cephalanthus occidentalis* or *Physocarpus opulifolius*. The herbaceous layer ranges from sparse to moderately dense. Characteristic herbs include *Apocynum cannabinum, Polygonum virginianum, Polygonum hydropiper, Polygonum pensylvanicum, Polygonum hydropiperoides, Polygonum sagittatum, Polygonum pensylvanicum, Asclepias incarnata, Eupatorium serotinum, Hypericum* spp., *Bidens* spp., *Artemisia annua, Cyperus* spp., *Boehmeria cylindrica, Phyla lanceolata, Hibiscus laevis, Ipomoea lacunosa, Acalypha rhomboidea, Phalaris arundinacea, Dichanthelium clandestinum, Leersia virginica, Panicum virgatum, Pilea pumila*, and *Justicia americana*. Vines such as *Vitis riparia* and *Toxicodendron radicans* are often found throughout this association. Exotics such as *Microstegium vimineum, Polygonum caespitosum var. longisetum, Lythrum salicaria*, and *Polygonum cuspidatum* are a frequent problem.

The two variants of this type in the Potomac drainage [see Environment] are similar in total floristic composition but may differ considerably in herbaceous density and the relative abundances of individual species. The high-gradient variant tends to have a sparse herb layer of somewhat stunted ruderal species, including *Apocynum cannabinum, Cyperus strigosus, Acalypha rhomboidea*, and *Eupatorium serotinum*. The low-gradient variant has a variable herb layer that includes flood-tolerant species such as *Pilea pumila, Leersia virginica, Leersia oryzoides, Scrophularia marilandica*, annual species of *Polygonum* (*Polygonum caespitosum var. longisetum, Polygonum punctatum, Polygonum sagittatum*), *Mimulus alatus, Mimulus ringens, Carex lurida, Carex frankii,*

Carex tribuloides, Eupatorium perfoliatum, Paspalum fluitans, Verbena hastata, and *Scutellaria lateriflora*. Exotics are common in both variants.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Betula nigra*, *Platanus occidentalis*
Short shrub/sapling	Broad-leaved deciduous shrub	*Hibiscus laevis*
Herb (field)	Flowering forb	*Acalypha rhomboidea*, *Chamaesyce humistrata*, *Eupatorium serotinum*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Betula nigra*, *Platanus occidentalis*
Herb (field)	Liana	*Vitis riparia*
Herb (field)	Flowering forb	*Lythrum salicaria*, *Polygonum hydropiper*, *Polygonum pensylvanicum*
Herb (field)	Graminoid	*Leersia virginica*, *Panicum virgatum*, *Phalaris arundinacea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Betula nigra*, *Chamaesyce humistrata*, *Hibiscus laevis*, *Platanus occidentalis*
Global: *Acer saccharinum*, *Betula nigra*, *Leersia virginica*, *Panicum virgatum*, *Phalaris arundinacea*, *Platanus occidentalis*, *Polygonum hydropiper*, *Salix nigra*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Abutilon theophrasti* (Medium/Low), *Ailanthus altissima* (Medium), *Artemisia annua* (Medium/Insignificant), *Datura stramonium* (High/Low), *Humulus japonicus* (Medium/Low), *Melilotus officinalis* (Medium/Low), *Microstegium vimineum* (High/Medium), *Polygonum perfoliatum* (Medium), *Silene latifolia* ssp. *alba*
Global: Invasive/Exotic Plants: *Lythrum salicaria* (High), *Microstegium vimineum* (High/Medium), *Polygonum caespitosum* var. *longisetum*, *Polygonum cuspidatum* (High/Medium), *Polygonum hydropiper*

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Betula nigra - Platanus occidentalis / Impatiens capensis* Floodplain Forest (CEGL006184)
- *Platanus occidentalis - Acer saccharinum - Fraxinus pennsylvanica / Boehmeria cylindrica - Carex emoryi* Floodplain Forest (CEGL006476) is more restricted in its range, documented only from relatively stable, bedrock and high channel shelves along high-gradient stretches of the Potomac River in DC, MD, VA. It typically has a higher species richness, a higher percentage of perennial species and a more layered vegetation structure.
- *Platanus occidentalis - Betula nigra / Cornus amomum / (Andropogon gerardii, Chasmanthium latifolium)* Floodplain Forest (CEGL003725)
- *Platanus occidentalis / Dichanthelium clandestinum - Festuca subverticillata* Floodplain Forest (CEGL004031)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community occurs adjacent to Water-willow Rocky Bar and Shore (CEGL004286) along the Potomac River in Maryland.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Classification of this type was refined through analysis of data from 40 plots from the Potomac River across several physiographic provinces. *Salix interior*, a former nominal in the type, is listed as "rare" in Maryland and Virginia (Kartesz 1999).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs along rivers and large streams in the High Allegheny Plateau, Central Appalachians, and Lower New England. It was sampled along the Potomac River in Maryland at Potomac Wayside in Harpers Ferry.
Global Range: This association is found in the High Allegheny, Central Appalachian, Piedmont, and Lower New England ecoregions from West Virginia, Virginia, and Maryland north to New York. It is also attributed to the Western Allegheny Plateau. The low-gradient variant is widespread along major streams of the Piedmont Mesozoic Basins in northern Virginia and Maryland, and scattered along lower-gradient stretches of rivers and large streams in the Ridge and Valley province. It has been documented by plot data from the Potomac and Monocacy rivers and Antietam Creek in Maryland and Bull Run in Virginia. Its distribution is very likely much wider than existing data indicate.
Nations: US
States/Provinces: MD:S4, NJ, NY, PA:S4, VA:S3, WV
TNC Ecoregions: 49:C, 52:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCP, 212Ga:CCC, 212Gb:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Ea:CCC, 221Fa:CCC, 231:C, 232Ac:CCC, M221Aa:CCC, M221Ab:CCP, M221Ac:CCC, M221Ad:CCC, M221Ba:CCP, M221Bd:CCP, M221Be:CCC, M221C:CC, M221Da:CCC
Federal Lands: NPS (Antietam, Appalachian Trail [Central Appalachians], C&O Canal, Delaware Water Gap, George Washington Parkway, Harpers Ferry, Manassas, Monocacy, Upper Delaware)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WCRS
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 9 accuracy assessment points): APPA.0451, APPA_AA_0015, APPA_AA_0262, APPA_AA_0890, APPA_AA_0923, APPA_AA_1041, APPA_AA_1141, APPA_AA_1414, APPA_AA_1527, APPA_AA_1569.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid, S.C. Gawler and G.P. Fleming
References: CAP pers. comm. 1998, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Fleming 2002b, Fleming 2007, Fleming and Patterson 2003, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006, Harrison 2004, Harrison 2011, Kartesz 1999, Lea 2000, Lea 2003, Lea 2004, Perles et al. 2004, Perles et al. 2007, Perles et al. 2008, TNC and WPC 2004, Zimmerman 2011e, Zimmerman et al. 2012

A3701 *Platanus occidentalis - Fraxinus pennsylvanica - Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance

Alliance Summary Description: Stands are typically dominated by *Fraxinus pennsylvanica* and *Platanus occidentalis* with *Liquidambar styraciflua* and/or *Liriodendron tulipifera*. Other canopy and understory species that may be present include *Acer rubrum, Aesculus sylvatica* (within its range), *Alnus serrulata, Asimina triloba, Carpinus caroliniana, Cornus florida, Fagus grandifolia, Fraxinus americana*, and *Ulmus americana*, in the non-montane part of the distribution. Species present in the montane occurrences include *Betula alleghaniensis, Betula lenta, Liriodendron tulipifera*, and *Platanus occidentalis*, with *Betula nigra, Carpinus caroliniana, Fraxinus americana, Hamamelis virginiana, Liquidambar styraciflua, Pinus strobus, Pinus virginiana*, and *Tsuga canadensis*. *Euonymus americanus* is a typical shrub species in the lower elevation occurrences, while *Leucothoe fontanesiana* and *Rhododendron maximum* are common at higher elevations. These are high-energy floodplain forests of the Appalachian and Piedmont regions from Massachusetts, New York, and Connecticut south to Tennessee and Georgia. They typically occur on rocky streambeds and alluvial deposits of relatively high-gradient rivers.

[CEGL006575] *Fraxinus pennsylvanica - (Juglans nigra, Platanus occidentalis)* Floodplain Forest

Translated Name: **Green Ash - (Black Walnut, American Sycamore) Floodplain Forest**
Common Name: **Green Ash - Mixed Hardwood Floodplain Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Sugarberry - Sweetgum Floodplain Forest (G673)
Alliance	*Platanus occidentalis - Fraxinus pennsylvanica - Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance (A3701)

ELEMENT CONCEPT

Global Summary: This is a green ash - mixed hardwood floodplain forest of the northern Piedmont in the mid-Atlantic eastern United States. It occurs behind levees and on low terraces that are flooded annually for short durations (less than one week per year). Water table is high for the majority of the growing season. Soils are generally silts or clay loams but can have coarser substrates where flood water velocity is higher. The canopy is codominated by *Fraxinus pennsylvanica* with *Juglans nigra* and/or *Platanus occidentalis*. Additional associates include *Ulmus americana, Celtis occidentalis, Acer rubrum, Acer saccharinum*, and *Quercus palustris*. In some areas *Fraxinus americana* may be present in place of *Fraxinus pennsylvanica*. Subcanopy and shrub layers are sparse and generally composed of canopy species regeneration plus *Carpinus caroliniana, Carya cordiformis, Lindera benzoin, Cornus amomum, Viburnum prunifolium*, and *Viburnum dentatum*. The invasive shrubs *Rosa multiflora, Lonicera morrowii, Berberis thunbergii*, and *Lonicera japonica* can be problematic. Herbaceous species, where exotics are not rampant, can include *Impatiens pallida, Impatiens capensis, Laportea canadensis, Verbesina alternifolia, Thalictrum pubescens, Hydrophyllum canadense, Podophyllum peltatum, Symplocarpus foetidus, Circaea lutetiana, Boehmeria cylindrica, Onoclea sensibilis, Arisaema triphyllum*, and *Viola* spp. Woody vines include *Toxicodendron radicans* and *Parthenocissus quinquefolia*. Exotic species tend to dominate the herb layer, including *Alliaria petiolata, Glechoma hederacea*, and *Microstegium vimineum*. Diagnostic features of this floodplain forest include the presence of *Juglans nigra* and rich herbs.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This green ash - mixed hardwood floodplain forest occurs behind levees and on low or mid terraces that are flooded annually for short durations (less than one week per year). It occurs on islands, bars, and mid-terrace shorelines.

Global Environment: These floodplain forests occur behind levees and on low terraces or mid terraces that are flooded annually for short durations (less than one week per year). It also occurs on islands, bars, and mid-terrace shorelines. The water table is high for the majority of the growing season. Soils are generally silts, sandy loams, or clay loams but can have coarser substrates where floodwater velocity is higher.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This floodplain forest with mixed hardwoods is dominated by *Fraxinus pennsylvanica* and/or *Platanus occidentalis*, generally with other enrichment indicators such as *Juglans nigra*.

Global Vegetation: The canopy is codominated by *Fraxinus pennsylvanica* with *Juglans nigra* and/or *Platanus occidentalis*. Additional associates include *Ulmus americana, Celtis occidentalis, Acer rubrum, Acer saccharinum*, and *Quercus palustris*. Subcanopy and shrub layers are sparse and generally composed of canopy species regeneration plus *Carpinus caroliniana, Carya cordiformis, Lindera benzoin, Cornus amomum, Viburnum prunifolium*, and *Viburnum dentatum*. The invasive shrubs *Rosa multiflora, Lonicera morrowii, Berberis thunbergii*, and *Lonicera japonica* can be problematic. Herbaceous species, where exotics are not rampant, can include *Impatiens pallida, Impatiens capensis, Laportea canadensis, Verbesina alternifolia, Thalictrum pubescens, Hydrophyllum canadense, Podophyllum peltatum, Symplocarpus foetidus, Circaea lutetiana, Boehmeria cylindrica, Onoclea sensibilis, Arisaema triphyllum*, and *Viola* spp. Woody vines include *Toxicodendron radicans* and *Parthenocissus quinquefolia*. Exotic species tend to dominate the herb layer, including *Alliaria petiolata, Glechoma hederacea*, and *Microstegium vimineum*. Diagnostic features of this floodplain forest include the presence of *Juglans nigra* and rich herbs.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fraxinus pennsylvanica*, *Juglans nigra*, *Platanus occidentalis*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharinum*
Tree canopy	Broad-leaved deciduous tree	*Betula nigra*, *Fraxinus pennsylvanica*, *Platanus occidentalis*
Tree subcanopy	Broad-leaved deciduous tree	*Carpinus caroliniana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Cornus amomum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Liana	*Parthenocissus quinquefolia*
Herb (field)	Flowering forb	*Ageratina altissima* var. *altissima*, *Podophyllum peltatum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Fraxinus pennsylvanica*, *Juglans nigra*, *Platanus occidentalis*
Global: *Acer saccharinum*, *Betula nigra*, *Carpinus caroliniana*, *Cornus amomum*, *Fraxinus pennsylvanica*, *Platanus occidentalis*, *Podophyllum peltatum*, *Symplocarpus foetidus*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium), *Lonicera japonica* (High/Medium), *Lonicera morrowii* (High/Medium), *Rosa multiflora* (Medium/Low); **Other Plants**: *Hydrophyllum canadense* (G5), *Juglans nigra* (G5), *Toxicodendron radicans* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (21-Apr-2004).

RELATED CONCEPTS

Global Similar Types:
- *Fraxinus pennsylvanica* - *Ulmus* spp. - *Celtis occidentalis* Floodplain Forest (CEGL002014)
- *Platanus occidentalis* - *Fraxinus pennsylvanica* - *Ulmus americana / Cornus sericea* Floodplain Forest (CEGL006901)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed in New York and Connecticut during summer 2012 mapping reconnaissance.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed in New York and Connecticut during summer 2012 mapping reconnaissance.
Global Range: Currently described from the northern Piedmont of Pennsylvania, Delaware, New Jersey, and possibly Maryland.
Nations: US
States/Provinces: CT, DE:S3, MD?, NJ, NY, PA:S4
TNC Ecoregions: 48:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Bc:CCC, 221Bd:CCC, 221Db:CCC, 221Dc:CCC, 222Ic:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Saratoga); USFWS (Montezuma)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FFAW
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 accuracy assessment points): APPA_AA_1930, APPA_AA_2216, APPA_AA_2852, APPA_AA_2973.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid and S.C. Gawler
References: Bowman 2000, Breden et al. 2001, Clancy 1996, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Fike 1999, NRCS 2004a, PDCNR 1999, Podniesinski and Wagner 2002, Stone et al. 2006, WPC and TNC 2002, Zimmerman 2011c, Zimmerman et al. 2012

[CEGL006255] *Liriodendron tulipifera - Platanus occidentalis - Betula lenta / Lindera benzoin / Circaea lutetiana ssp. canadensis* Floodplain Forest

Translated Name: **Tuliptree - American Sycamore - Sweet Birch / Northern Spicebush / Broadleaf Enchanter's-nightshade Floodplain Forest**
Common Name: **Northern Blue Ridge Montane Alluvial Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Sugarberry - Sweetgum Floodplain Forest (G673)
Alliance	*Platanus occidentalis - Fraxinus pennsylvanica - Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance (A3701)

ELEMENT CONCEPT

Global Summary: This community type occupies montane alluvial floodplains along more-or-less high-gradient streams and small rivers at the foot of the Blue Ridge in Virginia and Maryland. It appears to be confined to floodplains with relatively fertile alluvial deposits derived from metabasalt (greenstone), pyroxene-rich granites, or metasiltstone/phyllite. These habitats are typically narrow, nearly flat, and have complex, coarse, bouldery or cobbly microtopography and rocky streambeds. Soils are well-drained and moderately fertile. Most of the lower streamside terraces are probably flooded briefly at least annually. Larger floods are rare. However, periodic catastrophic floods associated with hurricanes or exceptionally large rainfall events may be very destructive to stream channels and vegetation. Many of these sites were probably cleared and/or subjected to multiple historical disturbances, including grazing and cultivation . This forest is composed primarily of mesophytic upland species with some admixture of species characteristic of alluvial and wetland habitats. Vegetation is generally species-rich and heterogeneous, with composition frequently shifting in association with microhabitat conditions and disturbance histories. The overstory typically contains many tree species. However, *Liriodendron tulipifera* is generally a constant codominant, while *Platanus occidentalis* is usually scattered and occasionally abundant. Other species that are important in some stands include *Acer negundo, Acer rubrum, Acer saccharum, Betula alleghaniensis, Betula lenta, Betula nigra, Carya cordiformis, Carya ovata, Fagus grandifolia, Fraxinus americana, Fraxinus pennsylvanica, Juglans nigra, Nyssa sylvatica, Quercus alba, Quercus prinus, Quercus rubra, Tilia americana, Tsuga canadensis, Ulmus americana*, and *Ulmus rubra*. The understory contains saplings of the overstory species, along with *Asimina triloba, Carpinus caroliniana, Cornus florida, Corylus* spp., *Hamamelis virginiana, Lindera benzoin, Ostrya virginiana*, and *Viburnum prunifolium*. The herb layer is very diverse and dominated by numerous upland mesophytic species. Wet microhabitats typically support *Impatiens capensis, Carex intumescens, Carex tribuloides, Glyceria striata, Thalictrum pubescens, Viola cucullata*, and few other wetland plants.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This richer and more diverse small stream floodplain forest occurs in the Northern Blue Ridge near Roanoke, Virginia (and extending north to Catoctin Mountain, Maryland) and is confined to floodplains with relatively fertile base-rich alluvial deposits derived from metabasalt (greenstone), pyroxene-rich granites, or metasiltstone/phyllite.
Global Environment: This community type occupies montane alluvial floodplains along more-or-less high-gradient streams and small rivers at the foot of the Blue Ridge. It appears to be confined to floodplains with relatively fertile alluvial deposits derived from metabasalt (greenstone), pyroxene-rich granites, or metasiltstone/phyllite. These habitats are typically narrow, nearly flat, and have complex, coarse, bouldery or cobbly microtopography and rocky

streambeds. Soils are well-drained and moderately fertile. Most of the lower streamside terraces are probably flooded briefly at least annually. Larger floods are rare. However, periodic catastrophic floods associated with hurricanes or exceptionally large rainfall events may be very destructive to stream channels and vegetation. Many of these sites were probably cleared and/or subjected to multiple historical disturbances, including grazing and cultivation.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is dominated or codominated by *Liriodendron tulipifera* but with a mixture of other trees, including *Platanus occidentalis, Betula lenta, Acer saccharum var. saccharum, Acer rubrum, Carya cordiformis, Aesculus flava, Quercus* spp., *Fagus grandifolia*, and others. *Lindera benzoin* dominates the shrub layer, but it can also include *Asimina triloba, Carpinus caroliniana, Viburnum prunifolium*, and others. Vines may be common. The herb layer is very diverse and dominated by numerous upland mesophytic species; *Circaea lutetiana ssp. canadensis* is characteristic, and *Polygonatum biflorum var. commutatum, Mertensia virginica*, and *Eurybia divaricata* may be common.
Global Vegetation: This forest is composed primarily of mesophytic upland species with some admixture of species characteristic of alluvial and wetland habitats. Vegetation is generally species-rich and heterogeneous, with composition frequently shifting in association with microhabitat conditions and disturbance histories. The overstory typically contains many tree species. However, *Liriodendron tulipifera* is generally a constant codominant, while *Platanus occidentalis* is usually scattered and occasionally abundant. Other species that are important in some stands include *Acer negundo, Acer rubrum, Acer saccharum, Betula alleghaniensis, Betula lenta, Betula nigra, Carya cordiformis, Carya ovata, Fagus grandifolia, Fraxinus americana, Fraxinus pennsylvanica, Juglans nigra, Nyssa sylvatica, Quercus alba, Quercus prinus, Quercus rubra, Tilia americana, Tsuga canadensis, Ulmus americana*, and *Ulmus rubra*. The understory contains saplings of the overstory species, along with *Asimina triloba, Carpinus caroliniana, Cornus florida, Corylus* spp., *Hamamelis virginiana, Lindera benzoin, Ostrya virginiana*, and *Viburnum prunifolium*. The herb layer is very diverse and dominated by numerous upland mesophytic species. Wet microhabitats typically support Impatiens capensis, *Carex intumescens, Carex tribuloides, Glyceria striata, Thalictrum pubescens, Viola cucullata*, and few other wetland plants.
Global Dynamics: The relatively fertile, low-lying habitats occupied by this association provide optimal habitats for many invasive introduced species, especially *Microstegium vimineum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula lenta*, *Liriodendron tulipifera*, *Platanus occidentalis*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Flowering forb	*Circaea lutetiana* ssp. *canadensis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera*, *Platanus occidentalis*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Betula lenta*, *Circaea lutetiana* ssp. *canadensis*, *Lindera benzoin*, *Liriodendron tulipifera*, *Platanus occidentalis*
Global: *Amphicarpaea bracteata*, *Arisaema triphyllum*, *Betula lenta*, *Carpinus caroliniana*, *Circaea lutetiana* ssp. *canadensis*, *Impatiens capensis*, *Lindera benzoin*, *Liriodendron tulipifera*, *Platanus occidentalis*, *Polystichum acrostichoides*, *Thelypteris noveboracensis*, *Toxicodendron radicans*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (5-Aug-2004). There are probably hundreds of occurrences of this community along the length of the northern Blue Ridge. However, patches are relatively small and high-quality stands are uncommon.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Liriodendron tulipifera / Galium concinnum - Carex laxiculmis* Forest (CEGL006473)
- *Liquidambar styraciflua - Liriodendron tulipifera - (Platanus occidentalis) / Halesia tetraptera / Amphicarpaea bracteata* Floodplain Forest (CEGL007880) occurs in similar southern Appalachian floodplains.
- *Liriodendron tulipifera - Pinus strobus - (Tsuga canadensis) / Carpinus caroliniana / Amphicarpaea bracteata* Forest (CEGL008405) similar Central Appalachian montane floodplain forest (primarily of shale and metasedimentary substrates) with a prominent coniferous component.
- *Platanus occidentalis - Liriodendron tulipifera - (Betula alleghaniensis) / Alnus serrulata - Leucothoe fontanesiana* Floodplain Forest (CEGL004691) occurs in similar southern Appalachian floodplains.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: Montane floodplain forests of the Appalachians are poorly inventoried. Based on existing data, this vegetation appears to represent a relatively cohesive, if variable, association-level unit.

ELEMENT DISTRIBUTION

Global Range: The type likely occurs along the foot of the northern Blue Ridge from near Roanoke, Virginia, to the north end of Catoctin Mountain, Maryland.
Nations: US
States/Provinces: MD, VA:S3
TNC Ecoregions: 59:C
USFS Ecoregions (1994/95): 221Da:???, 231Ak:???, 231Al:???, M221Ab:C??, M221Ad:C??, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Catoctin Mountain, Shenandoah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCHW
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 accuracy assessment points): APPA_AA_0822, APPA_AA_0881, APPA_AA_1208.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): E. Largay
Global Description Author(s): G. Fleming
References: Eastern Ecology Working Group n.d.*, Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Harrison 2004, Lea 2003, Young et al. 2006, Young et al. 2009

[CEGL004073] *Platanus occidentalis - Acer negundo - Juglans nigra / Asimina triloba / Mertensia virginica* Floodplain Forest

Translated Name: **American Sycamore - Box-elder - Black Walnut / Pawpaw / Virginia Bluebells Floodplain Forest**
Common Name: **Piedmont-Central Appalachian Rich Floodplain Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Sugarberry - Sweetgum Floodplain Forest (G673)
Alliance	*Platanus occidentalis - Fraxinus pennsylvanica - Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance (A3701)

ELEMENT CONCEPT

Global Summary: This association occupies the higher elevations of floodplains, floodplain berms, and low terraces of major Mid-Atlantic rivers (e.g., Potomac, Shenandoah, Monocacy, James) and as the main floodplain vegetation on medium-sized rivers draining areas of nutrient-rich substrates (e.g., Antietam Creek, Bull Run). Soil texture is variable, ranging from silty-clay loams to loams over much of the range, and samples collected from plots had high base status. This vegetation type is a closed forest with mixed overstory dominance by *Platanus occidentalis, Juglans nigra, Carya cordiformis, Celtis occidentalis, Ulmus americana*, and, locally, *Fraxinus pennsylvanica, Liriodendron tulipifera*, and *Quercus shumardii*. *Acer saccharinum* is codominant in a minority of

stands but absent or unimportant in many others. *Acer negundo* is strongly dominant in the subcanopy. *Asimina triloba* and/or *Lindera benzoin* dominate a moderately dense to dense shrub layer. The herb layer is rich in spring ephemerals and other nutrient-demanding species, including *Mertensia virginica, Asarum canadense, Chaerophyllum procumbens, Hydrophyllum canadense, Viola striata, Phlox divaricata, Podophyllum peltatum, Erythronium americanum, Dicentra canadensis, Sanicula odorata, Packera aurea (= Senecio aureus), Claytonia virginica, Festuca subverticillata, Carex jamesii, Carex grisea, Floerkea proserpinacoides, Osmorhiza longistylis*, and *Ranunculus abortivus*. Invasive exotics, especially *Alliaria petiolata, Veronica hederifolia, Duchesnea indica, Urtica dioica ssp. dioica, Microstegium vimineum*, and *Glechoma hederacea*, are usually abundant.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This rich floodplain forest occupies the higher elevations of floodplains, floodplain berms, and low terraces of major Mid-Atlantic rivers (Potomac, Shenandoah, Monocacy, Susquehanna) and as main floodplain vegetation on medium-sized rivers draining areas of nutrient-rich substrates (e.g., Antietam Creek, Bull Run, Blue Ridge Creeks in Pennsylvania). It was observed within the AT corridor in Giles and Bedford counties in Virginia and north in Washington County, along the Potomac River in Maryland and in Cumberland County, Pennsylvania. Soil texture is variable, ranging from silty-clay loams to loams over much of the range, but it can be sandy loams or sands along high-gradient reaches.

Global Environment: This association occupies the higher elevations of floodplains, floodplain berms, and low terraces of major Mid-Atlantic rivers (Potomac, Shenandoah, Monocacy) and as main floodplain vegetation on medium-sized rivers draining areas of nutrient-rich substrates (e.g., Antietam Creek, Bull Run). In the Potomac Gorge, average flood-return interval was from about 3 to 15 years. Soil texture is variable, ranging from silty-clay loams to loams over much of the range, but it can be sandy loams or sands along high-gradient reaches. Soil samples collected from plots have a mean pH of 6.1, high calcium content (mean about 2200 ppm), and 80-100% total base saturation.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is dominated by a mixture of *Platanus occidentalis, Juglans nigra, Carya cordiformis, Celtis occidentalis*, and *Ulmus americana*. *Acer negundo* is strongly dominant in the subcanopy. *Acer saccharinum* is codominant in a minority of stands but absent or unimportant in many others. *Asimina triloba* and/or *Lindera benzoin* dominate a moderately dense to dense shrub layer. This community is rich in spring ephemerals and nutrient-demanding species such as *Mertensia virginica, Asarum canadense, Chaerophyllum procumbens, Hydrophyllum canadense, Viola striata, Phlox divaricata, Podophyllum peltatum*, and others. Invasive exotics are typically abundant.

Global Vegetation: This vegetation type is a closed forest with mixed overstory dominance by *Platanus occidentalis, Juglans nigra, Carya cordiformis, Celtis occidentalis, Ulmus americana*, and, locally, *Fraxinus pennsylvanica, Liriodendron tulipifera*, and *Quercus shumardii*. *Acer saccharinum* is codominant in a minority of stands but absent or unimportant in many others. *Acer negundo* is strongly dominant in the subcanopy. *Asimina triloba* (usually on sites with coarser soil textures) and /or *Lindera benzoin* (on finer-textured substrates) dominate a moderately dense to dense shrub layer. Vines are common, with *Parthenocissus quinquefolia, Vitis vulpina*, and *Toxicodendron radicans* most frequent. The herb layer is rich in spring ephemerals and other nutrient-demanding species, including *Mertensia virginica, Asarum canadense, Chaerophyllum procumbens, Hydrophyllum canadense, Viola striata, Phlox divaricata, Podophyllum peltatum, Erythronium americanum, Dicentra canadensis, Sanicula odorata (= Sanicula gregaria), Packera aurea (= Senecio aureus), Claytonia virginica, Festuca subverticillata, Carex jamesii, Carex grisea, Floerkea proserpinacoides, Osmorhiza longistylis*, and *Ranunculus abortivus*. Invasive exotics may be abundant and are represented by *Alliaria petiolata, Veronica hederifolia, Duchesnea indica, Urtica dioica ssp. dioica, Microstegium vimineum*, and *Glechoma hederacea*.

Most Abundant Species

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya cordiformis*, *Platanus occidentalis*, *Ulmus americana*
Tree subcanopy	Broad-leaved deciduous tree	*Acer negundo*, *Celtis occidentalis*, *Juglans nigra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Asimina triloba*, *Lindera benzoin*
Herb (field)	Flowering forb	*Mertensia virginica*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya cordiformis*, *Platanus occidentalis*, *Ulmus americana*
Tree subcanopy	Broad-leaved deciduous tree	*Acer negundo*, *Celtis occidentalis*, *Juglans nigra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Asimina triloba*, *Lindera benzoin*
Herb (field)	Liana	*Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Vitis vulpina*
Herb (field)	Flowering forb	*Mertensia virginica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer negundo*, *Asimina triloba*, *Juglans nigra*, *Mertensia virginica*, *Platanus occidentalis*, *Ulmus americana*
Global: *Acer negundo*, *Asimina triloba*, *Juglans nigra*, *Mertensia virginica*, *Platanus occidentalis*, *Ulmus americana*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Phacelia covillei* (G3); **Invasive/Exotic Plants**: *Alliaria petiolata* (High/Medium), *Duchesnea indica* (Low/Insignificant), *Glechoma hederacea* (Low), *Microstegium vimineum* (High/Medium), *Urtica dioica* ssp. *dioica*, *Veronica hederifolia*

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (25-Jan-2005). The type is not rare but has a restricted geographic range, is confined to larger rivers in the Mid-Atlantic region, and is subject to continuing degradation by invasive species.

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Floodplain Forest (CEGL006217)
- *Liriodendron tulipifera - Acer negundo - (Platanus occidentalis) / Carpinus caroliniana / Polygonum virginianum* Floodplain Forest (CEGL006492)
- *Platanus occidentalis - Acer saccharinum - Juglans nigra - Ulmus rubra* Floodplain Forest (CEGL007334) covers rich floodplain forest west of the Appalachians.
- *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Floodplain Forest (CEGL006458)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This type was defined to cover rich large-stream floodplain forests of the Mid-Atlantic Piedmont and Central Appalachians.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: This type was defined to cover rich large-stream floodplain forests of the Mid-Atlantic Piedmont and Central Appalachians. It was split off from the more broadly defined *Platanus occidentalis - Acer saccharinum - Juglans nigra - Ulmus rubra* Floodplain Forest (CEGL007334). This type was classified through analysis of 36 plot samples from Virginia and Maryland and through consultation with ecologists from those states and West Virginia. It has also been confirmed for Pennsylvania.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs along major Mid-Atlantic rivers in Pennsylvania, Maryland, Virginia, and West Virginia. It was observed within the AT corridor in Giles and Bedford counties in Virginia and north in Washington County, along the Potomac River in Maryland and in Cumberland County, Pennsylvania.
Global Range: This community occurs on floodplains of large and medium-sized Mid-Atlantic rivers, including the Potomac, Shenandoah, James, Rappahannock, Monocacy, Clinch, and possibly others northward.
Nations: US
States/Provinces: MD:S3, PA, VA:S3S4, WV:S2?
TNC Ecoregions: 49:C, 52:C, 58:C, 59:C, 61:C

USFS Ecoregions (1994/95): 221Da:CCC, 221Ea:CCC, 231Aa:CCP, 231Ae:CCP, 231Ak:CCP, 231Al:CCC, 231Ap:CCC, 232Ad:CCC, M221A:CC, M221D:CC
Federal Lands: NPS (Antietam, Appalachian Trail [Central Appalachians], C&O Canal, Eisenhower, Friendship Hill, George Washington Parkway, Gettysburg, Harpers Ferry, Manassas, Monocacy, National Capital-East); USFS (George Washington, Jefferson?, Monongahela); USFWS (National Conservation Training Center, Patuxent)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FFCR
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: UMESC collected five observation points for this community with the help of Natural Heritage vegetation ecologists from Virginia and Pennsylvania during the summer of 2011. The data are georeferenced with USNVC association attribution, but do not include vegetation data.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (10 accuracy assessment points): APPA_AA_0065, APPA_AA_0255, APPA_AA_0311, APPA_AA_0334, APPA_AA_0471, APPA_AA_0634, APPA_AA_0968, APPA_AA_1132, APPA_AA_1313, APPA_AA_1425.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and K.D. Patterson
References: Burns and Honkala 1990b, Eastern Ecology Working Group n.d., Fleming 2002b, Fleming 2007, Fleming and Coulling 2001, Fleming and Patterson 2003, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming and Weber 2003, Fleming et al. 2001, Fleming et al. 2004, Harrison 2004, Harrison 2011, Lea 2000, Lea 2003, Lea 2004, Luken 2003, Perles et al. 2006b, Perles et al. 2006c, Pyle 1995, Rawinski et al. 1996, Sigafoos 1976, Thomson et al. 1999, VDNH 2003, VDNH 2003*, Vanderhorst 2000b, WVNHP unpubl. data b, Zimmerman 2011l, Zimmerman 2011m, Zimmerman et al. 2012

A3702 *Platanus occidentalis - Liquidambar styraciflua - Liriodendron tulipifera* Southern Appalachian Floodplain Forest Alliance

Alliance Summary Description: These are diverse floodplain forests with variable composition, typically dominated by some combination of *Celtis laevigata, Fraxinus pennsylvanica, Liquidambar styraciflua, Liriodendron tulipifera, Platanus occidentalis*, and *Ulmus americana*. Stands also probably include *Acer negundo, Carya cordiformis, Celtis occidentalis, Juglans nigra, Salix nigra*, and *Ulmus alata*. The understory may be dense and typically contains *Asimina triloba, Crataegus spathulata*, and *Lindera benzoin*. Examples are found in the interior south of the United States, including the Interior Low Plateau, southern Cumberlands/Ridge and Valley, the Piedmont, and the adjacent Southern Blue Ridge from Alabama north to the Carolinas and west to Kentucky and Tennessee. One association known from the Piedmont and the lower elevations of the adjacent Southern Blue Ridge may contain *Betula alleghaniensis* and/or *Betula lenta*.

[CEGL004691] *Platanus occidentalis - Liriodendron tulipifera - (Betula alleghaniensis) / Alnus serrulata - Leucothoe fontanesiana* Floodplain Forest

Translated Name: **American Sycamore - Tuliptree - (Yellow Birch) / Hazel Alder - Highland Doghobble Floodplain Forest**
Common Name: **Appalachian Montane Alluvial Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Sugarberry - Sweetgum Floodplain Forest (G673)
Alliance	*Platanus occidentalis - Liquidambar styraciflua - Liriodendron tulipifera* Southern Appalachian Floodplain Forest Alliance (A3702)

ELEMENT CONCEPT

Global Summary: This association covers alluvial forests of Southern Blue Ridge and nearby portions of the inner Piedmont. This type is associated with narrow, rocky floodplains and islands in medium-sized rivers, typically at elevations below 915 m (3000 feet). It is more frequent below 610 m (2000 feet). Examples are known from the

Nantahala Gorge, Slickrock Creek, the South Toe River, and the Black and Craggy Mountains. Canopy composition of stands is variable but typical dominants are *Platanus occidentalis, Liriodendron tulipifera, Fraxinus americana, Betula alleghaniensis*, and *Betula lenta*. *Platanus* is characteristic, but not necessarily dominant in stands of this association. Other canopy/subcanopy trees can include *Carpinus caroliniana, Betula nigra, Acer rubrum, Pinus virginiana, Pinus strobus*, and *Tsuga canadensis*. In contrast to montane alluvial forests on the margins of the Southern Blue Ridge or on larger rivers, *Liquidambar styraciflua* is rare to absent in this type. The shrub stratum can be dense, often with local dominance by *Leucothoe fontanesiana* or *Rhododendron maximum*. Other characteristic shrubs include *Alnus serrulata, Xanthorhiza simplicissima, Corylus americana, Cornus amomum, Hamamelis virginiana, Euonymus americanus*, and *Hydrangea arborescens*. Vines can be prominent including *Aristolochia macrophylla, Parthenocissus quinquefolia, Smilax glauca, Smilax rotundifolia*, and *Vitis aestivalis*. Herbaceous species composition varies from site to site, and herbaceous strata can be quite patchy on the rocky substrate. Characteristic species known from these forests include *Amphicarpaea bracteata, Actaea racemosa (= Cimicifuga racemosa), Polystichum acrostichoides, Eurybia divaricata (= Aster divaricatus), Anemone quinquefolia, Athyrium filix-femina, Claytonia virginica, Erythronium americanum, Medeola virginiana, Packera aurea, Stellaria pubera, Tiarella cordifolia*, and *Viola blanda*. *Carex* species may be common (e.g., *Carex appalachica, Carex austrocaroliniana, Carex blanda, Carex digitalis, Carex plantaginea, Carex swanii, Carex torta*).

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This alluvial forest is associated with narrow, rocky floodplains and islands in medium-sized rivers.
Global Environment: This association covers alluvial forests of Southern Blue Ridge and nearby portions of the inner Piedmont. This type is associated with narrow, rocky floodplains and islands in medium-sized rivers, typically at elevations below 915 m (3000 feet). It is more frequent below 610 m (2000 feet). Examples are known from the Nantahala Gorge, Slickrock Creek (Newell et al. 1997), Great Smoky Mountains, the South Toe River, the Black Mountains, Craggy Mountains (McLeod and Ulrey unpubl. data), and the Chattahoochee National Forest of Georgia.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is typically dominated by *Platanus occidentalis, Liriodendron tulipifera, Fraxinus americana, Betula lenta*, and *Betula alleghaniensis*. Evergreen tree species are few to none. The shrub layer is often dense with *Rhododendron maximum* and *Leucothoe fontanesiana*. Other shrubs or small trees may include *Alnus serrulata, Xanthorhiza simplicissima, Carpinus caroliniana, Corylus americana, Cornus amomum, Hamamelis virginiana, Euonymus americanus*, and *Hydrangea arborescens*. Vine species such as *Parthenocissus quinquefolia, Aristolochia macrophylla, Smilax glauca*, and *Smilax rotundifolia* may occur.
Global Vegetation: Canopy composition of stands is variable but typical dominants are *Platanus occidentalis, Liriodendron tulipifera, Fraxinus americana, Betula alleghaniensis*, and *Betula lenta*. *Platanus* is characteristic but not necessarily present in all stands of this association. Other canopy/subcanopy trees can include *Carpinus caroliniana, Betula nigra, Acer rubrum, Pinus virginiana, Pinus strobus*, and *Tsuga canadensis*. In contrast to montane alluvial forests on the margins of the Southern Blue Ridge or on larger rivers, *Liquidambar styraciflua* is rare to absent in this type. The shrub stratum can be dense, often with local dominance by *Leucothoe fontanesiana* or *Rhododendron maximum*. Other characteristic shrubs include *Alnus serrulata, Xanthorhiza simplicissima, Corylus americana, Cornus amomum, Hamamelis virginiana, Euonymus americanus*, and *Hydrangea arborescens*. Vines can be prominent including *Aristolochia macrophylla, Parthenocissus quinquefolia, Smilax glauca, Smilax rotundifolia*, and *Vitis aestivalis*. Herbaceous species composition varies from site to site, and herbaceous strata can be quite patchy on the rocky substrate. Characteristic species known from these forests include *Amphicarpaea bracteata, Actaea racemosa (= Cimicifuga racemosa), Polystichum acrostichoides, Eurybia divaricata (= Aster divaricatus), Anemone quinquefolia, Athyrium filix-femina, Claytonia virginica, Erythronium americanum, Medeola virginiana, Packera aurea, Stellaria pubera, Tiarella cordifolia*, and *Viola blanda*. In addition, *Carex* species may be common (e.g., *Carex appalachica, Carex austrocaroliniana, Carex blanda, Carex digitalis, Carex plantaginea, Carex swanii, Carex torta*).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Platanus occidentalis*
Tree subcanopy	Broad-leaved deciduous tree	*Carpinus caroliniana*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*, *Betula lenta*, *Fraxinus americana*, *Liriodendron tulipifera*, *Platanus occidentalis*
Tree subcanopy	Broad-leaved deciduous tree	*Carpinus caroliniana*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Leucothoe fontanesiana*
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron maximum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Alnus serrulata*, *Betula alleghaniensis*, *Betula lenta*, *Carpinus caroliniana*, *Fraxinus americana*, *Leucothoe fontanesiana*, *Liriodendron tulipifera*, *Platanus occidentalis*, *Rhododendron maximum*
Global: *Alnus serrulata*, *Betula alleghaniensis*, *Betula lenta*, *Betula nigra*, *Carpinus caroliniana*, *Fraxinus americana*, *Leucothoe fontanesiana*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, *Rhododendron maximum*, *Tsuga canadensis*, *Xanthorhiza simplicissima*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Invasive/Exotic Plants: *Artemisia vulgaris* (invasive/exotic), *Hesperis matronalis* (Medium/Low, invasive/exotic), *Microstegium vimineum* (High/Medium, invasive/exotic), *Rumex crispus* (Low/Insignificant, invasive/exotic)
Global: Vulnerable Plants: *Heuchera caroliniana* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2? (23-Feb-1999). This community is naturally uncommon in the Southern Blue Ridge. Well-developed examples are rare due to clearing for agriculture and development. This community is threatened by road building and other disturbances causing hydrologic alteration.

RELATED CONCEPTS

Global Similar Types:

- *Liquidambar styraciflua - Liriodendron tulipifera - (Platanus occidentalis) / Halesia tetraptera / Amphicarpaea bracteata* Floodplain Forest (CEGL007880) with at least partial dominance by *Liquidambar styraciflua*.
- *Liriodendron tulipifera - Platanus occidentalis - Betula lenta / Lindera benzoin / Circaea lutetiana ssp. canadensis* Floodplain Forest (CEGL006255)
- *Platanus occidentalis / Dichanthelium clandestinum - Festuca subverticillata* Floodplain Forest (CEGL004031)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: This alluvial forest type is less common in the Southern Blue Ridge than alluvial forests dominated by *Tsuga canadensis*, which are found in areas with better-developed soils and less frequent flooding.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: One stand was sampled in Carter County, Tennessee and the other stand was sampled along the Nolichucky River, Pisgah National Forest in Tennessee.
Global Range: This community is found in the Southern Blue Ridge of western North Carolina, northern South Carolina, and eastern Tennessee. It likely extends into Georgia.
Nations: US
States/Provinces: GA?, NC, SC, TN
TNC Ecoregions: 51:C, 52:C

USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee (Piedmont)?, Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee?, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAMA
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 8 accuracy assessment points): APPA.0162, APPA.0575, APPA_AA_0266, APPA_AA_0910, APPA_AA_1052, APPA_AA_1055, APPA_AA_1060, APPA_AA_1131, APPA_AA_1280, APPA_AA_1437.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo
Global Description Author(s): K.D. Patterson
References: Allard 1990, Fleming and Patterson 2009a, McLeod 1988, NatureServe Ecology - Southeastern U.S. unpubl. data, Newell and Peet 1995, Newell et al. 1997, Peet et al. unpubl. data, Pittillo and Smathers 1979, Schafale 1998a, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

M503. Central Hardwood Swamp Forest

G597. Central Hardwood Flatwoods & Swamp Forest

Group Summary Description: This wooded wetland vegetation group encompasses various primarily non-alluvial wetlands of the central to east-central United States. It is a diverse group, containing types associated with ponds and depressions, as well as various kinds of flatwoods. Ponded examples vary from open water to herb-, shrub-, or tree-dominated. The vegetation may be zoned, with an outer ring of trees, a more interior ring of shrubs, herbs and vines, and possibly a deeper central area with or without standing water year-round depending on precipitation. *Quercus* species, including *Quercus bicolor* and *Quercus palustris*, dominate the canopy in many examples of this group. In addition, *Acer rubrum, Acer saccharinum, Fraxinus pennsylvanica, Nyssa* spp., *Platanus occidentalis, Ulmus americana*, or a combination of these, may dominate. *Cephalanthus occidentalis* is a typical shrub component in areas with a longer hydroperiod. The herbaceous layer is widely variable depending on geography and hydroperiod. In flatwoods examples, across the upper Midwest and Lower New England, *Quercus bicolor* and/or *Quercus palustris* are the common oak species. South of the glaciated Midwest (e.g., in the Ozarks), *Quercus stellata* is more common. Drier examples of flatwoods across the range of this group may have *Acer rubrum, Fagus grandifolia, Nyssa sylvatica, Quercus alba, Quercus rubra*, and *Quercus velutina*. Understory shrub and herbaceous species vary with moisture level and canopy density. Flooding, drought, and fire can impact examples of this vegetation. Fire is particularly important in flatwoods examples found in the south-central United States.

These wetland features are the result of topographic or edaphic circumstances that promote an enhanced hydroperiod at these sites, and this affects the vegetation and dynamics of these communities. The depressional swamps and flatwoods associations are found throughout the northern glaciated Midwest into the south-central United States ranging east into Lower New England. Stands of both types occur on flat to gently sloping to undulating surfaces, as well as in shallow to deep basins of sinkholes or other isolated depressions on uplands, as well as poorly drained uplands; glaciated examples occur in depressions associated with glacial features such as tillplains, lakeplains or outwash plains. Soils are poorly drained to very poorly drained, and surface water may be present for extended periods of time, rarely becoming dry. Soils often contain an impermeable clay layer or fragipan creating a shallow, perched water table. Saturation can vary, with ponding common during wetter seasons, and drought possible during the summer and autumn months.

The typical hydrology is seasonally flooded, but the hydroperiod may be of greater or lesser length, depending on the depth of the basin or depression feature and the annual rainfall. Water depth may vary greatly on a seasonal basis and may be a meter deep or more in the winter in longer hydroperiod examples. Some examples become dry in the summer. Soils may be deep (100 cm or more), consisting of poorly drained mineral soil, as well as of peat or muck, with parent material of peat, muck or alluvium. Microtopography and fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this group.

A3408 *Quercus palustris - Quercus bicolor* Flooded & Swamp Forest Alliance

Alliance Summary Description: This floodplain forest occurs along smaller rivers in southern New England and the northern Piedmont, as well as in West Virginia. The setting can range from high terraces to any broad flat area with diffuse or braided drainage. The canopies of examples in New England and the northern Piedmont contain *Fraxinus pennsylvanica, Quercus palustris*, and *Ulmus americana*, with *Acer rubrum* and occasionally with *Quercus bicolor*. In addition, *Carya cordiformis, Fraxinus americana, Fraxinus nigra, Nyssa sylvatica*, and/or *Platanus occidentalis* may be present. West Virginia examples are dominated by *Quercus palustris* in association with *Acer rubrum, Carya ovata, Fraxinus americana, Fraxinus nigra, Nyssa sylvatica*, and *Quercus bicolor*. The shrub layer is dominated by *Carpinus caroliniana, Cornus amomum, Ilex verticillata, Lindera benzoin*, and *Viburnum dentatum*.

[CEGL006185] *Quercus palustris - Acer rubrum / Carex grayi - Geum canadense* Wet Forest

Translated Name: **Pin Oak - Red Maple / Gray's Sedge - White Avens Wet Forest**
Common Name: **Pin Oak Small River Floodplain Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Swamp Forest (M503)
Group	Central Hardwood Flatwoods & Swamp Forest (G597)
Alliance	*Quercus palustris* - *Quercus bicolor* Flooded & Swamp Forest Alliance (A3408)

ELEMENT CONCEPT

Global Summary: This freely drained floodplain forest occurs along smaller rivers in southern New England and the northern Piedmont. The setting can range from high terraces to any broad flat area with diffuse or braided drainage. The canopy is composed of *Quercus palustris, Fraxinus pennsylvanica, Acer rubrum, Ulmus americana*, and occasionally *Quercus bicolor, Fraxinus americana, Fraxinus nigra, Carya cordiformis, Nyssa sylvatica*, and/or *Platanus occidentalis*. More typically upland trees sometimes found on these terraces include *Quercus alba, Liriodendron tulipifera, Betula alleghaniensis, Pinus strobus*, and *Acer saccharum*. *Carpinus caroliniana* may be present as a small tree. The shrub layer includes *Lindera benzoin, Viburnum recognitum, Cornus amomum, Cornus obliqua*, or *Sambucus canadensis*. The herbaceous layer is variable in composition and usually dense. It can have abundant sedges, including *Carex lurida, Carex crinita, Carex intumescens, Carex rosea, Carex prasina, Carex lupulina*, or *Carex grayi*, with additional species such as *Cinna arundinacea, Leersia virginica, Panax trifolius, Symplocarpus foetidus, Geum canadense, Polygonum virginianum (= Tovara virginiana), Impatiens* spp., *Onoclea sensibilis, Athyrium filix-femina, Arisaema triphyllum, Iris versicolor, Viola sororia*, and *Toxicodendron radicans*. *Berberis thunbergii* and *Microstegium vimineum* are common invasive species in these forests.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This pin oak - red maple floodplain forest occurs in a temporarily flooded streambed. Evidence of disturbance includes the presence of exotic plants.

Global Environment: This forest occurs on alluvial deposits in the floodplain of small rivers. Flooding occurs during local events, especially during winter months. These areas can be seasonally, temporarily or intermittently flooded, often with networks of small drainages and pools throughout. Many of these areas were previously used as pasture.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This floodplain forest has abundant *Acer rubrum* and along with a significant component of *Quercus palustris*; canopy associates include *Fraxinus pennsylvanica, Ulmus americana, Salix nigra*, and occasionally *Quercus bicolor*. Shrubs include *Lindera benzoin, Rosa multiflora*, and other exotics. The herb layer is generally diverse with abundant *Carex* spp., *Impatiens capensis, Lysimachia nummularia* (exotic), and *Boehmeria cylindrica*. In addition, the site supports NJ state-critically imperiled *Cinna latifolia*.

Global Vegetation: The canopy is composed of *Quercus palustris, Fraxinus pennsylvanica, Acer rubrum, Ulmus americana*, and occasionally *Quercus bicolor, Fraxinus americana, Fraxinus nigra, Carya cordiformis, Nyssa sylvatica*, and/or *Platanus occidentalis*. More typically upland trees sometimes found on these terraces include *Quercus alba, Liriodendron tulipifera, Betula alleghaniensis, Pinus strobus*, and *Acer saccharum*. *Carpinus caroliniana* may be present as a small tree. The shrub layer includes *Lindera benzoin, Viburnum recognitum, Cornus amomum, Cornus obliqua*, or *Sambucus canadensis*. The herbaceous layer is variable in composition and usually dense. It can have abundant sedges, including *Carex lurida, Carex crinita, Carex intumescens, Carex rosea, Carex prasina, Carex lupulina*, or *Carex grayi*, with additional species such as *Cinna arundinacea, Leersia virginica, Panax trifolius, Symplocarpus foetidus, Geum canadense, Polygonum virginianum (= Tovara virginiana), Impatiens* spp., *Onoclea sensibilis, Athyrium filix-femina, Arisaema triphyllum, Iris versicolor, Viola sororia*, and *Toxicodendron radicans*. *Berberis thunbergii* and *Microstegium vimineum* are common invasive species in these forests.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*, *Fraxinus pennsylvanica*, *Quercus palustris*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Flowering forb	*Boehmeria cylindrica*, *Impatiens capensis*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*, *Fraxinus pennsylvanica*, *Quercus palustris*, *Ulmus americana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Cornus* spp., *Lindera benzoin*
Herb (field)	Graminoid	*Carex crinita*, *Carex intumescens*, *Carex lurida*, *Cinna arundinacea*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Fraxinus pennsylvanica*, *Lindera benzoin*, *Quercus palustris*
Global: *Carex grayi*, *Fraxinus pennsylvanica*, *Geum canadense*, *Lindera benzoin*, *Quercus bicolor*, *Quercus palustris*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Cinna latifolia* (G5, NJ state-critically imperiled); **Invasive/Exotic Plants**: *Lonicera morrowii* (High/Medium), *Lysimachia nummularia* (Medium/Low), *Microstegium vimineum* (High/Medium), *Rosa multiflora* (Medium/Low)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (20-May-2011). Approximately 50 occurrences occupying 10,000 acres or less are estimated over a somewhat limited range from southern New England to central New Jersey. This vegetation has likely declined over the short term and long term due to a number of human activities. Since many occurrences are located not far from large urban centers, existing occurrences face continued threats of construction and agriculture and associated runoff, as well as from hydrological manipulations such as culverts.

RELATED CONCEPTS

Global Similar Types:

- *Quercus palustris - (Quercus bicolor) - Acer rubrum / Vaccinium corymbosum / Osmunda cinnamomea* Wet Forest (CEGL006240) basin swamp with *Quercus palustris* and *Acer rubrum*.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This floodplain forest was sampled near Unionville East in New Jersey.
Global Range: This association is currently known from southern New England to New Jersey and Pennsylvania.
Nations: US
States/Provinces: CT, MA, NJ, NY, PA, RI
TNC Ecoregions: 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Ac:CCC, 221Ae:CCC, 221Af:CCC, 221Bd:CCC, 221Da:CCC, 221Dc:CCC, 232Ac:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap, Eisenhower, Gettysburg); USFWS (Great Swamp)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FPOF
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 observation point): APPA.1366.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid, L.A. Sneddon and S.C. Gawler
References: Barrett and Enser 1997, Breden et al. 2001, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Enser 1999, Enser and Lundgren 2006, Fike 1999, Metzler and Barrett 2001, Metzler and Barrett 2006, Perles et al. 2006c, Perles et al. 2007, Rawinski 1984a, Swain and Kearsley 2001, Zimmerman 2011f, Zimmerman et al. 2012

G044. CENTRAL INTERIOR-APPALACHIAN SEEPAGE SWAMP

Group Summary Description: This group of deciduous acidic seepage swamp forest communities is found primarily in two distinctive cool temperate regions of eastern North America. One of these constitutes the broadly conceived Appalachian region, including the southern Piedmont, the Cumberland Plateau and Ridge and Valley regions, parts of the Central Appalachians, and portions of the Southern Blue Ridge including the flat metasedimentary upland surfaces of Chilhowee Mountain, Tennessee. Some of the associations from this region range peripherally into the adjacent Interior Low Plateau and coastal plains, but these areas are not part of the core area. The other part of the group's range includes the unglaciated Interior Low Plateau from Alabama to Kentucky, and the Ouachitas and Ozarks of Arkansas and Oklahoma. These wetland forests generally occur where the substrate is saturated to the surface for extended periods during the growing season, but where surface water is seldom present for more than short periods of time. For example, in the Cumberland Plateau, stands most often occur in streamhead swales or on broad sandstone ridges where soils are sandy and saturated due to a combination of perched water table and seepage flow. Examples range in condition from open woodlands to forests. Typical woody species include *Acer rubrum, Nyssa sylvatica, Liriodendron tulipifera, Liquidambar styraciflua, Ilex opaca var. opaca, Oxydendrum arboreum*, and *Viburnum nudum*. In the Piedmont, vegetation is variable within and among examples. Included are seepage-fed wetlands on gentle slopes, with substantial seepage flow and which may be influenced by wildland fire. In the Ouachita Mountains of central Arkansas, as well as on Mount Magazine and in the Ozarks, examples may be found along the bottom slopes of smaller valleys, as well as in the upper riparian zones of larger creeks, sometimes extending upslope along small ephemeral drainages. The soil remains saturated to very moist throughout the year. The vegetation is typically forested with highly variable canopy composition. *Acer rubrum var. trilobum, Nyssa sylvatica, Liquidambar styraciflua*, and *Quercus alba* are common and typical. Other canopy species may include *Fagus grandifolia* and *Magnolia tripetala*. Canopy coverage can be moderately dense to quite open. The subcanopy is often well-developed and characteristically includes *Ilex opaca var. opaca, Magnolia tripetala, Carpinus caroliniana*, and *Ostrya virginiana*. Individual occurrences of these forests tend to be small in extent and can provide habitat for rare plant and animal species.

A3358 *Acer rubrum / Alnus serrulata - Ilex verticillata* Appalachian-Piedmont Seepage Forest Alliance

Alliance Summary Description: Vegetation of this alliance is found in forested acidic seeps and saturated swamp forests of the southern Piedmont and Appalachian regions of the southeastern United States. Forests in this alliance have variable canopy composition, but *Acer rubrum* and *Nyssa sylvatica* are common components. Canopy composition differs from the surrounding upland and varies with geography. Typical canopy species across the range of this alliance include *Acer rubrum var. trilobum, Nyssa sylvatica*, and *Liriodendron tulipifera*. One association contains *Pinus strobus*. Understory and shrub species include *Alnus serrulata, Ilex opaca var. opaca, Ilex verticillata, Photinia pyrifolia (= Aronia arbutifolia), Rhododendron canescens*, and *Viburnum nudum var. nudum*. Characteristic herbaceous species include *Carex* spp., *Osmunda cinnamomea, Osmunda regalis*, and *Woodwardia areolata*. In addition, *Sphagnum* spp. are typical. These wetland forests generally occur where the soils are saturated to the surface for extended periods during the growing season, but where surface water is seldom present. These forested, primarily acidic seeps are found on hillsides, streamheads, floodplain edges, poorly drained depressions, and gentle slopes where saturated conditions influence the vegetation.

[CEGL007853] *Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Seep Forest

Translated Name: **Red Maple - Blackgum / Common Winterberry - Black Highbush Blueberry / Cinnamon Fern Seep Forest**

Common Name: **Central Appalachian Acidic Seepage Swamp Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Swamp Forest (M503)
Group	Central Interior-Appalachian Seepage Swamp (G044)
Alliance	*Acer rubrum / Alnus serrulata - Ilex verticillata* Appalachian-Piedmont Seepage Forest Alliance (A3358)

Element Concept

Global Summary: This community occurs on groundwater-saturated flats and low slopes along streams in the Ridge and Valley, northern Cumberland Plateau, Northern Blue Ridge, and western Piedmont at elevations of 200-900 m (700-2900 feet). Habitats are usually more-or-less narrow and elongate, with hummock-and-hollow microtopography, and frequently with a small ephemeral stream channel running through or adjacent to the community. Substrates are poorly drained mineral soils with numerous hydric indicators. The ground surface is slightly sloping, and drainage is usually via small, intricately braided channels with interspersed hummocks. The canopy is usually closed and consists of *Acer rubrum, Nyssa sylvatica*, and *Liriodendron tulipifera*. *Quercus alba* is an important associate in some areas, and *Ulmus rubra, Fraxinus americana*, and *Platanus occidentalis* are present in some stands. Minor or local tree species include *Magnolia acuminata, Tsuga canadensis, Betula lenta, Pinus rigida*, and *Pinus strobus*. The shrub stratum may be well-developed and includes *Ilex verticillata, Ilex opaca, Vaccinium corymbosum, Kalmia latifolia, Alnus serrulata, Viburnum nudum var. cassinoides, Viburnum dentatum, Smilax* spp., and, less consistently, *Carpinus caroliniana, Asimina triloba, Euonymus americanus, Lindera benzoin, Gaylussacia frondosa, Gaylussacia baccata, Menziesia pilosa, Vaccinium fuscatum, Chionanthus virginicus, Viburnum nudum var. nudum, Rhododendron viscosum*, and *Toxicodendron vernix*. *Rubus hispidus* is an abundant creeping vine in many stands. Typical herbaceous plants include *Osmunda cinnamomea, Carex gynandra, Carex lurida, Carex atlantica, Carex debilis, Thelypteris noveboracensis, Platanthera clavellata, Chelone glabra, Medeola virginiana, Dioscorea quaternata, Juncus effusus, Lycopus uniflorus, Lycopodium obscurum, Osmunda regalis var. spectabilis, Symplocarpus foetidus, Veratrum viride, Viola hastata*, and *Viola cucullata*.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This narrow seepage swamp occurs on groundwater-saturated flats and low slopes along headwater streams at elevations of 200 to 900 m (700-2,900 feet) in areas underlain by acidic sedimentary and metamorphic rocks. One plot was sampled in Loudon County, Virginia, in the Central Appalachian project area. It is a small-patch community that is well-developed in the large alluvial fans along the western foot of the Northern Blue Ridge and in small-stream valleys and low-gradient plateau drainages of the Ridge and Valley province and parts of the Cumberland Plateau. Habitats are usually more-or-less narrow and elongate, with hummock-and-hollow microtopography, and frequently with a small ephemeral stream channel running through or adjacent to the community. Substrates are poorly drained mineral soils. The unvegetated surface is dominated by leaf litter.

Global Environment: This community occurs on groundwater-saturated flats along low- to middle-elevation streams and headwaters seeps in areas underlain by acidic sedimentary and metamorphic rocks. It is a small-patch type that is particularly frequent and well-developed in the large alluvial fans along the western foot of the Northern Blue Ridge and in small-stream valleys and low-gradient plateau drainages of the Ridge and Valley province and parts of the Cumberland Plateau. Outliers occur throughout the western Piedmont, particularly in districts underlain by acidic metasedimentary rocks. Habitats are usually more-or-less narrow and elongate, with hummock-and-hollow microtopography, and frequently with a small ephemeral stream channel running through or adjacent to the community. Substrates are poorly drained mineral soils with numerous hydric indicators, including saturated horizons, oxidized root channels, low chroma, gley, and mottles. Local areas of organic muck sometimes accumulate in depressions. The ground surface is slightly sloping, and drainage is usually via small, intricately braided channels with interspersed hummocks. Moss mats, predominantly of *Sphagnum* spp., are usually abundant and provide a rooting medium for herbaceous species. Soils collected from plot samples are very strongly acidic with moderately low to very low base status. Patches of this community are mostly shaded by overhanging trees, but sunny spots may be created by canopy gaps, and larger patches may have small open centers.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Acer rubrum* is dominant or codominant with *Nyssa sylvatica* in the canopy often with *Liriodendron tulipifera*. *Hamamelis virginiana, Amelanchier arborea, Chionanthus virginicus, Lindera benzoin*, and *Rubus hispidus* are common shrubs. *Osmunda cinnamomea var. cinnamomea* dominates the ground story with patches of *Symplocarpus foetidus* and *Thelypteris noveboracensis*. Other herbs include *Maianthemum canadense, Eurybia divaricata*, and *Viola cucullata*.
Global Vegetation: This forest association has an open to closed canopy of *Acer rubrum, Nyssa sylvatica*, and *Liriodendron tulipifera*. *Quercus alba* is an important associate in some areas, and *Ulmus rubra, Fraxinus americana*, and *Platanus occidentalis* are present in some stands. *Pinus rigida* is a frequent overstory associate in some Ridge and Valley and Blue Ridge stands, although its numbers have been recently reduced by southern pine beetle outbreaks. Minor tree species, especially at the higher elevations, include *Magnolia acuminata, Tsuga canadensis, Betula lenta*, and *Pinus strobus*. A single, anomalous stand in Augusta County, Virginia, contains an abundance of the disjunct Coastal Plain tree *Magnolia virginiana* (Carr 1939). *Amelanchier arborea* is usually common in the understory, along with reproduction of *Acer rubrum* and *Nyssa sylvatica*. The shrub stratum is often well-developed and includes *Ilex verticillata, Ilex opaca, Kalmia latifolia, Alnus serrulata, Viburnum dentatum, Photinia pyrifolia (= Aronia arbutifolia), Vaccinium corymbosum*, and *Smilax* spp. Less frequent, but locally important, shrubs include *Asimina triloba, Vaccinium fuscatum, Euonymus americanus, Toxicodendron vernix, Viburnum nudum var. nudum, Viburnum nudum var. cassinoides, Menziesia pilosa, Carpinus caroliniana, Chionanthus virginicus, Lindera benzoin, Gaylussacia frondosa, Rhododendron catawbiense, Rhododendron periclymenoides*, and *Rhododendron viscosum*. *Rubus hispidus* is an abundant creeping vine in many stands; *Smilax rotundifolia* may also be present. The most characteristic herbaceous plants are *Osmunda cinnamomea, Osmunda regalis var. spectabilis, Platanthera clavellata, Chelone glabra, Rubus hispidus, Viola cucullata, Carex gynandra, Carex lurida, Carex atlantica, Carex debilis, Oxypolis rigidior, Thelypteris noveboracensis, Athyrium filix-femina, Dioscorea quaternata, Juncus effusus, Lycopus uniflorus, Medeola virginiana, Polystichum acrostichoides, Potentilla simplex*, and *Viola hastata*. Where shrubs are sparse, as in most of the West Virginia occurrences, fern cover is typically extensive. Less frequent but typical herbs include *Parnassia asarifolia, Carex intumescens, Carex leptalea, Symplocarpus foetidus, Veratrum viride, Maianthemum canadense, Lycopodium obscurum, Onoclea sensibilis, Leersia virginica, Boehmeria cylindrica, Lycopus virginicus, Glyceria striata*, and *Dryopteris cristata*. Many additional herbaceous species, including several more typical of uplands, occur at low constancy and cover. The bryophyte layer may also be diverse; species of mosses and liverworts identified from plots include *Atrichum undulatum, Aulacomnium palustre, Bryhnia novae-angliae, Callicladium haldanianum, Campylium radicale, Dicranum scoparium, Hypnum imponens, Jungermannia gracillima, Leucobryum albidum, Mnium hornum, Pellia epiphylla, Plagiomnium ciliare, Platygyrium repens, Steerecleus serrulatus*, and *Thuidium delicatulum*. Mean vascular plant species richness of 37 plot-sampled stands in Virginia and West Virginia is 47 taxa per 400 square meters.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Liriodendron tulipifera*, *Nyssa sylvatica*
Herb (field)	Flowering forb	*Symplocarpus foetidus*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Liriodendron tulipifera*, *Nyssa sylvatica*, *Quercus alba*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Hamamelis virginiana*, *Lindera benzoin*, *Liriodendron tulipifera*, *Nyssa sylvatica*, *Osmunda cinnamomea*, *Rubus hispidus*, *Thelypteris noveboracensis*, *Viola cucullata*
Global: *Acer rubrum*, *Alnus serrulata*, *Aulacomnium palustre*, *Bryhnia novae-angliae*, *Callicladium haldanianum*, *Campylium radicale*, *Carex baileyi*, *Carex debilis*, *Carex folliculata*, *Carex intumescens*, *Carex prasina*, *Chelone glabra*, *Cinna arundinacea*, *Dichanthelium dichotomum*, *Glyceria melicaria*, *Glyceria striata*, *Ilex verticillata*,

Juncus effusus, *Liriodendron tulipifera*, *Lycopus uniflorus*, *Mnium hornum*, *Nyssa sylvatica*, *Osmunda cinnamomea*, *Oxypolis rigidior*, *Pellia epiphylla*, *Plagiomnium ciliare*, *Platanthera clavellata*, *Rubus hispidus*, *Thelypteris noveboracensis*, *Viola cucullata*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Eriocaulon decangulare* (G5, VA state-rare), *Helonias bullata* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (14-Feb-2012). This association has a narrow geographic range and is further limited by its requirement for special, localized wetlands. The type is confined to groundwater-saturated, nutrient-poor habitats that are large enough to support forest vegetation. February 2012: Two issues regarding the global rank have emerged since the analysis of this type using the rank calculator in 2008. The calculator produced a rank of G1. The rank of G1Q was assigned based on the taxonomic overlap with other associations of the alliance, especially *Acer rubrum - Nyssa sylvatica* High Allegheny Plateau-Central Appalachian Seep Forest (CEGL006132). However, after further discussion with ecologists in the Virginia Division of Natural Heritage, the suggested assigned rank is G2. This type occurs naturally in small patches, so that even a moderately large number of occurrences yields a low area of occupancy. The rank calculator assigns an automatic G1 for areas of occupancy <250 sq km regardless of the number of occurrences. The taxonomic status of the type is felt to be robust because its classification was the result of a regional analysis conducted for the vegetation classification and mapping of the National Capital Region parks.

RELATED CONCEPTS

Global Similar Types:

- *Acer rubrum - Fraxinus nigra - Betula alleghaniensis / Veratrum viride - Carex bromoides* Seep Forest (CEGL008416)
- *Acer rubrum - Nyssa sylvatica - Magnolia virginiana / Viburnum nudum var. nudum / Osmunda cinnamomea* Swamp Forest (CEGL006238)
- *Acer rubrum - Nyssa sylvatica* High Allegheny Plateau-Central Appalachian Seep Forest (CEGL006132)
- *Acer rubrum var. trilobum / Viburnum nudum var. nudum / Osmunda cinnamomea - Saururus cernuus - Impatiens capensis* Seep Forest (CEGL004426)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: The one plot in Loudon County, Virginia, is located along a narrow feeder seep, where *Trientalis borealis* occurs at its lowest elevation in Virginia. The co-occurrence of this species with *Toxicodendron vernix*, a rarity in the mountainous portions of the state, is a notable floristic feature of the community.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Examples occur near the Maple Flats pond complex (Augusta County, Virginia). This community is also known from Massanutten Mountain (Lee District, George Washington National Forest), elsewhere along the foot of the Blue Ridge (north of Maple Flats), a site on the northern Blue Ridge in Loudoun County, Virginia (owned by The Appalachian Trail Club), and in the Bull Run Mountains of Virginia, an isolated Piedmont foothill in Fauquier and Prince William counties, Virginia; occurrences in the latter two areas do not have *Pinus rigida* (or much of it) but are otherwise very similar (Fleming 1998). Quantitative analysis of a 1300-plot regional dataset for the National Capital Region Parks Vegetation Mapping Project Phase I indicate that a portion of Gould and Berdine's (1998) "circumneutral" seepage swamp community from Catoctin Mountain, Maryland, also corresponds to this type. It has also been sampled in West Virginia, where occurrences generally lack a dense shrub layer and are characterized by heavy fern cover.

There are unresolved issues regarding conceptual overlap between this type and *Acer rubrum - Nyssa sylvatica* High Allegheny Plateau-Central Appalachian Seep Forest (CEGL006132). The latter type is a broadly defined community type that encompasses both seepage wetlands and poorly drained depressions. The community classified and described here for Virginia is limited conceptually to flow-through, groundwater-seepage wetlands. Communities with similar *Acer - Nyssa* canopies but occurring in saturated to seasonally flooded depression wetlands without apparent seepage inputs have been documented in Virginia but are not treated due to insufficient data. Nevertheless, they appear to warrant segregation from the seepage wetland communities because of their hydrologic regime, distinctly different herbaceous composition, and much lower species richness.

This type is currently under-represented by plot data, but observations suggest that it is relatively consistent in its composition and environmental affiliations. However, community characterization and nomenclature are

subject to change pending further data collection and analysis, ideally based on wider geographic sampling. The recognition of segregate associations, subassociations, or variants may also be warranted following additional assessment. Lower-elevation sites are characterized by *Amianthium muscitoxicum, Brachyelytrum erectum, Carex debilis, Carex intumescens, Cypripedium acaule, Gaylussacia frondosa, Lindera benzoin, Platanthera ciliaris, Platanthera clavellata, Uvularia sessilifolia, Viburnum nudum var. nudum*, and *Viola x primulifolia*. Middle-elevation sites are characterized by *Oclemena acuminata (= Aster acuminatus), Betula lenta, Magnolia acuminata, Pinus strobus, Rhododendron catawbiense*, and *Rhododendron viscosum*. A single site (Magnolia Swamp), possibly with boggier or more organic soils, is characterized by *Magnolia virginiana, Arethusa bulbosa, Dulichium arundinaceum, Juncus effusus, Parthenocissus quinquefolia, Triadenum virginicum*, and *Woodwardia areolata*.

This type is similar in many respects to, and intergrades with, Montane Basic Seepage Swamps that are situated on calcareous soils derived from metabasalt (greenstone) and carbonate rock substrates [see *Acer rubrum - Fraxinus nigra - Betula alleghaniensis / Veratrum viride - Carex bromoides* Seep Forest (CEGL008416)]. These environmentally disparate swamps share a surprising number of prominent species including *Acer rubrum, Symplocarpus foetidus, Veratrum viride, Osmunda cinnamomea, Osmunda regalis var. spectabilis, Carex leptalea*, etc. Acidic seepage swamps, however, have lower species richness and mostly lack distinctly base-loving species such as *Fraxinus americana, Fraxinus nigra, Caltha palustris, Carex bromoides, Saxifraga pensylvanica*, etc. *Sphagnum* mosses, as well as many vascular plants that characterize Acidic Seepage Swamps, are absent or unimportant in the calcareous swamps. Examples include *Pinus rigida, Nyssa sylvatica, Viburnum nudum, Parnassia asarifolia, Platanthera ciliaris, Platanthera clavellata, Rubus hispidus, Lycopodium obscurum, Carex debilis*, and *Carex folliculata* (Fleming and Van Alstine 1999).

Formerly a common canopy tree of this community type in certain localities (e.g., Maple Flats, Augusta County), *Pinus rigida* has been nearly eliminated from many stands by a recent outbreak of southern pine beetles (*Dendroctonus frontalis*).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from the Central Appalachians of Maryland and Virginia into the Cumberland Mountains in West Virginia. It was sampled at Piney Run West Branch in Loudon County, Virginia.
Global Range: The documented range of this community type encompasses the Central Appalachians of Maryland and Virginia, and the Cumberland Mountains in West Virginia. In Virginia, it is scattered throughout the mountains (Northern Blue Ridge) and, more locally, the western Piedmont (Allard and Leonard 1943).
Nations: US
States/Provinces: MD, NC, PA?, VA:S2, WV
TNC Ecoregions: 50:C, 51:C, 52:C, 59:C
USFS Ecoregions (1994/95): 231Aa:CC?, 231Ae:CCC, 231Ak:CC?, 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Bd:C??, M221Ca:CCC, M221Cb:CCC, M221Cc:CC?, M221Ce:CC?, M221Da:CCC, M221Db:CC?
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Gauley River, New River Gorge, Shenandoah); USFS (George Washington, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCAS
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 plots; 1 accuracy assessment point): APPA.0381, APPA.0488, APPA_AA_0216.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming, P. Coulling, S.C. Gawler
References: Allard and Leonard 1943, Carr 1939, Fleming 1998, Fleming 2002a, Fleming 2002b, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2003, Fleming and Patterson 2011a, Fleming and Van Alstine 1999, Fleming et al. 2001, Fleming et al. 2007b, Fleming pers. comm., Gould and Berdine 1998, Harrison 2004, Southeastern Ecology Working Group n.d., VDNH 2003, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2010, WVNHP unpubl. data b, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL007443] ***Acer rubrum var. trilobum - Nyssa sylvatica / Osmunda cinnamomea - Carex intumescens / Sphagnum lescurii*** **Seep Forest**
Translated Name: **Carolina Red Maple - Blackgum / Cinnamon Fern - Greater Bladder Sedge / Yellow Peatmoss Seep Forest**
Common Name: **Appalachian Forested Acidic Seep**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Swamp Forest (M503)
Group	Central Interior-Appalachian Seepage Swamp (G044)
Alliance	*Acer rubrum / Alnus serrulata - Ilex verticillata* Appalachian-Piedmont Seepage Forest Alliance (A3358)

Element Concept

Global Summary: These forested acidic seeps occur in the Cumberland Plateau, the Ridge and Valley, areas of the western portions of the Southern Blue Ridge at lower elevations, as well as in the Appalachian Plateaus of Kentucky (Cliff section), and western Kentucky at the edge of the Shawnee Hills (Dripping Springs Escarpment). These forests are found primarily in streamhead swales on broad ridges on sandy, saturated soils derived from shales and sandstones. This community develops where a perched water table is present, as opposed to seepage from the base of a slope [for vegetation related to this latter condition, see *Acer rubrum var. trilobum - Nyssa sylvatica / Rhododendron canescens - Viburnum nudum var. nudum / Woodwardia areolata* Seep Forest (CEGL004425)]. Canopy coverage can be moderately dense to quite open. Canopy composition is highly variable, but *Acer rubrum var. trilobum, Nyssa sylvatica, Liriodendron tulipifera*, and *Liquidambar styraciflua* are common. Subcanopy trees can include *Ilex opaca var. opaca, Carpinus caroliniana*, and (within range) *Magnolia macrophylla*. Tall shrubs are scattered and may be locally dominant. Typical shrubs include *Ilex verticillata, Alnus serrulata, Rhododendron maximum, Photinia melanocarpa (= Aronia melanocarpa), Vaccinium simulatum, Viburnum nudum var. nudum*, and *Cornus foemina*. In examples from the Southern Blue Ridge, *Viburnum nudum var. cassinoides* will replace *Viburnum nudum var. nudum* in this type. Woody vines can be common and include *Toxicodendron radicans* and (especially towards the southern part of the association's distribution), *Decumaria barbara* and *Bignonia capreolata*. Typical herbaceous species include *Osmunda cinnamomea, Osmunda regalis var. spectabilis, Chasmanthium laxum, Thelypteris noveboracensis, Woodwardia areolata, Oxypolis rigidior, Carex intumescens, Carex debilis, Carex crinita, Medeola virginiana, Lobelia cardinalis, Juncus effusus var. pylaei, Scirpus polyphyllus, Rubus hispidus, Solidago patula var. patula, Athyrium filix-femina ssp. asplenioides*, and *Viola x primulifolia*. *Platanthera integrilabia* and *Platanthera clavellata* are also known from these forested seeps but are more typical in more open woodland seeps. Patches of *Sphagnum* spp. are common and *Sphagnum lescurii* is typical. In the Daniel Boone National Forest (Kentucky), some stands can contain *Tsuga canadensis* and be transitional to *Tsuga canadensis - Acer rubrum - (Nyssa sylvatica) / Rhododendron maximum / Sphagnum* spp. Seep Forest (CEGL007565).

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This small-patch forested seep community was observed at Dick's Creek Gap in Georgia at 900 m (2,950 feet) elevation. There is a stream flowing through it.
Global Environment: These forests are found primarily in streamhead swales on broad ridges on sandy, saturated soils derived from shales and sandstones. This community develops where a perched water table is present, as opposed to seepage from the base of a slope.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy is dominated by *Nyssa sylvatica* over an understory dominated by *Rhododendron maximum*.
Global Vegetation: Canopy coverage can be moderately dense to quite open. Canopy composition is highly variable, but *Acer rubrum var. trilobum, Nyssa sylvatica, Liriodendron tulipifera*, and *Liquidambar styraciflua* are common. Subcanopy trees can include *Ilex opaca var. opaca, Carpinus caroliniana*, and (within range) *Magnolia macrophylla*. Tall shrubs are scattered and may be locally dominant. Typical shrubs include *Ilex verticillata, Alnus serrulata, Rhododendron maximum, Photinia melanocarpa (= Aronia melanocarpa), Photinia pyrifolia (= Aronia arbutifolia), Vaccinium simulatum, Viburnum nudum var. nudum, Arundinaria gigantea*, and *Cornus foemina*. In examples from the Southern Blue Ridge, *Viburnum nudum var. cassinoides* will replace *Viburnum nudum var. nudum* in this type. Woody vines can be common, and include *Toxicodendron radicans* and (especially towards the

southern part of the association's distribution), *Decumaria barbara* and *Bignonia capreolata*. Typical herbaceous species include *Osmunda cinnamomea, Osmunda regalis var. spectabilis, Chasmanthium laxum, Thelypteris noveboracensis, Woodwardia areolata, Woodwardia virginica, Oxypolis rigidior, Carex intumescens, Carex debilis, Carex crinita, Medeola virginiana, Lobelia cardinalis, Oxypolis rigidior, Juncus effusus var. pylaei, Scirpus polyphyllus, Rubus hispidus, Solidago patula var. patula, Lycopus uniflorus, Athyrium filix-femina ssp. asplenioides*, and *Viola x primulifolia*. *Platanthera integrilabia* and *Platanthera clavellata* are also known from these forested seeps but are more typical in more open woodland seeps. Patches of *Sphagnum* spp. are common and *Sphagnum lescurii* is typical. These forests are found primarily in streamhead swales on broad ridges on sandy, saturated soils derived from shales and sandstones. This community develops where a perched water table is present, as opposed to seepage from the base of a slope [for vegetation related to this latter condition, see *Acer rubrum var. trilobum - Nyssa sylvatica / Rhododendron canescens - Viburnum nudum var. nudum / Woodwardia areolata* Seep Forest (CEGL004425)]. In the Daniel Boone National Forest (Kentucky), some stands can contain *Tsuga canadensis*, and be transitional to *Tsuga canadensis - Acer rubrum - (Nyssa sylvatica) / Rhododendron maximum / Sphagnum* spp. Seep Forest (CEGL007565).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Nyssa sylvatica*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Nyssa sylvatica*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Nyssa sylvatica*, *Rhododendron maximum*
Global: *Acer rubrum* var. *trilobum*, *Carex intumescens*, *Chasmanthium laxum*, *Nyssa sylvatica*, *Osmunda cinnamomea*, *Sphagnum lescurii*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Cypripedium kentuckiense* (G3), *Hexastylis contracta* (G3), *Hexastylis shuttleworthii* var. *harperi* (G4T3), *Platanthera integra* (G3G4), *Platanthera integrilabia* (G2G3), *Vaccinium hirsutum* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (30-Dec-2008). This association is restricted to a small-scale wetland habitat in a limited region. It is vulnerable to alteration or destruction by various anthropogenic activities, including hydrologic modifications. Most examples are on private land and remain unprotected.

RELATED CONCEPTS

Global Similar Types:
- *Acer rubrum var. trilobum - Nyssa sylvatica / Rhododendron canescens - Viburnum nudum var. nudum / Woodwardia areolata* Seep Forest (CEGL004425) is related to seepage at the base of a slope.
- *Acer rubrum var. trilobum / Alnus serrulata / Calamagrostis coarctata* Seep Woodland (CEGL003737) is more open and on coarser substrates.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: No plots or observation points were sampled for this community; however, it was observed by a NatureServe ecologist and the UMESC mapping team during the summer of 2010 during mapping reconnaissance.
Global Classification Comments: There is a good deal of variability in examples of saturated *Acer rubrum var. trilobum - Nyssa sylvatica* forests in this region, in terms of hydroperiod, extent, and environment. More typical examples exhibit dominance or at least codominance by *Osmunda cinnamomea*, but some apparently drier or shorter hydroperiod examples are dominated by *Thelypteris noveboracensis* instead, and often lack *Sphagnum* or have it at very low density. These are included here as marginal to the concept and may represent either part of the natural

variation or lower quality examples. Often this apparent variability is present within one stream reach. Some "examples" or parts of examples are very narrow bands along streams, and these are effectively below the minimum size for an occurrence, and thus would be mappable only at the very finest scales.

Examples are known from the Somerset and Stearns ranger districts of the Daniel Boone National Forest, in the Appalachian Plateaus, Cliff section of Kentucky. Similar seeps are known from western Kentucky, at the edge of the Shawnee Hills; they are included here for now. Related vegetation from the Cretaceous Gravel Hills of the Mississippi Embayment, which occurs at the bases of slopes rather than in streamheads on broad ridges, is accommodated in *Acer rubrum var. trilobum - Nyssa sylvatica / Rhododendron canescens - Viburnum nudum var. nudum / Woodwardia areolata* Seep Forest (CEGL004425). This association is known from Tennessee in the southwestern portion of the southern Blue Ridge. A similar woodland community is *Acer rubrum var. trilobum / Alnus serrulata / Calamagrostis coarctata* Seep Woodland (CEGL003737). In general, stands of this association (CEGL007443) have greater canopy cover and thereby denser shade, as well as being in a finer-textured, mucky substrate - in contrast to the more open canopy and coarser-textured, sandier substrate of CEGL003737.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was observed at Dick's Creek Gap in Georgia.
Global Range: This community is known from the Cumberland Plateau of Alabama, Tennessee and Kentucky, the adjacent Ridge and Valley, as well as lower elevation areas of the western portions of the Southern Blue Ridge in Tennessee and Georgia, the Appalachian Plateaus of Kentucky (Cliff section), and at the edge of the Shawnee Hills in western Kentucky.
Nations: US
States/Provinces: AL:S2, GA, KY, NC, TN
TNC Ecoregions: 44:C, 50:C, 51:C
USFS Ecoregions (1994/95): 221Hc:CCC, 221He:CCC, 222Dg:CCC, 222Eo:CCC, 222G:CC, 231Ca:CCC, 231Cc:CCC, 231Cd:CCC, 231Db:CCC, 231Dc:CCC, 231De:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Big South Fork, Little River Canyon, Mammoth Cave); USFS (Bankhead, Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Talladega (Talladega)?); USFWS (Mountain Longleaf)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: No plots or observation points were sampled for this community; however, it was observed by a NatureServe ecologist and the UMESC mapping team during the summer of 2010 and during accuracy assessment.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay
Global Description Author(s): J. Campbell and K.D. Patterson
References: ALNHP unpubl. data, Allard 1990, Evans 1991, Evans et al. 2009, NatureServe Ecology - Southeastern U.S. unpubl. data, Pyne et al. 2010, Schafale 2012, Schotz et al. 2008, Schotz pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

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[CEGL007565] *Tsuga canadensis - Acer rubrum - (Nyssa sylvatica) / Rhododendron maximum / Sphagnum* spp. Seep Forest

Translated Name: **Eastern Hemlock - Red Maple - (Blackgum) / Great Laurel / Peatmoss species Seep Forest**
Common Name: **Swamp Forest - Bog (Typic Type)**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Swamp Forest (M503)
Group	Central Interior-Appalachian Seepage Swamp (G044)
Alliance	*Acer rubrum / Alnus serrulata - Ilex verticillata* Appalachian-Piedmont Seepage Forest Alliance (A3358)

ELEMENT CONCEPT

Global Summary: This palustrine forest has a closed or open canopy and an open to dense shrub layer, interspersed with small *Sphagnum*-herb dominated depressions. These forests are found throughout the Southern Blue Ridge, and in the Cumberland Mountains and Cumberland Plateau, at elevations below 1200 m (4000 feet), in poorly drained bottomlands, generally with visible microtopography of ridges and sloughs or depressions. It often occurs near streams and is undoubtedly occasionally flooded. The canopy is composed of various mixtures of evergreen and deciduous species, often dominated by *Tsuga canadensis* and *Acer rubrum*, and less often by *Liriodendron tulipifera, Nyssa sylvatica, Pinus strobus*, or *Pinus rigida*. The dominant shrubs are usually *Rhododendron maximum, Kalmia latifolia*, and *Leucothoe fontanesiana*, but other shrubs include *Salix nigra, Alnus serrulata, Ilex montana, Cornus amomum, Viburnum nudum var. cassinoides*, and *Toxicodendron vernix*. Herbs in *Sphagnum*-herb dominated openings include *Solidago patula var. patula, Symphyotrichum puniceum (= Aster puniceus), Dalibarda repens, Osmunda cinnamomea, Carex folliculata, Carex gynandra, Carex scabrata, Carex leptalea, Carex stricta, Sarracenia purpurea, Sagittaria latifolia (= var. pubescens)*, and *Leersia virginica*. Herbs in the forested areas include *Glyceria melicaria, Lycopodium obscurum, Onoclea sensibilis, Maianthemum canadense, Thelypteris noveboracensis*, and *Osmunda regalis var. spectabilis*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This uncommon acidic groundwater-influenced forested montane shrub-bog complex occurs in poorly drained, relatively flat to slightly concave depressions associated with streamheads and seeps at 1,094 m (3,589 feet) elevation.
Global Environment: The type occurs mostly at elevations below 1200 m (4000 feet), in poorly drained bottomlands, generally with visible microtopography of ridges and sloughs or depressions. It often occurs near streams and is undoubtedly occasionally flooded. In Virginia, habitats range from 790-1340 m (2600-4400 feet) elevation and are typically located along small, braided headwaters streams draining visible groundwater discharge. Soils are very strongly acidic (mean pH in plots = 4.8) with low base status.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This forest has a closed or open canopy and an open to dense shrub layer, interspersed with small *Sphagnum*- and herb-dominated depressions. The canopy is composed of various mixtures of evergreen and deciduous species, often dominated by *Tsuga canadensis* and *Acer rubrum*, and less often by *Liriodendron tulipifera, Nyssa sylvatica, Betula lenta, Pinus strobus*, or *Pinus rigida*. *Rhododendron maximum* may be common in the shrub layer. Common herbs include *Athyrium filix-femina ssp. asplenioides, Lycopus uniflorus, Oclemena acuminata*, and *Viola cucullata*.
Global Vegetation: This palustrine forest has a closed or open canopy and an open to dense shrub layer, interspersed with small *Sphagnum*- and herb-dominated depressions. The canopy is composed of various mixtures of evergreen and deciduous species, including *Tsuga canadensis, Acer rubrum, Liriodendron tulipifera, Nyssa sylvatica, Pinus strobus*, and *Pinus rigida*. Canopy dominants vary with elevation. Occurrences at lower elevations tend to be dominated by *Acer rubrum, Liriodendron tulipifera*, and/or *Nyssa sylvatica*, while examples at higher elevations are usually dominated by *Tsuga canadensis* and/or *Betula alleghaniensis*. *Picea rubens* is a minor canopy component at the highest elevations. The dominant shrubs are usually *Rhododendron maximum, Kalmia latifolia*, and *Leucothoe fontanesiana*, but other shrubs may include *Salix nigra, Alnus serrulata, Ilex montana, Cornus amomum, Viburnum nudum var. cassinoides*, and *Toxicodendron vernix*. Herbaceous species of sphagnous openings include *Solidago patula, Symphyotrichum puniceum (= Aster puniceus), Dalibarda repens, Osmunda cinnamomea, Carex folliculata, Carex gynandra, Carex scabrata, Carex leptalea, Carex stricta, Sarracenia purpurea, Sagittaria latifolia (= var. pubescens)*, and *Leersia virginica*. Herbs in more densely shaded areas include *Glyceria melicaria, Lycopodium obscurum, Onoclea sensibilis, Maianthemum canadense, Thelypteris noveboracensis*, and *Osmunda regalis var. spectabilis*.

Overstory composition of the very few documented examples in Virginia is somewhat heterogeneous and may represent an elevational gradient. The lowest-elevation stand (at 790 m or 2600 feet) in Carroll County (Southern Blue Ridge) is codominated by *Acer rubrum* and *Pinus strobus* with minor associates of *Betula alleghaniensis*, and *Tsuga canadensis*. A Giles County (Ridge and Valley) stand at 1160 m (3800 feet) has a mixed canopy of *Acer rubrum, Nyssa sylvatica, Picea rubens*, and *Pinus rigida*. The third stand, located at 1335 m (4380 feet) in Grayson County (Southern Blue Ridge) is overwhelmingly dominated by *Betula alleghaniensis*, with minor associates of *Acer rubrum* and *Picea rubens*. *Rhododendron maximum* is the dominant shrub, and *Osmunda cinnamomea* the dominant herb, at all three sites. Other species prominent in at least two of the three stands include *Kalmia latifolia, Hamamelis virginiana, Rhododendron viscosum, Rubus hispidus, Viola macloskeyi ssp. pallens, Carex trisperma, Glyceria melicaria, Lycopodium obscurum*, and *Carex intumescens*. *Dalibarda repens* is an

abundant herb at the Carroll County (lowest-elevation) site, while *Solidago rugosa, Carex ruthii*, and *Carex baileyi* are common at the Grayson County (highest-elevation) site. Mean species richness ranges from 30 to 46 taxa per 400 m2 (mean = 40).

Global Dynamics: The factors responsible for creating and maintaining this community are not well known, although beaver activity may play a role. The frequency and role of flooding is not known. This community may represent late successional stage of primary succession from once extensive, open bog areas and will remain in a forest condition unless the canopy is removed by tree blowdown, logging, or fire.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* var. *trilobum*, *Betula lenta*
Short shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*
Herb (field)	Flowering forb	*Viola macloskeyi* ssp. *pallens*
Nonvascular	Moss	*Sphagnum* spp.

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*
Short shrub/sapling	Broad-leaved evergreen tree	*Rhododendron maximum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*, *Leucothoe fontanesiana*
Herb (field)	Graminoid	*Carex gynandra*, *Glyceria melicaria*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*
Nonvascular	Moss	*Sphagnum* spp.

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Sphagnum* spp., *Viola cucullata*
Global: *Carex folliculata*, *Carex ruthii*, *Carex trisperma*, *Dalibarda repens*, *Glyceria melicaria*, *Lycopodium obscurum*, *Osmunda cinnamomea*, *Rhododendron maximum*, *Rhododendron viscosum*, *Sphagnum* spp., *Viola macloskeyi* ssp. *pallens*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Carex ruthii* (G3), *Chelone cuthbertii* (G3, Southern Blue Ridge endemic), *Dalibarda repens* (G5, VA state-rare), *Helonias bullata* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (14-Dec-1998). This community is somewhat more common and secure than herbaceous and shrub-dominated nonalluvial wetlands of the Southern Blue Ridge, most of which are ranked G1. However, this community has been severely impacted by development, conversion to pasture and agriculture, and hydrologic alterations--changes which are concentrated in flat areas along streams in the steep landscapes of the Southern Blue Ridge. Most occurrences are small (less than 5 acres), very few are unaltered, and almost all have experienced alterations of hydrology, which makes their long-term viability questionable.

RELATED CONCEPTS

Global Similar Types:

- *Tsuga canadensis - Liriodendron tulipifera - Platanus occidentalis / Rhododendron maximum - Xanthorhiza simplicissima* Wet Forest (CEGL007143)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Also known as the Southern Appalachian "swamp forest - bog complex."
Global Classification Comments: Canopy dominants vary with elevation. Occurrences at lower elevations tend to be dominated by *Acer rubrum, Liriodendron tulipifera*, and/or *Nyssa sylvatica*, while examples at higher elevations are usually dominated by *Tsuga canadensis*. This community is naturally rare, due to the scarcity of flat, wet sites in the Blue Ridge Mountains and Cumberland Mountains. Its rarity is also due to anthropogenic factors, being located

in accessible, low-elevation sites which are prone to logging and agricultural activities. Most historic occurrences of this community have been destroyed or strongly altered by draining, impoundment, or conversion to pasture. This community extends to a few sites in the Appalachian Plateau of Kentucky, where similar seeps are known, but these lack *Leucothoe fontanesiana* and *Sarracenia purpurea*. Higher elevation bogs exist in the Smokies and other portions of the Blue Ridge [see *Calamagrostis cainii - Carex ruthii - Parnassia asarifolia / Sphagnum* spp. Herbaceous Seep (CEGL007877) and *Carex gynandra - Platanthera clavellata - Drosera rotundifolia - Carex ruthii / Sphagnum* spp. Herbaceous Seep (CEGL007697), for example], but they occur in much higher elevations, have a higher proportion of *Carex* spp., and occur within a matrix of spruce-fir or northern hardwood forests. Four plots (three from the Virginia and one from Cherokee National Forest, Tennessee) were classified as this association in the Appalachian Trail analysis (Fleming and Patterson 2009a). *Acer rubrum* and *Rhododendron maximum* are present and abundant in all the plot samples and species that are present in at least three of the four plots include *Athyrium filix-femina ssp. asplenioides, Hamamelis virginiana, Lycopus uniflorus, Oclemena acuminata, Osmunda cinnamomea, Tsuga canadensis, Vaccinium simulatum*, and *Viola cucullata*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This forested swamp-bog complex was documented at Lindy Creek Bog, Tennessee, and Big Wilson Creek, Virginia, in the AT corridor.
Global Range: This community is found in the Southern Blue Ridge and Ridge and Valley from Pennsylvania south to Georgia, ranging west into the Cumberland Mountains and Cumberland Plateau of Kentucky.
Nations: US
States/Provinces: GA, KY, NC, PA, SC, TN, VA:S1
TNC Ecoregions: 50:C, 51:C, 52:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ac:CCC, M221Bb:CCP, M221Bf:CCC, M221Cc:CCC, M221Da:CCP, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Cumberland Gap, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone?, Jefferson, Nantahala, Pisgah, Sumter (Mountains)?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots): APPA.0090, APPA.0377.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay
Global Description Author(s): K.D. Patterson, G. Fleming and P. Coulling
References: Allard 1990, CAP pers. comm. 1998, Evans 1991, Evans et al. 2009, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Peet et al. unpubl. data, Schafale 1998a, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data, USFS 1988, VDNH 2003, Weakley and Schafale 1994, White 2006, Wichmann 2009, Wichmann et al. 2007, Wichmann et al. 2007*

G667. NORTHEASTERN FOREST VERNAL POOL

Group Summary Description: This broadly defined group comprises sparsely vegetated northeastern vernal woodland pools that are important breeding habitats for amphibians and invertebrates; vegetation is widely variable. The association in this group is characterized by seasonally fluctuating water levels; the substrate may dry out completely in the summer. Hydrology may be affected by impermeable soils, seasonally high water tables, seasonal flooding in nearby streams and drainages, and/or impervious bedrock at or near the surface. The substrate is mineral soil with or without a layer of muck. The species composition is variable among sites, as well as annually and seasonally. Larger examples of this community type may exhibit strong zonation. Many smaller, shaded vernal ponds are unvegetated, their bottoms consisting of dead leaves and algae.

A3686 Eastern North American Vernal Pool Alliance

Alliance Summary Description: This broadly defined alliance comprises sparsely vegetated northeastern vernal woodland pools that are important breeding habitats for amphibians and invertebrates; vegetation is widely variable. The association in this alliance is characterized by seasonally fluctuating water levels; the substrate may dry out completely in the summer. Hydrology may be affected by impermeable soils, seasonally high water tables, seasonal flooding in nearby streams and drainages, and/or impervious bedrock at or near the surface. The substrate is mineral soil with or without a layer of muck. The species composition is variable among sites, as well as annually and seasonally. Larger examples of this community type may exhibit strong zonation. Many smaller, shaded vernal ponds are unvegetated, their bottoms consisting of dead leaves and algae.

[CEGL006453] Eastern Woodland Vernal Pool

Translated Name: **Eastern Woodland Vernal Pool**
Common Name: **Eastern Woodland Vernal Pool**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Swamp Forest (M503)
Group	Northeastern Forest Vernal Pool (G667)
Alliance	Eastern North American Vernal Pool Alliance (A3686)

ELEMENT CONCEPT

Global Summary: This association is characterized by seasonally fluctuating water levels; it may dry out completely in the summer. Hydrology may be affected by impermeable soils, seasonally high water tables, seasonal flooding in nearby streams and drainages, and/or impervious bedrock at or near the surface. The substrate is mineral soil with or without a layer of muck. The species composition is variable among sites, as well as annually and seasonally. Larger examples of this community type may exhibit strong zonation. Many smaller, shaded vernal ponds are unvegetated, their bottoms consisting of dead leaves and algae.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This vernal pool community is characterized by seasonally fluctuating water levels with bottoms consisting of dead leaves and algae. It was sampled once in the Central Appalachian project area in a very poorly drained, seasonally flooded basin with silty clay soil. The unvegetated surface is covered by leaf litter and bare soil with some downed wood. Evidence of disturbance includes the natural seasonal fluctuations in the water table, freeze/thaw cycles, trails, and the presence of exotic plant species.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This vernal pool community is characterized by seasonally fluctuating water levels with bottoms consisting of dead leaves and algae. Sites are seasonally flooded basins with very poorly drained muck soil occurring under the surrounding upland forest canopy. Evidence of disturbance includes a minor presence of exotic plants.

Global Environment: This association is characterized by seasonally fluctuating water levels; it may dry out completely in the summer. Hydrology may be affected by impermeable soils, seasonally high water tables, seasonal flooding in nearby streams and drainages, and/or impervious bedrock at or near the surface. The substrate in most vernal pools is mineral soil with or without a layer of muck, but some are boulder-filled depressions. Boulder vernal pools may dry out completely in the summer, and their hydrology is controlled by impervious bedrock below the boulderfield.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The species composition is variable among sites, variable annually, and variable seasonally. Larger examples may exhibit strong zonation. Many smaller, shaded vernal ponds are unvegetated, their bottoms consisting of dead leaves and algae. Cover may be sparse and often varies through the season. Most tree species overhang the pools occur in the adjacent forest association. Species composition is extremely variable, and many pools contain no vegetation. Of the species listed below, only a few are likely to be found on any one site. In the plot sampled, the vegetation includes *Platanus occidentalis, Acer saccharinum, Juglans nigra, Verbesina alternifolia, Alliaria petiolata*, and bryophytes.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The species composition is variable among sites, variable annually, and variable seasonally. Larger examples may exhibit strong zonation. Many smaller, shaded vernal ponds are unvegetated, their bottoms consisting of dead leaves and algae. Cover may

be sparse and often varies through the season. Most tree species occur in the adjacent forest association and overhang the pools. Species composition is extremely variable, and many pools contain no vegetation. Of the species listed below, only a few are likely to be found on any one site. In one sampled plot, the vegetation includes *Acer rubrum, Betula alleghaniensis, Picea rubens*, and *Tsuga canadensis*. Another site is dominated by bryophytes on rock with very small amounts of *Deschampsia caespitosa* and *Polygonum persicaria*.

Global Vegetation: The species composition is variable among sites, variable annually, and variable seasonally. Larger examples may exhibit strong zonation. Many smaller, shaded vernal ponds are unvegetated, their bottoms consisting of dead leaves and algae. Cover may be sparse and often varies through the season. Species composition is extremely variable, and of the species listed below, only a few are likely to be found on any one site. Typical representatives include *Dulichium arundinaceum, Glyceria* sp., *Leersia oryzoides, Scirpus cyperinus, Lycopus uniflorus, Polygonum* spp., *Thelypteris palustris, Carex gynandra, Carex crinita, Carex leptonervia, Carex stipata, Carex canescens, Carex vesicaria, Juncus effusus, Bidens* spp., *Hypericum mutilum, Hypericum canadense, Osmunda cinnamomea, Osmunda regalis, Agrostis scabra, Utricularia geminiscapa, Triadenum virginicum, Sagittaria* sp., and *Eleocharis* spp. Although this community type is predominantly herbaceous, shrubs and small trees may be present. Typical woody species include *Vaccinium corymbosum, Lyonia ligustrina, Quercus palustris, Nyssa sylvatica, Acer rubrum, Salix* spp., *Cephalanthus occidentalis*, and *Ilex verticillata*.

Global Dynamics: This community experiences seasonally fluctuating water levels; it may dry out completely in the summer. Hydrology may be affected by impermeable soils, seasonally high water tables, seasonal flooding in nearby streams and drainages, and/or impervious bedrock at or near the surface.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*, *Juglans nigra*, *Platanus occidentalis*
Herb (field)	Flowering forb	*Verbesina alternifolia*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Ilex verticillata*, *Salix* spp., *Vaccinium corymbosum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Cephalanthus occidentalis*
Herb (field)	Flowering forb	*Bidens* spp., *Polygonum* spp., *Sagittaria latifolia*
Herb (field)	Graminoid	*Eleocharis* spp., *Juncus effusus*, *Leersia oryzoides*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris palustris*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area):
Appalachian National Scenic Trail (Lower New England Project Area):
Global: *Bidens* spp., *Cephalanthus occidentalis*, *Eleocharis* spp., *Leersia oryzoides*, *Polygonum* spp., *Sagittaria latifolia*, *Thelypteris palustris*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Polygonum persicaria*
Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Polygonum persicaria*
Global: Vulnerable Plants: *Scirpus ancistrochaetus* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (23-May-2011). Despite large numbers of occurrences, vernal pools are small-patch isolated wetlands that are not protected by the EPA's Clean Water Act. As such, they are vulnerable to a host of threats, including outright destruction, as well as impacts of logging, development, overuse of ATVs, altered hydrology such as ditching, filling or impoundments, and pollution as a result of runoff from agriculture, development, road construction, etc.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Species are variable and many pools contain no vegetation. Many will also be below the minimum map unit size.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Species are variable and many pools contain no vegetation. Many will also be below the minimum map unit size. All vernal pools occur under the canopy of the surrounding upland forest canopy.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Recognition of vernal pool associations is complicated not only by the lack of good data but by the seasonal and spatial variability in composition. The largest factor, however, is that vernal pools are generally defined by their invertebrate and amphibian communities and often do not have characteristic suites of plant species. This type should be considered tentative pending more data.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs primarily in glaciated or periglacial areas, from Quebec and New Brunswick south through New York to northern Pennsylvania and northern New Jersey. It was sampled in Cumberland and Northampton counties in Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community occurs primarily in glaciated or periglacial areas, from Quebec and New Brunswick south through New York to northern Pennsylvania and northern New Jersey. It was sampled in Pennsylvania and at Kent Pond in Vermont.
Global Range: This association occurs in the northeastern U.S., and presumably in adjacent Canada, primarily in glaciated or periglacial areas, from Quebec and New Brunswick south through New York to northern Pennsylvania and northern New Jersey.
Nations: CA, US
States/Provinces: CT, MA, MD, ME, NH:S3, NJ, NY:S3S4, PA, RI, VT:S3, WV
TNC Ecoregions: 48:C, 49:C, 59:C, 60:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212C:CC, 221Ae:CCC, 221Bc:CCC, 221Da:CCC, 221Fa:CCC, 222:C, 232Ab:CCC, M212:C
Federal Lands: NPS (Acadia, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Delaware Water Gap, Sagamore Hill, Saratoga); USFWS (Cape May, E.B. Forsythe, Erie, Great Swamp)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HEVP
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot): APPA.0666.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 3 observation points): APPA.0654, APPA.1509, APPA.1571, APPA.1700.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: Center for Remote Sensing and Spatial Analysis n.d., Colburn 2004, Comer et al. 2005, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Edinger et al. 2008b, Fike 1999, Lubinski et al. 2003, MNHESP 2009, NRCS 2004a, NYNHP 2009, NatureServe 2009, PNHP n.d., Perles et al. 2007, Soil Conservation Service 1987, Sperduto and Nichols 2004, Thompson and Sorenson 2000, Zimmerman 2011w, Zimmerman et al. 2012

M504. Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest

G045. LAURENTIAN-ACADIAN-APPALACHIAN ACIDIC SWAMP

Group Summary Description: This group includes north-temperate acidic, nutrient-poor swamps of the northeastern U.S. and adjacent Canada, from southeastern Canada and New England to New York through the Central Appalachians south to Virginia and west to Ohio. They occur on mineral soils that are nutrient-poor; there may be an organic epipedon, and the substrate may be shallow to deep peat. Most are basin wetlands that remain saturated for all or nearly all of the growing season, and may have standing water seasonally. Some occur on gently sloping seepage lowlands, and even basin settings may have some seepage influence, especially near the periphery. *Acer rubrum* is a nearly constant and often dominant to codominant tree species. It may form a mostly deciduous canopy with *Fraxinus* spp., *Betula alleghaniensis*, or *Nyssa sylvatica*, or it may be mixed with conifers. *Tsuga canadensis* is the most widespread conifer in associations of this group. From central New England and New York north, *Picea rubens* is a characteristic associate (less commonly *Picea mariana*). *Larix laricina, Pinus strobus*, and *Abies balsamea* are occasional and in some places may be locally important. The herbaceous and shrub layers tend to be fairly species-poor. *Nemopanthus mucronatus, Viburnum nudum var. cassinoides, Ilex verticillata*, and *Vaccinium corymbosum* are typical shrubs through much of the range of this group, and *Rhododendron maximum* is often important in the central and southern portions of this group's range. Typical herbs include *Osmunda* spp., *Onoclea sensibilis, Dryopteris cristata, Carex folliculata, Carex intumescens, Carex stricta*, and *Carex scabrata*, among others. *Sphagnum* is an important component of the bryoid layer. In many swamps, species richness tends to be higher near the periphery where seepage waters influence the hydrology.

A3706 *Acer rubrum - Fraxinus pennsylvanica* Northeastern Swamp Forest Alliance

Alliance Summary Description: This alliance contains swamp forests in which *Fraxinus pennsylvanica* is characteristic, and *Acer rubrum* is nearly always present. Canopy composition differs sharply from the surrounding upland and varies with geography. It differs from associated temporarily flooded forests by the absence or unimportance of floodplain species such as *Acer saccharinum, Betula nigra, Platanus occidentalis*, and *Populus deltoides*. Other canopy species across the range of this alliance include *Betula lenta, Fraxinus americana, Liquidambar styraciflua, Liriodendron tulipifera, Quercus bicolor, Quercus palustris, Ulmus americana*, and *Ulmus rubra*. Understory and shrub species include *Alnus serrulata, Carpinus caroliniana, Cornus* spp., *Ilex verticillata, Lindera benzoin*, and *Vaccinium corymbosum*; *Nemopanthus mucronatus* often occurs in the northern portion of the range. Typical habitats include forested seeps on hillsides or along watercourses, edges and backswamps of floodplains that may be saturated by seepage from adjacent slopes, and other poorly drained depressions. Flooding occurs during the winter and spring and often extends into the growing season. Surface water is superficial, but the substrate is saturated to the surface by groundwater for extended periods during the growing season, or water may be ponded for most of the year. The substrate is generally muck rather than peat, overlying mineral soils.

[CEGL006406] *Acer rubrum - Fraxinus (pennsylvanica, americana) / Lindera benzoin / Symplocarpus foetidus* Swamp Forest

Translated Name: **Red Maple - (Green Ash, White Ash) / Northern Spicebush / Skunk-cabbage Swamp Forest**
Common Name: **Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Acer rubrum - Fraxinus pennsylvanica* Northeastern Swamp Forest Alliance (A3706)

ELEMENT CONCEPT

Global Summary: This association is a seepage swamp dominated by *Acer rubrum* and ranging from southern New England south to the Piedmont of Virginia. It generally occurs in saturated situations on slightly sloping hillsides, along small streams, or in basins that receive overland flooding in addition to groundwater influence. In general, these swamps are moderately acidic to moderately basic and have some seepage indicators but are not particularly species-rich. Soils are shallow to moderately deep mucks over mineral soils. *Acer rubrum* dominates the canopy;

Fraxinus pennsylvanica or *Fraxinus americana* are usually also found in the canopy and can be codominant. *Fraxinus nigra* is not generally associated with this type at the northern portion of the range, and, if present, occurs only as scattered individuals, but this species does occur in this type in Pennsylvania. Other canopy or subcanopy associates may include *Liriodendron tulipifera, Quercus bicolor, Quercus palustris, Prunus serotina, Fagus grandifolia, Betula lenta, Ulmus americana*, and *Ulmus rubra*. Conifers such as *Tsuga canadensis* or *Pinus strobus* are generally absent or occur in very low abundance. The shrub layer may be fairly open to quite dense, depending on the amount of canopy closure. Shrub species commonly include *Ilex verticillata, Rhododendron viscosum, Clethra alnifolia, Lindera benzoin, Cornus amomum, Alnus serrulata*, and less commonly *Vaccinium corymbosum, Lyonia ligustrina, Ilex montana, Toxicodendron vernix, Viburnum dentatum*, and *Viburnum nudum var. cassinoides (= Viburnum cassinoides)*. The herbaceous layer is variable in cover; *Symplocarpus foetidus* and *Osmunda cinnamomea* are nearly always present. In some areas, tall ferns (*Osmunda cinnamomea, Onoclea sensibilis, Osmunda regalis, Thelypteris palustris, Thelypteris noveboracensis*) form an herbaceous canopy within which other species are scattered. Microtopography is generally pronounced, resulting from tip-ups. Tree seedlings and *Sphagnum* mosses are common on hummocks but do not in general form extensive carpets. Additional nonvascular species can include *Plagiomnium cuspidatum (= Mnium cuspidatum)* and *Calliergon* spp. Invasive shrubs and herbs, including *Berberis thunbergii, Rosa multiflora, Lonicera morrowii, Alliaria petiolata*, and *Microstegium vimineum*, may be abundant.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This red maple seepage swamp occurs in saturated settings on slightly sloping hillsides, along small streams, or in basins that receive overland flooding in addition to groundwater influence. It was sampled twice in northern Pennsylvania in the Central Appalachian project area on gently sloping, seasonally flooded alluvial plain/backswamps with hummock-and-hollow microtopography. Soils are very poorly to somewhat poorly drained silt loam and silty clay. The unvegetated surface at one site is dominated by leaf litter with some downed wood and considerable standing water. The other site has an equal mix of leaf litter and bare soil with some downed wood. Evidence of disturbance includes nearby roads/railroad tracks and the presence of exotic plant species.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This red maple swamp forest receives considerable groundwater seepage (although not very enriched) and occurs in saturated settings, along small streams, or in basins that receive overland flooding in addition to groundwater influence. Sites are saturated flats with poorly to very poorly drained muck, sandy loam or clay loam soil. The unvegetated surface consists of leaf litter, downed wood, large/small rocks, bare soil, and/or standing water. Evidence of disturbance includes possible past grazing, trails, erosion and the presence of exotic plants.

Global Environment: This association is a seepage swamp dominated by *Acer rubrum* and ranging from southern New England to Virginia. It generally occurs in saturated soils on slightly sloping hillsides, along small headwater streams, or in depressions at the edges of floodplains that receive overland flooding in addition to groundwater inputs. In general, these swamps are moderately acidic to moderately basic and have some seepage indicators but are not particularly species-rich. Soils are shallow to moderately deep mucks over mineral soils. Microtopography is generally pronounced, resulting from tip-ups and the braided character of the drainage. Soil samples collected from 18 Maryland and Virginia plot samples are "intermediate" in chemistry, i.e., mean pH = 5.2, mean Ca = 1071 ppm, mean Mg = 195 ppm, mean total base saturation = 57%, but are more "basic" than "acidic" in their calcium and magnesium content.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Acer rubrum* is dominant or codominant in the canopy. *Fraxinus americana* and/or *Fraxinus pennsylvanica* is present, and *Fraxinus nigra* may be minor to absent (≤5%). *Betula alleghaniensis* may be common along with *Quercus palustris, Quercus bicolor*, and scattered *Ulmus americana, Pinus strobus*, and/or *Tsuga canadensis*. *Carpinus caroliniana* is typical in the understory. Shrubs are diverse and variable; *Lindera benzoin, Vaccinium corymbosum*, and *Ilex verticillata* are common. *Symplocarpus foetidus* and *Osmunda cinnamomea* are nearly always present in the herb layer; *Sphagnum* spp. may be common.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Acer rubrum* dominates the canopy; associates can include *Betula alleghaniensis* and *Fraxinus pennsylvanica*. The dense shrub layer is dominated by *Lindera benzoin* and may include *Ilex verticillata, Vaccinium corymbosum, Viburnum lentago*, and others. *Arisaema triphyllum, Athyrium filix-femina, Impatiens capensis, Onoclea sensibilis*, and *Symplocarpus foetidus* are common and/or abundant herbs. Mosses include *Mnium* spp. or *Calliergon* spp. Eight exotic taxa have

invaded these examples. In addition, this community supports NJ state-critically imperiled *Viburnum lantanoides* and NY state-critically imperiled *Viburnum nudum var. nudum*.

Global Vegetation: *Acer rubrum* dominates the canopy; *Fraxinus pennsylvanica* or *Fraxinus americana* are usually also found in the canopy and either can be codominant in the canopy. *Fraxinus nigra* is not generally associated with this type and, if present, occurs only as scattered individuals. Other canopy or subcanopy associates may include *Liriodendron tulipifera, Quercus bicolor, Quercus palustris, Prunus serotina, Fagus grandifolia, Betula lenta, Ulmus americana*, and *Ulmus rubra*. Conifers such as *Tsuga canadensis* or *Pinus strobus* are generally absent or occur in very low abundance. The shrub layer may be fairly open to quite dense, depending on the amount of canopy closure. Shrub species commonly include *Ilex verticillata, Rhododendron viscosum, Clethra alnifolia, Lindera benzoin, Cornus amomum, Alnus serrulata, Carpinus caroliniana*, and less commonly *Vaccinium corymbosum, Lyonia ligustrina, Ilex montana, Toxicodendron vernix, Viburnum dentatum*, and *Viburnum nudum var. cassinoides (= Viburnum cassinoides)*. The herbaceous layer is variable in cover; *Symplocarpus foetidus* and *Osmunda cinnamomea* are nearly always present. In some areas, tall ferns (*Osmunda cinnamomea, Onoclea sensibilis, Osmunda regalis, Thelypteris palustris, Thelypteris noveboracensis*) form an herbaceous canopy within which other species are scattered. These other herbaceous species include *Impatiens capensis, Galium aparine, Geum canadense, Arisaema triphyllum, Carex stricta, Carex gracillima, Carex intumescens, Carex radiata, Carex laevivaginata, Veratrum viride, Boehmeria cylindrica, Chelone glabra, Cardamine pensylvanica, Pilea pumila*, and *Glyceria* spp. At the southern end of the range in Maryland and Virginia, *Symplocarpus foetidus* is usually greatly dominant (>50% cover) early in the growing season, with *Saururus cernuus* frequently assuming patch-dominance during the summer. Tree seedlings and *Sphagnum* mosses are common on hummocks but do not in general form extensive carpets. Additional nonvascular species can include *Plagiomnium cuspidatum (= Mnium cuspidatum)* and *Calliergon* spp. Invasive shrubs and herbs, including *Berberis thunbergii, Rosa multiflora, Lonicera morrowii, Alliaria petiolata*, and *Microstegium vimineum*, may be abundant.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*
Herb (field)	Flowering forb	*Symplocarpus foetidus*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata*, *Lindera benzoin*
Herb (field)	Flowering forb	*Symplocarpus foetidus*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*, *Fraxinus americana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata*
Herb (field)	Flowering forb	*Symplocarpus foetidus*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Carpinus caroliniana*, *Fraxinus americana*, *Lindera benzoin*, *Osmunda cinnamomea*, *Symplocarpus foetidus*, *Vaccinium corymbosum*
Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Fraxinus pennsylvanica*, *Impatiens capensis*, *Lindera benzoin*, *Onoclea sensibilis*, *Symplocarpus foetidus*, *Vaccinium corymbosum*
Global: *Acer rubrum*, *Clethra alnifolia*, *Fraxinus americana*, *Fraxinus pennsylvanica*, *Lindera benzoin*, *Osmunda cinnamomea*, *Rhododendron viscosum*, *Symplocarpus foetidus*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Lonicera morrowii* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum caespitosum*, *Rosa multiflora* (Medium/Low), *Rumex crispus* (Low/Insignificant)
Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Viburnum lantanoides* (G5, NJ state-critically imperiled), *Viburnum nudum* var. *nudum* (G5T5, NY state-critically imperiled);

Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium), *Epipactis helleborine* (Medium/Low), *Lonicera morrowii* (High/Medium), *Malus pumila* (Medium/Insignificant), *Microstegium vimineum* (High/Medium), *Polygonum caespitosum*, *Rhamnus cathartica* (High/Medium), *Rosa multiflora* (Medium/Low), *Tussilago farfara* (Insignificant)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (30-Jan-2007). Although this is a small-patch community, its environmental requirements are quite general, and it occurs where acidic groundwater seepage emerges on the headwaters of stream drainages. The range extent crosses several ecoregions and 10 states. The major threat to this community is housing development, with disruption of groundwater source a lesser threat.

RELATED CONCEPTS

Global Similar Types:
- *Acer rubrum - Betula alleghaniensis / Lindera benzoin* Forest (CEGL006936)
- *Acer rubrum - Fraxinus nigra - (Tsuga canadensis) / Tiarella cordifolia* Swamp Forest (CEGL006502)
- *Acer rubrum - Fraxinus pennsylvanica - Liquidambar styraciflua* Floodplain Forest (CEGL006965)
- *Acer rubrum / Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest (CEGL006220)
- *Acer rubrum / Rhododendron viscosum - Clethra alnifolia* Swamp Forest (CEGL006156)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community is more common in the Lower New England project area, but it does extend south into the northern portion of the Central Appalachian project area in Pennsylvania.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: May be confused with Upland/Wetland Transitional Forest (CEGL006000) which is a forest that has upland *Quercus* spp. (*Quercus rubra, Quercus velutina*) in the canopy and a dense herb layer usually dominated by ferns. It is not saturated. The sites at Wawayanda State Park in New Jersey have canopies with high *Fraxinus pennsylvanica* cover, and *Lindera benzoin* is the dominant shrub.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Classification of this type at the southern end of the range is supported by analysis of a 1250-plot regional dataset compiled for the NCR and Mid-Atlantic national parks vegetation mapping project. In that analysis, this association was represented a group of 18 Maryland and Virginia plots.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from southern New England south to the Piedmont of Virginia. It was sampled in Perry and Cumberland counties in Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This red maple swamp was sampled at Housatonic Railroad Swamp Natural Heritage Site in Massachusetts; Upper Greenwood Lake West and Wawayanda State Park in New Jersey; and Nuclear Lake, West Mountain and Depot Hill in New York.
Global Range: This vegetation occurs in southern New England south through the mid-Atlantic states to Virginia.
Nations: US
States/Provinces: CT, DC, DE:S1, IN, MA, MD, NH:S2S3, NJ:S3S5, NY, PA:S4, RI, VA:S2?, VT
TNC Ecoregions: 48:C, 52:C, 58:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fa:CCP, 212Fb:CCP, 212Fc:CCC, 212Fd:CCP, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Ba:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Dc:CCC, 222Ib:CCC, 222Ic:CCC, 222Jj:CCC, 231Ae:CCC, 231Ak:CCC, 232Aa:CCP, 232Br:CCC, M221Ac:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appomattox Court House, C&O Canal, Delaware Water Gap, Gateway, George Washington Parkway, Indiana Dunes, Minute Man, Morristown, Prince William, Rock Creek, Saratoga, Upper Delaware, Weir Farm, Wolf Trap); USFWS (Great Meadows?, Iroquois, Montezuma, Patuxent)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAHS, FCAS
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 1 observation point; 1 accuracy assessment point): APPA.0502, APPA.1296, APPA_AA_0931.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (7 plots; 3 observation points; 29 accuracy assessment points): APPA.0007, APPA.0017, APPA.0040, APPA.0673, APPA.0678, APPA.0679, APPA.0927, APPA.1369, APPA.1371, APPA.1431, APPA_AA_1702, APPA_AA_1710, APPA_AA_1789, APPA_AA_1814, APPA_AA_1855, APPA_AA_1881, APPA_AA_1918, APPA_AA_1937, APPA_AA_2033, APPA_AA_2056, APPA_AA_2089, APPA_AA_2096, APPA_AA_2131, APPA_AA_2199, APPA_AA_2262, APPA_AA_2347, APPA_AA_2614, APPA_AA_2631, APPA_AA_2657, APPA_AA_2700, APPA_AA_2708, APPA_AA_2909, APPA_AA_2927, APPA_AA_2965, APPA_AA_3014, APPA_AA_3067, APPA_AA_3171, APPA_AA_3208, APPA_AA_3232.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): L.A. Sneddon, S.C. Gawler and G.P. Fleming
References: Breden 1989, Breden et al. 2001, Cowardin et al. 1979, Coxe 2009, Davis 2011f, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Edinger et al. 2008a, Ehrenfeld 1977, Enser 1993, Enser and Lundgren 2006, Fike 1999, Fleming 2007, Fleming and Patterson 2003, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2007b, Gawler et al. 2005, Golet et al. 1993, Harrison 2004, Harrison 2011, Hop et al. 2009, Lea and Riley 2005, Metzler and Barrett 2001, Metzler and Barrett 2006, Metzler et al. 2009, NRCS 2001b, NRCS 2004a, Patterson 2008a, Perles et al. 2007, Perles et al. 2008, Reschke 1990, Sneddon et al. 2008, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zimmerman et al. 2012

[CEGL008416] *Acer rubrum - Fraxinus nigra - Betula alleghaniensis / Veratrum viride - Carex bromoides* Seep Forest

Translated Name: **Red Maple - Black Ash - Yellow Birch / Green False Hellebore - Bromelike Sedge Seep Forest**
Common Name: **Central Appalachian Basic Seepage Swamp Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Acer rubrum - Fraxinus pennsylvanica* Northeastern Swamp Forest Alliance (A3706)

ELEMENT CONCEPT

Global Summary: This community occupies groundwater-saturated stream headwaters, large spring seeps and runs, and lateral areas in ravine and stream bottoms where groundwater emerges at the base of slopes. It is most frequent and best developed on Catoctin Formation metabasalt (greenstone) of the Northern Blue Ridge and other base-rich substrates. Soil chemistry data indicate moderately high calcium and magnesium levels. Overstory composition is mixed, with *Acer rubrum, Fraxinus americana*, and *Liriodendron tulipifera* the most abundant species. *Fraxinus nigra* is a frequent overstory associate but more abundant and sometimes dominant in the understory, along with young *Acer rubrum* and *Fraxinus americana*. With increasing elevation, *Betula alleghaniensis* becomes increasingly important, codominating most stands above 760 m (2500 feet) in Virginia and in the Catoctin Mountains of Maryland. Minor tree associates include *Betula lenta* and *Tilia americana*. Canopy closure is often incomplete (mean stratum cover = 60-80%), most evidently because of blowdowns. Very wet microhabitats that impede the establishment and firm rooting of trees may also contribute to a somewhat open canopy. Shrub stratum diversity is moderately high; *Lindera benzoin* is usually the most abundant species, and considerable stratum cover is contributed by tree saplings. Other frequently occurring true shrubs are *Alnus serrulata, Carpinus caroliniana, Hamamelis virginiana, Ilex verticillata*, and *Sambucus nigra ssp. canadensis*. Except in local areas where shrubs are dense, herbaceous cover is high (mean stratum cover = 90%). One or both of the early-maturing forbs *Symplocarpus foetidus* (mostly at lower elevations) and *Veratrum viride* are usually dominant over substantial areas. Because of microtopographic diversity, herbaceous patch-mosaics are typical in this vegetation. More-or-less constant,

sometimes locally abundant species include *Eurybia schreberi (= Aster schreberi), Caltha palustris, Carex bromoides, Carex gynandra, Carex prasina, Chelone glabra, Chrysosplenium americanum, Cinna arundinacea, Dryopteris carthusiana, Dryopteris goldiana, Glyceria striata, Impatiens capensis, Osmunda cinnamomea, Osmunda regalis var. spectabilis, Ranunculus recurvatus, Saxifraga pensylvanica, Packera aurea (= Senecio aureus), Sphenopholis pensylvanica, Thalictrum pubescens*, and *Viola cucullata*. Moss cover is often significant but only rarely includes *Sphagnum* spp. (not recorded in Virginia plots). Typical upland mesophytes commonly occur in well-drained hummock microhabitats and contribute to relatively high species-richness values for this type of wetland.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This basic seepage swamp occurs at groundwater-saturated stream headwaters, as large spring seeps and runs, and as lateral areas in ravine and stream bottoms where groundwater emerges at the bases of east- and south-facing gentle slopes. It was sampled at three locations in the park at low elevations (280-860 m). Soils are somewhat poorly drained to saturated. The unvegetated surface may be dominated by leaf litter or consist of a mix of exposed bedrock, large rocks, small rocks, downed wood, and/or standing water. Evidence of disturbance includes grazing/browsing, historic logging, and the presence of exotic plant species.

Global Environment: This community occupies groundwater-saturated stream headwaters, large spring seeps and runs, and lateral areas in ravine and stream bottoms where groundwater emerges at the base of slopes. Hydrologically, these habitats are classified as "groundwater slope wetlands," where seepage discharged at the ground surface is drained away as streamflow (Golet et al. 1993). Habitats are usually more-or-less narrow and elongate, with considerable exposed bouldery and cobble alluvium. Soils are predominantly mineral, but local areas of organic muck sometimes accumulate in depressions. The ground surface is slightly sloping (mean slope = 3°), and drainage is usually via small, intricately braided channels with intervening hummocks. Moss mats on boulders and cobble deposits commonly provide a rooting medium for herbaceous species, and "sedge tussocks" (especially of *Carex bromoides* and *Carex prasina*) are conspicuous features of these swamps. Soils collected from 25 Virginia and Maryland plot samples ranged from strongly acidic to neutral in pH, with moderately high calcium (mean = 1358 ppm) and magnesium (mean = 211 ppm) levels. This community is most frequent and best developed on Catoctin Formation metabasalt (greenstone) of the Northern Blue Ridge. There, it occurs locally in small patches (<12 ha [30 acres]) at elevations from about 275 to 850 m (900-2800 feet) and occasionally up to 975 m (3200 feet) (Ludwig et al. 1993). It has also been documented in northwestern Virginia in the Massanutten Mountains and western Ridge and Valley region, in the western Piedmont of both Virginia and Maryland and in Maryland's Allegheny Plateau in which stands observed and sampled occur at 800 m.. A somewhat isolated and disjunct occurrence is documented from the Dismal Creek valley in Giles County, in the southwestern Virginia Ridge and Valley. This is probably one of the southernmost occurrences for both the community type and *Fraxinus nigra*, a tree of pronounced northern distribution. The few known Ridge and Valley occurrences are associated with sites where Devonian or Silurian limestones are interbedded with sandstone and shale. While surficial outcrops of limestone are not evident at these sites, it is clear from both soil samples and floristic evidence that the wetlands are being supplied with calcium by groundwater.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Fraxinus americana* and/or *Fraxinus nigra* are characteristic in the canopy along with *Acer rubrum*. *Betula alleghaniensis* and/or *Liriodendron tulipifera* are common. *Lindera benzoin* is a constant shrub. *Asimina triloba* becomes common north of Maryland. *Chrysosplenium americanum, Veratrum viride, Carex bromoides, Collinsonia canadensis, Impatiens pallida, Osmunda cinnamomea var. cinnamomea*, and *Symplocarpus foetidus* are common in the diverse herbaceous layer. This community also supports VA-state imperiled *Trillium cernuum*.

Global Vegetation: Overstory composition is mixed, with *Acer rubrum, Fraxinus americana*, and *Liriodendron tulipifera* the most abundant species. *Fraxinus nigra* is a frequent overstory associate but more abundant and sometimes dominant in the understory, along with young *Acer rubrum* and *Fraxinus americana*. With increasing elevation, *Betula alleghaniensis* becomes increasingly important, codominating most stands above 760 m (2500 feet) in Virginia and in the Catoctin Mountains of Maryland. Minor tree associates include *Betula lenta* and *Tilia americana*. Almost all trees in plot-sampled stands were <50 cm dbh and most were <40 cm dbh; but scattered *Liriodendron* specimens >80 cm dbh occur, and in one plot such an individual tree accounts for the high canopy cover of this species. Canopy closure is often incomplete (mean stratum cover = 60-80%), most evidently because of blowdowns. Very wet microhabitats that impede the establishment and firm rooting of trees may also contribute to a somewhat open canopy. Shrub stratum diversity is moderately high; *Lindera benzoin* is usually the most abundant

species, and considerable stratum cover is contributed by tree saplings. Other frequently occurring true shrubs are *Alnus serrulata, Carpinus caroliniana, Hamamelis virginiana, Ilex verticillata*, and *Sambucus nigra ssp. canadensis*. Except in local areas where shrubs are dense, herbaceous cover is high (mean stratum cover = 90%). One or both of the early-maturing forbs *Symplocarpus foetidus* (mostly at lower elevations) and *Veratrum viride* are usually dominant over substantial areas. Because of microtopographic diversity, herbaceous patch-mosaics are typical in this vegetation. More-or-less constant, sometimes locally abundant species include *Eurybia schreberi (= Aster schreberi), Caltha palustris, Carex bromoides, Carex gynandra, Carex prasina, Chelone glabra, Chrysosplenium americanum, Cinna arundinacea, Dryopteris carthusiana, Dryopteris goldiana, Glyceria striata, Impatiens capensis, Osmunda cinnamomea, Osmunda regalis var. spectabilis, Ranunculus recurvatus, Saxifraga pensylvanica, Packera aurea (= Senecio aureus), Sphenopholis pensylvanica, Thalictrum pubescens*, and *Viola cucullata*. Moss cover is often significant, but only rarely includes *Sphagnum* spp. (not recorded in Virginia plots). Typical upland mesophytes commonly occur in well-drained hummock microhabitats and contribute to relatively high species richness values for this type of wetland (n = 60 taxa per 400 square meters for 25 plot samples).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*, *Fraxinus nigra*, *Liriodendron tulipifera*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Flowering forb	*Symplocarpus foetidus*, *Veratrum viride*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Fraxinus americana*, *Liriodendron tulipifera*
Tree subcanopy	Broad-leaved deciduous tree	*Fraxinus nigra*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Lindera benzoin*
Herb (field)	Flowering forb	*Symplocarpus foetidus*, *Veratrum viride*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Asimina triloba*, *Betula alleghaniensis*, *Chrysosplenium americanum*, *Fraxinus americana*, *Fraxinus nigra*, *Lindera benzoin*, *Liriodendron tulipifera*, *Symplocarpus foetidus*, *Veratrum viride*

Global: *Acer rubrum*, *Athyrium filix-femina* ssp. *asplenioides*, *Caltha palustris*, *Cardamine pensylvanica*, *Carex bromoides*, *Carex gynandra*, *Carex laevivaginata*, *Carex prasina*, *Carex scabrata*, *Carex scoparia*, *Carex seorsa*, *Chelone glabra*, *Chrysosplenium americanum*, *Cinna arundinacea*, *Dryopteris carthusiana*, *Dryopteris cristata*, *Eurybia schreberi*, *Fraxinus americana*, *Fraxinus nigra*, *Huperzia lucidula*, *Ilex verticillata*, *Impatiens capensis*, *Lindera benzoin*, *Micranthes micranthidifolia*, *Micranthes pensylvanica*, *Onoclea sensibilis*, *Osmunda regalis* var. *spectabilis*, *Packera aurea*, *Poa paludigena*, *Ranunculus hispidus* var. *caricetorum*, *Rosa palustris*, *Sambucus nigra* ssp. *canadensis*, *Sphenopholis pensylvanica*, *Symplocarpus foetidus*, *Thalictrum pubescens*, *Thelypteris noveboracensis*, *Trautvetteria caroliniensis*, *Trillium cernuum*, *Veratrum viride*, *Veronica americana*, *Veronica anagallis-aquatica*, *Viola cucullata*, *Vitis labrusca*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Trillium cernuum* (G5, VA state-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (High/Medium), *Microstegium vimineum* (High/Medium), *Rumex obtusifolius*, *Taraxacum officinale*

Global: Vulnerable Plants: *Aconitum reclinatum* (G3), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Platanthera grandiflora* (G5, VA state-rare), *Poa paludigena* (G3), *Symphyotrichum praealtum* var. *angustior* (G5T4, VA state-rare), *Trillium cernuum* (G5, VA state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (17-Apr-2000). This association has a narrow geographic range and is further limited by its small patch sizes and requirement for special, very localized wetlands. The type is confined to groundwater-saturated, base-rich habitats that are large enough to support forest vegetation.

RELATED CONCEPTS

Global Similar Types:

- *Acer rubrum - Fraxinus pennsylvanica / Lindera benzoin / Osmunda regalis - Pedicularis lanceolata* Seep Forest (CEGL007046)
- *Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Seep Forest (CEGL007853) acidic seepage swamp of the same Central Appalachian region; develops on sandstone and quartzite substrates and has higher component of acidophiles, e.g., *Nyssa sylvatica, Vaccinium* spp., *Pinus rigida, Rubus hispidus*, etc.; calciphilic species such as *Caltha palustris, Carex bromoides, Fraxinus nigra*, etc. are very sparse to absent.
- *Fraxinus nigra - Acer rubrum / Rhamnus alnifolia / Carex leptalea* Swamp Forest (CEGL007441) basic seepage swamp of the High Allegheny Mountains of Maryland, Pennsylvania, and West Virginia; more northern and fen-like compared to CEGL008416.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community is most frequent and best developed on Catoctin Formation metabasalt (greenstone) of the Northern Blue Ridge. There, it occurs locally in small patches (<12 hectares [30 acres]) at elevations from about 275 to 850 m (900-2,800 feet) and occasionally up to 975 m (3,200 feet) (Ludwig et al. 1993). Distinct floristic features of calcareous seepage swamps include the prevalence of *Fraxinus* spp. (especially *Fraxinus nigra*) and nutrient-demanding species, among the most diagnostic of which are *Caltha palustris, Carex bromoides, Carex laevivaginata, Pilea fontana, Poa paludigena, Ranunculus hispidus var. caricetorum, Saxifraga pensylvanica*, and *Trillium cernuum*. These communities lack the *Sphagnum* mosses that characterize acidic groundwater wetlands.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: Floristic diversity is increased by the presence of numerous terrestrial species growing on the hummocks.
Global Classification Comments: Classification of this type is supported by analysis of a 1250-plot regional dataset assembled for the NCR vegetation mapping project. In that analysis, this association is represented by 25 Virginia and Maryland plots that perform as a tight group in all analytical procedures. Distinct floristic features of calcareous seepage swamps include the prevalence of *Fraxinus* spp. (especially *Fraxinus nigra*) and nutrient-demanding species, among the most diagnostic of which are *Caltha palustris, Carex bromoides, Carex laevivaginata, Pilea fontana, Poa paludigena, Ranunculus hispidus var. caricetorum, Saxifraga pensylvanica*, and *Trillium cernuum*. These communities lack the *Sphagnum* mosses that characterize acidic groundwater wetlands. Moreover, many vascular plants that are common in or diagnostic of acidic seepage swamps are absent or unimportant (e.g., *Pinus rigida, Nyssa sylvatica, Viburnum nudum var. nudum, Parnassia asarifolia, Platanthera ciliaris, Platanthera clavellata, Rubus hispidus, Lycopodium obscurum, Carex debilis var. debilis*, and *Carex folliculata*) (Fleming and Van Alstine 1999).

Additionally, the spectrum of stands representing this association in Virginia shows a clear elevation gradient, with *Symplocarpus foetidus* and *Fraxinus nigra* decreasing in frequency and abundance and *Betula alleghaniensis* assuming codominance as elevation increases. In landscapes with suitably base-rich substrates such as Catoctin metabasalt, this type may intergrade with the higher elevation *Tsuga canadensis - Betula alleghaniensis / Veratrum viride - Carex scabrata - Oclemena acuminata* Swamp Forest (CEGL008533) in a transitional zone from about 760 to 900 m (2500-3000 feet) elevation.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs in the Central Appalachian region of Pennsylvania, Maryland, Virginia, and West Virginia. It was sampled in the northern Blue Ridge Mountains in Clarke (at Reservoir Hollow and Raven Rocks Hollow) and Augusta counties, Virginia.
Global Range: The probable range of this community encompasses the Central Appalachian region of Pennsylvania, Maryland, and Virginia, as well as Delaware and New Jersey. In Virginia, it is found primarily in the northern half of the mountains, apparently reaching its southern limits in Giles County. In Maryland, its distribution is centered in the Catoctin Mountains. The majority of occurrences are on the Northern Blue Ridge, but the type is also scattered in suitable habitats of the Ridge and Valley province, western Piedmont, and Maryland's Allegheny Plateau.
Nations: US
States/Provinces: DE:S1, MD, NJ, PA, VA:S3
TNC Ecoregions: 52:C, 58:C, 59:C, 61:C

USFS Ecoregions (1994/95): 221Db:CCC, 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Bd:C??, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Catoctin Mountain, Morristown, Shenandoah); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCAS
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 plots; 2 accuracy assessment points): APPA.0108, APPA.0330, APPA.0332, APPA_AA_0508, APPA_AA_0669.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Coxe 2009, Ehrenfeld 1977, Eyre 1980, Fleming 1999, Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming and Van Alstine 1999, Fleming et al. 2001, Fleming et al. 2006, Fleming et al. 2007b, Golet et al. 1993, Gould and Berdine 1998, Harrison 2004, Harrison 2011, Lea 2003, Ludwig et al. 1993, Sneddon et al. 2008, Southeastern Ecology Working Group n.d.*, VDNH 2003, VDNH unpubl. data, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL006220] *Acer rubrum / Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest

Translated Name: **Red Maple / Catberry - Highbush Blueberry Swamp Forest**
Common Name: **Northern Red Maple Swamp Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Acer rubrum - Fraxinus pennsylvanica* Northeastern Swamp Forest Alliance (A3706)

ELEMENT CONCEPT

Global Summary: This forested red maple swamp of stream drainages and wetland borders occurs in northern to central New England and New York, extending sporadically south to New Jersey. The hydrologic regime is variable among occurrences, generally influenced by seasonal flooding and often limited groundwater seepage. This association may occur in basins with little drainage, or on stream floodplains that remain saturated throughout most of the growing season. Soils vary according to setting; generally the substrate is mineral soil, acidic to weakly minerotrophic, but in some settings organic soil may be well-developed. The deciduous canopy ranges from closed to patchy, but the overall cover is that of a closed-canopy forest. The shrub layer, particularly in openings, is generally well-developed. The herb layer is usually fairly well-developed and may be extensive. The canopy is characteristically dominated by *Acer rubrum* with associates of *Fraxinus nigra, Fraxinus pennsylvanica, Betula alleghaniensis*, and *Ulmus americana*. *Tsuga canadensis, Picea rubens*, and *Abies balsamea*, while not abundant, characterize this association as one of cooler climates. (The *Picea* and *Abies* drop out in the southernmost occurrences of this type.) Typical shrubs include *Vaccinium corymbosum* (often dominant), *Ilex verticillata, Nemopanthus mucronatus, Lindera benzoin, Rosa palustris, Alnus incana, Viburnum nudum var. cassinoides*, and *Viburnum recognitum*. There is north-to-south variability in the shrub component as well, with *Nemopanthus* characteristic of all but the southernmost occurrences, and *Lindera* absent from more northerly occurrences. The herbaceous layer is often dominated by ferns, including *Osmunda cinnamomea, Osmunda regalis*, and *Osmunda claytoniana*. *Onoclea sensibilis, Dryopteris cristata*, and *Thelypteris palustris* are often present, though less abundant. *Carex stricta* may be locally dominant. Other species frequent in the herbaceous layer include *Impatiens capensis, Caltha palustris, Calamagrostis canadensis, Carex intumescens, Carex trisperma*, and *Arisaema triphyllum*. The bryophyte flora is not well documented; *Sphagnum* spp. and *Mnium* spp. are frequent, although not necessarily abundant. *Acer rubrum - Fraxinus (pennsylvanica, americana) / Lindera benzoin / Symplocarpus foetidus* Swamp Forest (CEGL006406) is distinguished by its greater abundance and extent of seepage indicators and its lacks lack of northern species such as *Picea rubens, Abies balsamea*, and *Nemopanthus mucronatus*. *Acer rubrum / Carex stricta - Onoclea sensibilis* Wet Woodland (CEGL006119) is also similar but has a more open canopy and typically a graminoid-dominated herbaceous layer. This association is also related to *Acer rubrum - Prunus serotina / Cornus amomum* Floodplain Forest (CEGL006503), which occurs along floodplains of major streams and minor rivers. While both can be dominated by red maple in the canopy, the understory vegetation

differs somewhat, with species more typical of floodplains (*Carpinus caroliniana, Cornus amomum, Prunus serotina*) in that type, and species typical of more constantly saturated conditions in this type.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This red maple swamp was sampled in New York and New Jersey in the Lower New England project area. One site is a flat basin with very poorly drained muck soil; the other is a very rocky, narrow, intermittent streambed with no water present but evidence of flow (wrack deposition). The unvegetated surface consists of leaf litter, with abundant downed wood and standing water possible. Evidence of disturbance includes alterations to hydrology (possible beaver activity), trails, and recreational use.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is only known from two locations in Maine and occurs along pond margins and streams feeding ponds. Elevations range from 200 to 400 m (655-1,310 feet). Positions are flat and saturated to permanently flooded. Soils are poorly to very poorly drained muck, silty clay loam and peat. Open water may be present part of the season or year-round.

Global Environment: This forested red maple swamp occupies stream drainages and wetland borders. The hydrologic regime is variable among occurrences, generally influenced both by groundwater seepage and seasonal flooding. This association may occur in basins with little drainage, or on stream floodplains that remain saturated throughout most of the growing season. Soils vary according to setting; generally the substrate is mineral soil, acidic to (less commonly) circumneutral, but in some settings organic soil may be well-developed.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These forested red maple swamps are dominated by *Acer rubrum* with many possible canopy associates. The shrub layer is dominated by *Clethra alnifolia, Vaccinium corymbosum, Ilex verticillata, Rhododendron viscosum*, and *Nemopanthus mucronatus*. The herb layer includes *Thelypteris palustris, Osmunda cinnamomea, Carex stricta, Triadenum virginicum*, and *Sphagnum* spp.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by open to closed deciduous forests and woodlands dominated by *Acer rubrum*. Canopy associates may include *Fraxinus nigra, Fraxinus pennsylvanica, Picea rubens, Pinus strobus, Ulmus americana*, and *Thuja occidentalis*. *Alnus incana* is the most characteristic dominant shrub, with *Ilex verticillata* codominating some sites. Other shrubs occurring at low cover may include *Rhododendron canadense, Spiraea alba, Viburnum nudum*, and *Viburnum recognitum*. The herbaceous layer may be dominated by ferns, graminoids or both, the most prominent being *Calamagrostis canadensis, Onoclea sensibilis*, and *Osmunda regalis*. Other common herbaceous associates include *Athyrium filix-femina, Carex stricta, Doellingeria umbellata, Iris versicolor, Lycopus uniflorus, Matteuccia struthiopteris, Osmunda cinnamomea, Rubus pubescens, Solidago rugosa*, and *Thalictrum pubescens*.

Global Vegetation: The deciduous canopy ranges from closed to patchy, but the overall cover is that of a closed-canopy forest. The shrub layer, particularly in openings, is generally well-developed. The herb layer is usually fairly well-developed and may be extensive. The canopy is characteristically dominated by *Acer rubrum* with associates of *Fraxinus nigra, Fraxinus pennsylvanica, Betula alleghaniensis*, and *Ulmus americana*. *Tsuga canadensis, Picea rubens*, and *Abies balsamea*, while not abundant, characterize this association as one of cooler climates. (The *Picea* and *Abies* drop out in the southernmost occurrences of this type.) Typical shrubs include *Vaccinium corymbosum* (often dominant), *Ilex verticillata, Nemopanthus mucronatus, Lindera benzoin, Rosa palustris, Alnus incana, Viburnum nudum var. cassinoides*, and *Viburnum recognitum*. There is north-to-south variability in the shrub component as well, with *Nemopanthus* characteristic of all but the southernmost occurrences, and *Lindera* absent from more northerly occurrences. The herbaceous layer is often dominated by ferns, including *Osmunda cinnamomea, Osmunda regalis*, and *Osmunda claytoniana*. *Onoclea sensibilis, Dryopteris cristata*, and *Thelypteris palustris* are often present, though less abundant. *Carex stricta* may be locally dominant. Other species frequent in the herbaceous layer include *Impatiens capensis, Caltha palustris, Calamagrostis canadensis, Carex intumescens, Carex trisperma*, and *Arisaema triphyllum*. The bryophyte flora is not well-documented; *Sphagnum* spp. and *Mnium* spp. are frequent, although not necessarily abundant.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata*, *Vaccinium corymbosum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Clethra alnifolia*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Ilex verticillata*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus incana*
Herb (field)	Graminoid	*Calamagrostis canadensis*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*, *Osmunda regalis*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Ilex verticillata*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Vaccinium corymbosum*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*, *Osmunda claytoniana*, *Osmunda regalis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Carex stricta*, *Clethra alnifolia*, *Ilex verticillata*, *Osmunda cinnamomea*, *Thelypteris palustris*, *Vaccinium corymbosum*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer rubrum*, *Alnus incana*
Global: *Acer rubrum*, *Arisaema triphyllum*, *Carex stricta*, *Dryopteris cristata*, *Ilex verticillata*, *Impatiens capensis*, *Onoclea sensibilis*, *Osmunda cinnamomea*, *Osmunda claytoniana*, *Osmunda regalis*, *Thelypteris palustris*, *Vaccinium corymbosum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (20-Jun-2006). Type is well-distributed in the glaciated Northeast.

RELATED CONCEPTS

Global Similar Types:

- *Acer rubrum - Fraxinus (pennsylvanica, americana) / Lindera benzoin / Symplocarpus foetidus* Swamp Forest (CEGL006406)
- *Acer rubrum - Fraxinus nigra - (Tsuga canadensis) / Tiarella cordifolia* Swamp Forest (CEGL006502)
- *Acer rubrum - Prunus serotina / Cornus amomum* Floodplain Forest (CEGL006503)
- *Acer rubrum / Carex stricta - Onoclea sensibilis* Wet Woodland (CEGL006119)
- *Acer rubrum / Rhododendron viscosum - Clethra alnifolia* Swamp Forest (CEGL006156)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: A continuum of Northern Appalachian acidic swamps, with very similar floristics, is expressed through three associations: the coniferous *Picea rubens - Abies balsamea / Gaultheria hispidula / Osmunda cinnamomea / Sphagnum* spp. Swamp Forest (CEGL006312), the mixed *Picea rubens - Acer rubrum / Nemopanthus mucronatus* Swamp Forest (CEGL006198), and the present type (deciduous), with all gradations of coniferous to deciduous evident.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This swamp forest was sampled north of Sunrise Mountain in New Jersey and in New York.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Church Pond and James Pond in Maine.
Global Range: This forest of stream drainages and wetland borders occurs from northern New England south sporadically to northern New Jersey.
Nations: CA, US
States/Provinces: MA?, ME, NB, NH, NJ, NY, PA, QC?, VT
TNC Ecoregions: 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Cb:CCC, 212Fc:CCC, 221Ae:CCP, 221Af:CCC, 221Ah:CCP, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Bb:CCC, 221Bd:CCC, M212A:CP, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212D:CP
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Delaware Water Gap); USFWS (Aroostook?, Assabet River?, Carlton Pond?, Great Meadows?, Moosehorn?, Nulhegan Basin, Pondicherry, Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAHS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 1 observation point; 11 accuracy assessment points): APPA.0908, APPA.1537, APPA_AA_1748, APPA_AA_1785, APPA_AA_1916, APPA_AA_1933, APPA_AA_1980, APPA_AA_2356, APPA_AA_2361, APPA_AA_2531, APPA_AA_2762, APPA_AA_2895, APPA_AA_3103.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 3 observation points; 9 accuracy assessment points): APPA.1627, APPA.1657, APPA.1658, APPA.1659, APPA.1661, APPA_AA_1653, APPA_AA_1811, APPA_AA_2245, APPA_AA_2596, APPA_AA_2911, APPA_AA_2924, APPA_AA_2932, APPA_AA_3000, APPA_AA_3313.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler and S.L. Neid
References: CDPNQ unpubl. data, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, Golet et al. 1993, Lubinski et al. 2003, NAP pers. comm. 1998, Perles et al. 2007, Rawinski 1984a, Sperduto 2000b, Sperduto and Nichols 2004, Sperduto and Nichols 2004*, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zika and Dann 1985

A2058 *Acer rubrum - Nyssa sylvatica* Swamp Forest Alliance

Alliance Summary Description: Forests in this alliance have variable canopy composition, but typical canopy species across the range of this alliance include *Acer rubrum var. trilobum* and *Nyssa sylvatica*; associated trees in the northern portion of the range may include *Picea rubens, Betula alleghaniensis, Tsuga canadensis*, and *Pinus strobus*. *Liquidambar styraciflua* and *Magnolia virginiana* are characteristic in the southern portions of the range. These forests are nutrient-poor and generally acidic, and occur in basins and seepage areas. The alliance ranges from southern Vermont to the northern Coastal Plain of Virginia.

[CEGL006014] *Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum* spp. Swamp Forest

Translated Name: **Red Maple - Blackgum - Yellow Birch / Peatmoss species Swamp Forest**
Common Name: **Red Maple - Blackgum Basin Swamp Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Acer rubrum - Nyssa sylvatica* Swamp Forest Alliance (A2058)

ELEMENT CONCEPT

Global Summary: This blackgum basin swamp of the northeastern United States is found from the Central Appalachians north to central New England, at the northern range limit for *Nyssa sylvatica*. It occupies saturated or seasonally wet basins, often in perched basins in small watersheds within upland forests. It also occurs on hillsides and seepage areas. In most settings, the mineral soil is overlain with a shallow to deep peat layer. Conditions are highly acidic and nutrient-poor. The tree canopy varies from an open woodland to nearly complete. Shrubs are well-represented and may be locally dense. Herbs are likewise patchy, and the herb layer is usually dominated by only a few species. The bryoid layer varies but is often extensive. Hummock-and-hollow microtopography is often pronounced, with bryophytes common on the hummocks and in those hollows where water does not stand for long periods. The canopy is dominated by *Acer rubrum* and *Nyssa sylvatica*; however, even where red maple is more abundant, the longevity and stature of the blackgum trees give them a strong impact. *Betula alleghaniensis, Tsuga canadensis, Pinus strobus*, and occasionally *Picea rubens* or *Picea mariana* may be minor canopy associates. The most abundant shrubs are *Ilex verticillata* and *Vaccinium corymbosum*; associated shrub species include *Viburnum nudum var. cassinoides, Nemopanthus mucronatus, Kalmia angustifolia, Gaylussacia baccata, Chamaedaphne calyculata, Lyonia ligustrina, Spiraea alba var. latifolia (= Spiraea latifolia)*, and *Cephalanthus occidentalis*. *Osmunda cinnamomea* is the characteristic dominant in the herb layer, with associates including *Osmunda regalis, Thelypteris palustris, Woodwardia virginica, Glyceria canadensis, Coptis trifolia, Carex atlantica, Carex trisperma, Carex folliculata, Carex intumescens, Calla palustris, Triadenum virginicum*, and *Symplocarpus foetidus*. Mosses are primarily *Sphagnum* spp., including *Sphagnum palustre* and *Sphagnum magellanicum*. These swamps are distinguished from other basin swamps in the Northern Appalachians by the presence of *Nyssa sylvatica*. They are distinguished from blackgum swamps further south by the absence of more Central Appalachian species such as *Liquidambar styraciflua, Rhododendron maximum, Rhododendron viscosum*, and *Magnolia virginiana*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This red maple - blackgum basin swamp occupies saturated or seasonally wet basins in upland forest settings. It was sampled at three locations in the Central Appalachian project area. Sites are seasonally flooded to saturated basin floors and seeps. Soils are very poorly to poorly drained muck, silt loam and sandy loam. The unvegetated surface is dominated by leaf litter along with lesser amounts of small rocks, downed wood, bare soil and occasional standing water. Up to 50% of the ground may be covered with sphagnum mosses. Evidence of disturbance includes trails, windthrow, and the presence of exotic plant species.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This red maple - blackgum basin swamp occupies saturated or seasonally wet basins in upland forest settings. Sites are permanently flooded to saturated basin floors and depressions with very poorly drained muck or peat soil sometimes with hummock-and-hollow microtopography. The unvegetated surface is made up of leaf litter and standing water with some downed wood, bare soil and mosses. No evidence of disturbance was reported.

Global Environment: This blackgum basin swamp of the northeastern United States is found from the Central Appalachians north to central New England, at the northern range limit for *Nyssa sylvatica*. It occupies saturated or seasonally wet basins, typically perched basins in small watersheds within upland forests. In most settings, the mineral soil is overlain with a shallow to deep peat layer. Conditions are highly acidic and nutrient-poor.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Acer rubrum* is dominant or codominant with *Nyssa sylvatica*; *Betula alleghaniensis*, or *Pinus strobus* may also occur in the canopy. *Fraxinus* spp. are sparse to absent. *Ilex verticillata, Vaccinium corymbosum, Rhododendron viscosum*, and/or *Lindera benzoin* are common shrubs. *Sphagnum* spp., *Osmunda cinnamomea*, and occasionally *Symplocarpus foetidus* carpet the ground story; *Maianthemum canadense* and *Medeola virginiana* are also common.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This hardwood forested swamp is codominated by *Acer rubrum* and *Nyssa sylvatica* with *Betula alleghaniensis* common. The shrub layer is usually well-developed with *Ilex verticillata, Vaccinium corymbosum, Rhododendron viscosum, Rhododendron maximum*, and/or *Lindera benzoin*. *Carex* spp. are common herbs. A dense *Sphagnum* spp. carpet is characteristic.

Global Vegetation: The tree canopy varies from an open woodland to nearly complete. Shrubs are well-represented and may be locally dense. Herbs are likewise patchy, and the herb layer is usually dominated by only a few species. The bryoid layer varies but is often extensive. Hummock-and-hollow microtopography is often pronounced, with bryophytes common on the hummocks and in those hollows where water does not stand for long periods. The canopy is dominated by *Acer rubrum* and *Nyssa sylvatica*; however, even where red maple is more abundant, the longevity and stature of the blackgum trees give them a strong impact. *Betula alleghaniensis, Tsuga canadensis,*

Pinus strobus, and in the north *Picea rubens* may be minor canopy associates. The most abundant shrubs are *Ilex verticillata* and *Vaccinium corymbosum*; associated shrub species include *Viburnum nudum var. cassinoides, Nemopanthus mucronatus, Kalmia angustifolia, Gaylussacia baccata, Chamaedaphne calyculata, Lyonia ligustrina, Spiraea alba var. latifolia (= Spiraea latifolia)*, and *Cephalanthus occidentalis*. *Osmunda cinnamomea* is the characteristic dominant in the herb layer, with associates including *Osmunda regalis, Thelypteris palustris, Woodwardia virginica, Glyceria canadensis, Coptis trifolia, Carex atlantica, Carex trisperma, Carex folliculata, Carex intumescens, Calla palustris, Triadenum virginicum*, and *Symplocarpus foetidus*. Mosses are primarily *Sphagnum* spp., including *Sphagnum palustre* and *Sphagnum magellanicum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Nyssa sylvatica*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Ilex verticillata*, *Vaccinium corymbosum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Flowering forb	*Symplocarpus foetidus*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*, *Nyssa sylvatica*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Ilex verticillata*, *Rhododendron viscosum*, *Vaccinium corymbosum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Nonvascular	Moss	*Sphagnum* spp.

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Nyssa sylvatica*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Ilex verticillata*, *Vaccinium corymbosum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Spiraea alba* var. *latifolia*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia angustifolia*
Herb (field)	Flowering forb	*Symplocarpus foetidus*
Herb (field)	Graminoid	*Carex folliculata*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*, *Thelypteris palustris*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Betula alleghaniensis*, *Ilex verticillata*, *Lindera benzoin*, *Nyssa sylvatica*, *Osmunda cinnamomea*, *Vaccinium corymbosum*
Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Ilex verticillata*, *Lindera benzoin*, *Nyssa sylvatica*, *Rhododendron viscosum*, *Sphagnum* spp., *Vaccinium corymbosum*
Global: *Acer rubrum*, *Betula alleghaniensis*, *Carex folliculata*, *Chamaedaphne calyculata*, *Ilex verticillata*, *Nyssa sylvatica*, *Osmunda cinnamomea*, *Vaccinium corymbosum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Microstegium vimineum* (High/Medium), *Polygonum caespitosum*
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (20-May-2011). Although there are a large number of occurrences occupying approximately 41 square km, this vegetation has declined substantially over the long term due to a number of human-caused disturbances. Commercial and residential development, road construction and its associated runoff, altered hydrology due to blocked culverts, impoundments, ditching and the like; logging and land clearing, and conversion to agriculture caused decline in this vegetation throughout its range over the long term. In recent decades, the establishment of wetland regulations led to protection of large occurrences by Federal and some state regulations, but other smaller occurrences, particularly those in isolated wetland basins, receive no wetlands

protection. Continued threats include residential and commercial development, establishment of culverts and impoundments, and in some cases invasive species.

Related Concepts

Global Similar Types:
- *Acer rubrum - Betula alleghaniensis / Lindera benzoin* Forest (CEGL006936)
- *Acer rubrum - Nyssa sylvatica - Magnolia virginiana / Viburnum nudum var. nudum / Osmunda cinnamomea* Swamp Forest (CEGL006238)
- *Acer rubrum - Nyssa sylvatica* High Allegheny Plateau-Central Appalachian Seep Forest (CEGL006132)
- *Acer rubrum / Rhododendron viscosum - Clethra alnifolia* Swamp Forest (CEGL006156)
- *Acer saccharum - Betula alleghaniensis - Fraxinus pennsylvanica / Lindera benzoin* Forest (CEGL006956)
- *Tsuga canadensis - Betula alleghaniensis / Ilex verticillata / Sphagnum* spp. Swamp Forest (CEGL006226)

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: New York examples have high cover of *Rhododendron maximum*.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

Element Distribution

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is found from the Central Appalachians north to central New England. It was sampled in Berks and Cumberland counties in Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This basin swamp was sampled in New Jersey and at Bellvale Mountain North and Canada Hill/Curry Pond in New York.
Global Range: This blackgum basin swamp of the northeastern United States is found from the Central Appalachians north to central New England.
Nations: US
States/Provinces: CT, MA:S2, MD?, ME, NH:S1S2, NJ, NY, PA, VT:S2
TNC Ecoregions: 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212A:CC, 212B:CC, 212C:CC, 212D:CC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Aa:CCC, 221Ae:CCC, 221Af:CCP, 221Ag:CCP, 221Ah:CCC, 221Ai:CCC, 221Ak:CCP, 221Al:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Ea:CCC, 221Fa:CCC, 221Fb:CCC, M212A:CC, M212Bb:CCC, M212Bc:CCP, M212Bd:CCC, M212Cb:CCP, M212Cc:CCP, M212Eb:CCP, M221Ac:CCC, M221Ad:CCC, M221Bf:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Delaware Water Gap, Gateway); USFS (Green Mountain)

Element Sources

Appalachian National Scenic Trail Map-Class Code: FAHS, FCAS
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 plots; 1 observation point; 2 accuracy assessment points): APPA.0503, APPA.0656, APPA.0665, APPA.1227, APPA_AA_0877, APPA_AA_1110.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 3 observation points; 18 accuracy assessment points): APPA.0066, APPA.1385, APPA.1397, APPA.1418, APPA_AA_0516, APPA_AA_1410, APPA_AA_1686, APPA_AA_1691, APPA_AA_1729, APPA_AA_1737, APPA_AA_1847, APPA_AA_2098, APPA_AA_2134, APPA_AA_2162, APPA_AA_2227, APPA_AA_2446, APPA_AA_2473, APPA_AA_2999, APPA_AA_3100, APPA_AA_3128, APPA_AA_3169, APPA_AA_3239.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: Breden et al. 2001, Cain and Penfound 1938, Cain and Penfound 1938*, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Edinger et al. 2008a, Eichelberger 2011i, Fike 1999, Gawler

2002, Gawler and Cutko 2010, Golet et al. 1993, Harrison 2004, Harrison 2011, Metzler and Barrett 2001, Metzler and Barrett 2006, NAP pers. comm. 1998, NRCS 2001b, Perles et al. 2007, Rawinski 1984a, Rhoads and Block 1999, Rhoads and Block 2002a, Rhoads and Block 2002b, Rhoads and Block 2005, Rhoads and Block 2006, Rhoads and Block 2008b, Sperduto 2000b, Sperduto and Nichols 2004, Sperduto et al. 2000b, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Vogelmann 1976, Windisch 1995c, Zebryk 1990, Zimmerman et al. 2012

A0653 *Acer rubrum* Swamp Woodland Alliance

Alliance Summary Description: This alliance includes tall graminoid marsh vegetation with a wooded canopy of variable closure. The understory is variable, usually characterized by *Carex stricta, Carex lacustris*, and a number of other graminoids and forbs, with a canopy of *Acer rubrum*. The vegetation is highly variable and dynamic, usually a successional stage resulting from disturbance, or occurring on the edges of larger wetlands. This alliance ranges broadly across the northeastern United States and southern Canada.

[CEGL006119] *Acer rubrum / Carex stricta - Onoclea sensibilis* Wet Woodland

Translated Name: **Red Maple / Upright Sedge - Sensitive Fern Wet Woodland**
Common Name: **Red Maple / Upright Sedge Wet Woodland**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Acer rubrum* Swamp Woodland Alliance (A0653)

Element Concept

Global Summary: This association is a partly wooded, deciduous-canopy wetland of the northeastern United States. It occurs on muck soils or mineral soils with a surface organic layer in poorly drained depressions influenced by groundwater. It is also common in those streamside and lakeside settings where the hydrology is that of a basin setting rather than a floodplain. The community is typically flooded in spring, with pools and small streams persisting throughout much of the growing season; soils may remain saturated or may become dry on the surface over the course of the growing season. Hummock-and-hollow topography may be pronounced. The canopy consists of scattered trees, with as little as 25% overall cover. The shrub layer is patchy and may be extensive in places. The herb layer is typically well-developed, with ferns and graminoids dominant. The bryophyte cover is variable. *Acer rubrum* is dominant in the canopy, often with many standing dead trees, and may be the only canopy species present. Associated trees may include *Fraxinus nigra, Ulmus americana*, and occasional *Pinus strobus, Tsuga canadensis*, or *Picea rubens*. The shrub layer is characterized by *Vaccinium corymbosum, Spiraea alba var. latifolia (= Spiraea latifolia)*, and *Ilex verticillata*. The herbaceous layer is typically dominated by the graminoids or the ferns. *Sphagnum* spp. are the characteristic bryophytes, with non-sphagnous mosses as associates. These woodlands are ecologically similar to both *Acer rubrum / Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest (CEGL006220) and *Picea rubens - Acer rubrum / Nemopanthus mucronatus* Swamp Forest (CEGL006198), but those are closed-canopy wetlands. This association does not include red maple wooded wetlands on deeper peat soils [see *Acer rubrum / Alnus incana - Ilex verticillata / Osmunda regalis* Woodland (CEGL006395) and *Acer rubrum - Fraxinus nigra - (Larix laricina) / Rhamnus alnifolia* Swamp Forest (CEGL006009)].

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This red maple wooded marsh occurs on muck soils or mineral soils with a surface organic layer, in poorly drained depressions influenced by groundwater. Sites are intermittently to permanently flooded basins and flats with very poorly drained muck or clay soils. The unvegetated surface consists of leaf litter, standing water or a combination of both. Evidence of disturbance includes alterations to hydrology, trails, recreational use and exotic plants.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is a partly wooded, deciduous-canopy wetland of central and northern New England. It occurs on muck soils or mineral soils with a surface organic layer, in poorly drained depressions influenced by groundwater. It is also common in those streamside and lakeside settings where the hydrology is that of a basin setting rather than a floodplain. The community is typically flooded in spring, with pools and small streams persisting throughout much of the growing

season; soils may remain saturated, or may become dry on the surface, over the course of the growing season. Hummock-and-hollow topography may be pronounced.

Global Environment: This association is a partly wooded, deciduous-canopy wetland of central and northern New England. It occurs on muck soils or mineral soils with a surface organic layer, in poorly drained depressions influenced by groundwater. It is also common in those streamside and lakeside settings where the hydrology is that of a basin setting rather than a floodplain. The community is typically flooded in spring, with pools and small streams persisting throughout much of the growing season; soils may remain saturated, or may become dry on the surface over the course of the growing season. Hummock-and-hollow topography may be pronounced.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Acer rubrum* dominates the canopy; *Fraxinus pennsylvanica* codominates in one example. *Rosa palustris, Vaccinium corymbosum*, and *Viburnum dentatum* are common shrubs. The herbaceous layer is strongly dominated by *Carex stricta*; other herbs may include forbs *Boehmeria cylindrica, Lycopus virginicus*, and *Symplocarpus foetidus*, and ferns *Onoclea sensibilis, Osmunda cinnamomea, Osmunda regalis*, and *Thelypteris palustris*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The canopy consists of scattered trees, with as little as 25% overall cover. The shrub layer is patchy and may be extensive in places. The herb layer is typically well-developed, with ferns and graminoids dominant. The bryophyte cover is variable. *Acer rubrum* is dominant in the canopy, often with many standing dead trees. Associated trees may include *Fraxinus nigra, Ulmus americana*, and occasional *Pinus strobus, Tsuga canadensis*, or *Picea rubens*. The shrub layer is characterized by *Vaccinium corymbosum, Spiraea alba var. latifolia (= Spiraea latifolia)*, and *Ilex verticillata*. Other shrubs may be locally common, including *Nemopanthus mucronatus, Viburnum nudum var. cassinoides, Viburnum dentatum, Lyonia ligustrina, Alnus incana, Ilex laevigata*, and creeping *Rubus hispidus*. The herbaceous layer is typically dominated by the graminoids *Carex stricta, Carex lacustris*, or *Calamagrostis canadensis* or the ferns *Onoclea sensibilis, Osmunda cinnamomea*, or *Osmunda claytoniana*. Less abundant herbs include *Carex intumescens, Carex folliculata, Carex canescens, Carex trisperma, Glyceria striata, Osmunda regalis, Dryopteris cristata, Thelypteris palustris, Lycopus uniflorus, Symplocarpus foetidus, Galium palustre, Cicuta bulbifera, Caltha palustris*, and *Impatiens capensis*. *Sphagnum* spp. are the characteristic bryophytes, with non-sphagnous mosses as associates.

Global Vegetation: The canopy consists of scattered trees, with as little as 25% overall cover. The shrub layer is patchy and may be extensive in places. The herb layer is typically well-developed, with ferns and graminoids dominant. The bryophyte cover is variable. *Acer rubrum* is dominant in the canopy, often with many standing dead trees. Associated trees may include *Fraxinus nigra, Ulmus americana*, and occasional *Pinus strobus, Tsuga canadensis*, or *Picea rubens*. The shrub layer is characterized by *Vaccinium corymbosum, Spiraea alba var. latifolia (= Spiraea latifolia)*, and *Ilex verticillata*. Other shrubs may be locally common, including *Nemopanthus mucronatus, Viburnum nudum var. cassinoides, Viburnum dentatum, Lyonia ligustrina, Alnus incana, Ilex laevigata*, and the creeping *Rubus hispidus*. The herbaceous layer is typically dominated by the graminoids *Carex stricta, Carex lacustris*, or *Calamagrostis canadensis* or the ferns *Onoclea sensibilis, Osmunda cinnamomea*, or *Osmunda claytoniana*. Less abundant herbs include *Carex intumescens, Carex folliculata, Carex canescens, Carex trisperma, Glyceria striata, Osmunda regalis, Dryopteris cristata, Thelypteris palustris, Lycopus uniflorus, Symplocarpus foetidus, Galium palustre, Cicuta bulbifera, Caltha palustris*, and *Impatiens capensis*. *Sphagnum* spp. are the characteristic bryophytes, with non-sphagnous mosses as associates.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Vaccinium corymbosum*, *Viburnum dentatum*
Herb (field)	Graminoid	*Carex stricta*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*, *Thelypteris palustris*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata*, *Vaccinium corymbosum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Spiraea alba* var. *latifolia*
Herb (field)	Graminoid	*Calamagrostis canadensis*, *Carex lacustris*, *Carex stricta*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*, *Osmunda cinnamomea*, *Osmunda claytoniana*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata*, *Vaccinium corymbosum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Spiraea alba* var. *latifolia*
Herb (field)	Graminoid	*Calamagrostis canadensis*, *Carex lacustris*, *Carex stricta*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*, *Osmunda cinnamomea*, *Osmunda claytoniana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Onoclea sensibilis*, *Vaccinium corymbosum*, *Viburnum dentatum*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer rubrum*, *Ilex verticillata*, *Onoclea sensibilis*, *Spiraea alba* var. *latifolia*, *Vaccinium corymbosum*
Global: *Acer rubrum*, *Ilex verticillata*, *Onoclea sensibilis*, *Spiraea alba* var. *latifolia*, *Vaccinium corymbosum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium), *Lythrum salicaria* (High), *Polygonum hydropiper*
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Acer rubrum / Carex lacustris* Wet Woodland (CEGL006105)
- *Acer rubrum / Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest (CEGL006220)
- *Acer rubrum / Rhododendron viscosum - Clethra alnifolia* Swamp Forest (CEGL006156)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Canopy cover can vary from open to partially closed. One site at Unionville West in New Jersey had 60% canopy cover.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This community was observed by the UMESC mapping team in southern New Hampshire.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This red maple wetland was sampled at Upper Greenwood Lake East and Unionville West in New Jersey and in New York.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: No plots or observation points were collected. It was observed by the UMESC mapping team in southern New Hampshire.
Global Range: This wetland is found in central and northern New England, south to Pennsylvania and New Jersey.
Nations: CA, US
States/Provinces: CT, DE:S1, MA, MD, ME, NH:S4S5, NJ, NY, PA:S5, QC?, RI, VT
TNC Ecoregions: 49:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Aa:CCP, 221Ab:CCC, 221Ae:CCC, 221Ai:CCC, 221Bd:CCC, 221Da:CCC, 221Fa:CCC, M212C:CC, M212Ea:CCC, M212Eb:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bf:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Cape Cod, Minute Man); USFWS (Erie, Great Meadows, Great Swamp, Moosehorn, Oxbow, Patuxent, Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WMUM
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: This community was observed by the UMESC mapping team in southern New Hampshire and sampled during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 1 observation point; 6 accuracy assessment points): APPA.0532, APPA.0926, APPA.1361, APPA_AA_2110, APPA_AA_2129, APPA_AA_2196, APPA_AA_2297, APPA_AA_2887, APPA_AA_3140.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (3 accuracy assessment points): APPA_AA_2486, APPA_AA_2744, APPA_AA_3335.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: Barrett and Enser 1997, CAP pers. comm. 1998, CDPNQ unpubl. data, Cowardin et al. 1979, Coxe 2009, Eastern Ecology Working Group n.d., Edinger et al. 2002, Eichelberger 2011p, Enser and Lundgren 2006, Eyre 1980, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Gawler et al. 2005, Golet et al. 1993, Hunt 1999, Metzler and Barrett 2001, Metzler and Barrett 2006, Moore and Taylor 1927, Rawinski 1984a, Sneddon et al. 2010, Sperduto 2000a, Sperduto 2000b, Sperduto and Nichols 2004, Sperduto and Nichols 2004*, Swain and Kearsley 2001, Thompson and Sorenson 2000, Zimmerman et al. 2012

A3416 *Betula alleghaniensis - Tsuga canadensis* Swamp Forest Alliance

Alliance Summary Description: This alliance includes swamp forests of the Great Lakes states and Northeast, ranging from southeastern Canada through New England to the Central Appalachians, Blue Ridge, and Ridge and Valley. Stands are often dominated by *Tsuga canadensis, Betula alleghaniensis*, and *Acer rubrum*, with closed to open canopies and an open to dense shrub layer, interspersed with small *Sphagnum* - herb-dominated depressions. Canopies are composed of various mixtures of evergreen and deciduous species. Minor canopy associates include *Acer rubrum, Fraxinus americana, Fraxinus pennsylvanica, Pinus strobus*, and *Nyssa sylvatica*; *Liriodendron tulipifera* may be a component at the southern limit, while *Picea rubens* may occur as scattered individuals in the north. Shrubs include *Acer pensylvanicum, Alnus incana ssp. rugosa, Hamamelis virginiana, Ilex montana, Ilex verticillata, Kalmia latifolia, Lindera benzoin, Nemopanthus mucronatus, Rhododendron maximum, Vaccinium corymbosum, Viburnum lantanoides*, and *Viburnum nudum var. cassinoides*. Herbs in the forested areas include *Coptis trifolia, Cornus canadensis, Glyceria melicaria, Lycopodium obscurum, Maianthemum canadense, Onoclea sensibilis, Osmunda regalis var. spectabilis*, and *Thelypteris noveboracensis*. Soils of this alliance vary from saturated muck to imperfectly drained mineral soils and are often acidic. Communities in this alliance occur in upland valleys created by bedrock depressions, on lower slopes, or adjacent to streams and lakes.

[CEGL006380] *Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest

Translated Name: **Yellow Birch - Red Maple - (Eastern Hemlock, Balsam Fir) / Cinnamon Fern Swamp Forest**
Common Name: **Hardwood - Conifer Seepage Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Betula alleghaniensis - Tsuga canadensis* Swamp Forest Alliance (A3416)

Element Concept

Global Summary: This mixed forest type occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians. Settings include stream drainages, seepage channels, inactive river terraces, and slope bottoms, but not permanently saturated basins. Perennial seepage from upslope or an impervious soil layer keeps water near the surface. There is often pronounced hummock-and-hollow microtopography. The somewhat acidic to circumneutral mineral soils are typically saturated early in the season but may dry out as summer progresses. The canopy closure ranges from somewhat open to nearly closed. Shrubs are sparse; the herb layer is patchy and may be locally dense. The bryoid layer is typically fairly sparse. The canopy is codominated by *Tsuga canadensis* and mixed hardwoods such as *Betula alleghaniensis, Fraxinus americana*, and *Acer rubrum*. Less frequent species can include *Pinus strobus, Fraxinus pennsylvanica*, and *Fraxinus nigra*. *Picea rubens* may occur sporadically at the northern extent of this community, and *Nyssa sylvatica* may occur to the south. The shrub layer often includes *Lindera benzoin, Viburnum lantanoides (= Viburnum alnifolium)*, and *Acer pensylvanicum*. The herb layer reflects the underlying moisture gradients, with *Osmunda cinnamomea, Osmunda claytoniana, Geum rivale, Impatiens capensis, Thelypteris palustris, Arisaema triphyllum, Symplocarpus foetidus, Hydrocotyle americana*, and *Cardamine pensylvanica* in the more moist areas, and *Coptis trifolia, Thelypteris noveboracensis, Athyrium filix-femina, Oclemena acuminata (= Aster acuminatus), Dryopteris intermedia, Cornus canadensis, Aralia nudicaulis*, and *Clintonia borealis* typical of the areas grading to upland. Bryophyte cover is variable and often includes *Sphagnum girgensohnii, Thuidium delicatulum, Bazzania trilobata*, and *Mnium* spp. These forests are somewhat similar to *Tsuga canadensis - Betula alleghaniensis / Ilex verticillata / Sphagnum* spp. Swamp Forest (CEGL006226) but occur on mineral soils, not in peaty basins, and have understory species that indicate somewhat more nutrient-enriched conditions.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This mixed hemlock - hardwood forest occurs on mineral-soil wetlands in seepage-influenced areas, at wetland-upland ecotones, along intermittent streams and on slopes rather than in basins. Sampled site elevations range from 295-611 m (968-2,000 feet). It occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians. Sites are typically gentle lower slopes with northern and western aspects. Soils are temporarily flooded to saturated and include very poorly to poorly drained peat and muck, as well as moderately well- to well-drained silt loam and loam. The unvegetated surface consists of leaf litter, with lesser amounts of large/small rocks, bare soil, downed wood, and/or standing water. Evidence of disturbance includes trails and powerline corridor, past logging and clearing, and the presence of exotic plants.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is only known from two locations in the Northern Appalachian project area and occurs in seepage areas and pond margins with flat to moderate slopes at elevation ranging from 200 to 650 m (655-2,130 feet). Soils are somewhat to very poorly drained with standing water occasionally present.

Global Environment: This mixed forest type occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians. Settings include stream drainages, seepage channels, inactive river terraces, and slope bottoms where an impervious soil layer keeps water near the surface, but not permanently saturated basins. The somewhat acidic to circumneutral mineral soils are typically saturated early in the season, but may dry out as summer progresses. There is often pronounced hummock-and-hollow microtopography.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy includes *Acer rubrum, Betula alleghaniensis, Acer saccharum*, and occasionally *Tsuga* spp. (≤25% of canopy). The herbaceous layer is more indicative of nutrient-enriched conditions with species such as *Geum rivale, Impatiens capensis,*

Thelypteris palustris, and *Arisaema triphyllum*. Common herbs from plots sampled in this area include *Athyrium filix-femina, Glyceria melicaria, Onoclea sensibilis, Osmunda cinnamomea*, and *Tiarella cordifolia*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by closed-canopy deciduous or mixed deciduous-evergreen forests dominated by *Betula alleghaniensis*. Canopy associates are variable and include *Abies balsamea, Acer rubrum, Fraxinus americana, Picea rubens*, and *Tsuga canadensis*. Shrub dominants include *Rubus pubescens* and *Viburnum lantanoides*. Herbaceous cover is variable. Characteristic species include *Carex leptonervia, Coptis trifolia, Dryopteris intermedia, Oclemena acuminata, Onoclea sensibilis, Oxalis montana, Phegopteris connectilis*, and *Trillium undulatum*. Bryophytes and lichens are often a prominent feature of the ground layer.

Global Vegetation: The canopy closure ranges from somewhat open to nearly closed. Shrubs are sparse; the herb layer is patchy and may be locally dense. The bryoid layer is typically fairly sparse. The canopy is codominated by *Tsuga canadensis* and mixed hardwoods such as *Betula alleghaniensis* and *Acer rubrum*. Less frequent species can include *Pinus strobus, Fraxinus pennsylvanica*, and *Fraxinus nigra*. *Picea rubens* and/or *Abies balsamea* may occur sporadically at the northern extent of this community, and *Nyssa sylvatica* may occur to the south. The shrub layer often includes *Lindera benzoin, Viburnum lantanoides (= Viburnum alnifolium)*, and *Acer pensylvanicum*. The herb layer reflects the underlying moisture gradients, with *Osmunda cinnamomea, Osmunda claytoniana, Geum rivale, Impatiens capensis, Thelypteris palustris, Arisaema triphyllum, Symplocarpus foetidus, Hydrocotyle americana*, and *Cardamine pensylvanica* in the more moist areas, and *Coptis trifolia, Thelypteris noveboracensis, Oclemena acuminata (= Aster acuminatus), Dryopteris intermedia, Cornus canadensis, Aralia nudicaulis*, and *Clintonia borealis* typical of the areas grading to upland. Bryophyte cover is spotty, and often includes *Sphagnum girgensohnii, Bazzania trilobata*, and *Mnium* spp.

Most Abundant Species

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula alleghaniensis*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Acer saccharum*
Herb (field)	Graminoid	*Glyceria melicaria*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*, *Osmunda cinnamomea*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula alleghaniensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Rubus pubescens*, *Viburnum lantanoides*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*, *Onoclea sensibilis*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula alleghaniensis*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin*, *Viburnum lantanoides*
Herb (field)	Flowering forb	*Arisaema triphyllum*, *Impatiens capensis*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*, *Osmunda claytoniana*

Characteristic Species

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Acer saccharum*, *Betula alleghaniensis*, *Glyceria melicaria*, *Onoclea sensibilis*, *Osmunda cinnamomea*

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Betula alleghaniensis*, *Phegopteris connectilis*, *Rubus pubescens*

Global: *Arisaema triphyllum*, *Tsuga canadensis*

Other Noteworthy Species

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium), *Frangula alnus* (High/Medium), *Polygonum persicaria*, *Rhamnus cathartica* (High/Medium), *Solanum dulcamara* (Low), *Tussilago farfara* (Insignificant)

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Tsuga canadensis - Betula alleghaniensis / Ilex verticillata / Sphagnum* spp. Swamp Forest (CEGL006226)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community is transitional between wetland and upland. Eastern hemlock is not always in the canopy of this community.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: At the Lower New England/Northern Appalachian AT classification meeting there was discussion about the richness of this association (CEGL006380); Vermont says yes, Maine says no. One sloping seepage swamp site in Shrewsbury, Vermont, has deep muck (60 cm+) rather than mineral soil.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: Conifers are characteristic but not necessarily prominent. The more southerly examples have hemlock as an associate, while more northerly examples tend to have balsam fir.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Massachusetts (Beartown State Forest, Crystal Mountain Natural Heritage Site, October Mountain State Forest, Shaker Campsite Natural Heritage Site, Tully Mountain), New York (Sunken Mine Road North/Fahnestock State Park), and Vermont (Sherburne Pass, Shrewsbury, Stratton Pond vicinity).
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from two locations in Maine at Surplus Pond and Church Pond.
Global Range: This mixed forest type occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians, and adjacent Canada.
Nations: CA, US
States/Provinces: CT, MA, ME:S3, NB, NH, NY, QC:S4?, RI, VT:S3
TNC Ecoregions: 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 221Ae:CCC, 221Ag:CCP, 221Ai:CCC, 221Ak:CCC, 221Al:CCP, M212Ad:CCC, M212Ba:CCC, M212Bc:CCP, M212Bd:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Marsh-Billings-Rockefeller)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FRHS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 plots; 6 observation points; 3 accuracy assessment points): APPA.0029, APPA.0170, APPA.0967, APPA.1413, APPA.1458, APPA.1488, APPA.1707, APPA.1723, APPA.1725, APPA_AA_2364, APPA_AA_2413, APPA_AA_2519.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (3 plots; 1 observation point; 17 accuracy assessment points): APPA.1590, APPA.1598, APPA.1663, APPA.1665, APPA_AA_1804, APPA_AA_1884, APPA_AA_1919, APPA_AA_1942, APPA_AA_2019, APPA_AA_2240, APPA_AA_2263, APPA_AA_2302, APPA_AA_2489, APPA_AA_2514, APPA_AA_2616, APPA_AA_2872, APPA_AA_2905, APPA_AA_2935, APPA_AA_2967, APPA_AA_3135, APPA_AA_3203.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler and S.L. Neid
References: CDPNQ unpubl. data, Cowardin et al. 1979, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Enser 1999, Enser and Lundgren 2006, Eyre 1980, Gawler 2000, Gawler 2002, Gawler and Cutko 2010, Metzler and Barrett 2001, Metzler and Barrett 2006, Sperduto 1997b, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2000, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006226] *Tsuga canadensis - Betula alleghaniensis / Ilex verticillata / Sphagnum* spp. Swamp Forest

Translated Name: **Eastern Hemlock - Yellow Birch / Common Winterberry / Peatmoss species Swamp Forest**
Common Name: **Hemlock - Hardwood Swamp Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Betula alleghaniensis - Tsuga canadensis* Swamp Forest Alliance (A3416)

Element Concept

Global Summary: These hemlock-hardwood swamps are common throughout most of New England, New York and Pennsylvania, mostly in glaciated areas south of spruce-fir forest regions. Most are mixed-canopy wetland forests, but in some may be strongly coniferous. They occur in poorly drained basins over bedrock or compacted till. "Pocket swamps," small isolated basins in upland forests, are one setting, and these swamps also occur adjacent to streams and lakes in larger basins. The acidic, organic soils remain saturated for most or all of the growing season; they may partially dry out, particularly in smaller basins. Canopy closure is nearly complete, and shrubs are sparse. The herbaceous layer may be well-developed, with ferns especially characteristic. Bryophyte cover varies, but is usually extensive. *Tsuga canadensis* is either canopy dominant or is mixed with other trees including *Acer rubrum, Betula alleghaniensis, Pinus strobus, Nyssa sylvatica*, and *Fraxinus nigra*. Scattered shrubs include *Vaccinium corymbosum, Ilex verticillata, Lyonia ligustrina, Nemopanthus mucronatus*, and *Viburnum nudum var. cassinoides*. *Osmunda cinnamomea, Osmunda regalis*, and *Onoclea sensibilis* are prominent ferns; associated herbs include *Carex folliculata, Carex trisperma, Carex disperma, Maianthemum canadense, Coptis trifolia, Dryopteris cristata, Rubus pubescens*, and *Mitchella repens*. Bryophytes include *Sphagnum girgensohnii, Sphagnum palustre*, and other *Sphagnum* species, as well as *Pleurozium schreberi* and *Bazzania trilobata*. These forests lack the species of more southerly affinity, such as *Rhododendron maximum* or *Liriodendron tulipifera*, that characterize hemlock swamps to the south, which are covered by *Tsuga canadensis / Rhododendron maximum / Sphagnum* spp. Swamp Forest (CEGL006279). Mixed expression of these swamps may be similar in canopy composition to *Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest (CEGL006380); those are mineral-soil wetlands in seepage-influenced areas, typically at wetland-upland ecotones, and usually occur on slopes rather than in basins. *Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum* spp. Swamp Forest (CEGL006014) is ecologically similar but is more strongly deciduous, with limited hemlock.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: These mixed hemlock - hardwood basin swamps occur on saturated acidic, peaty, organic soils occupying poorly drained basins over bedrock or compacted till. Sites are saturated basins with very poorly drained muck soil. The unvegetated surface includes downed wood, bare soil, and mosses. Evidence of disturbance includes uprooted hemlocks due to poor root anchorage and a minor presence of exotic plants.
Global Environment: These hemlock-hardwood swamps are common throughout most of New England, New York and Pennsylvania, mostly in glaciated areas south of spruce-fir forest regions. Most are mixed-canopy wetland forests, but in some may be strongly coniferous. They occur in poorly drained basins over bedrock or compacted till. "Pocket swamps," small isolated basins in upland forests, are one setting, and these swamps also occur adjacent to streams and lakes in larger basins. The acidic, organic soils remain saturated for most or all of the growing season; they may partially dry out, particularly in smaller basins.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These forested wetlands are dominated by *Tsuga canadensis* in the canopy and subcanopy along with lesser amounts of *Acer rubrum, Betula alleghaniensis, Pinus strobus, Nyssa sylvatica*, and *Fraxinus* spp. Shrubs are sparse but may include *Ilex verticillata* and *Kalmia latifolia*. Herbs are often dense, especially *Osmunda cinnamomea* and several sedges, including *Carex folliculata, Carex trisperma*, and *Carex disperma*. Forbs may include *Aralia nudicaulis, Pilea pumila*, and *Tiarella cordifolia*. *Sphagnum* spp. tend to carpet the surface.
Global Vegetation: Canopy closure is nearly complete, and shrubs are sparse. The herbaceous layer may be well-developed, with ferns especially characteristic. Bryophyte cover varies, but is usually extensive. *Tsuga canadensis* is either canopy dominant or is mixed with other trees including *Acer rubrum, Betula alleghaniensis, Pinus strobus,*

Nyssa sylvatica, and *Fraxinus nigra*. Scattered shrubs include *Vaccinium corymbosum, Ilex verticillata, Lyonia ligustrina, Nemopanthus mucronatus*, and *Viburnum nudum var. cassinoides*. *Osmunda cinnamomea, Osmunda regalis*, and *Onoclea sensibilis* are prominent ferns; associated herbs include *Carex folliculata, Carex trisperma, Carex disperma, Maianthemum canadense, Coptis trifolia, Dryopteris cristata, Rubus pubescens*, and *Mitchella repens*. Bryophytes include *Sphagnum girgensohnii, Sphagnum palustre*, and other *Sphagnum* species, as well as *Pleurozium schreberi* and *Bazzania trilobata*. These forests lack the species of more southerly affinity, such as *Rhododendron maximum* or *Liriodendron tulipifera*, that characterize hemlock swamps to the south.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula alleghaniensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia latifolia*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*
Nonvascular	Moss	*Sphagnum* spp.

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Betula alleghaniensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata*, *Vaccinium corymbosum*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*, *Osmunda cinnamomea*, *Osmunda regalis*
Nonvascular	Moss	*Sphagnum girgensohnii*, *Sphagnum palustre*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Betula alleghaniensis*, *Ilex verticillata*, *Kalmia latifolia*, *Sphagnum* spp., *Tsuga canadensis*
Global: *Betula alleghaniensis*, *Ilex verticillata*, *Sphagnum girgensohnii*, *Sphagnum palustre*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum* spp. Swamp Forest (CEGL006014)
- *Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest (CEGL006380)
- *Betula alleghaniensis - Acer rubrum - Tsuga canadensis / Sphagnum* spp. Forest (CEGL006955)
- *Tsuga canadensis - Betula alleghaniensis* Swamp Forest (CEGL005003)
- *Tsuga canadensis / Rhododendron maximum / Sphagnum* spp. Swamp Forest (CEGL006279)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Tipped over and leaning trees are common in this forested swamp community.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: A barred owl and red-backed salamander were reported at the Beartown site in Vermont.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community occurs throughout most of New England and New York, mostly in glaciated areas south of spruce-fir forest regions. It was sampled at Beartown State Forest and Upper Goose Pond Natural Heritage Site in Massachusetts.
Global Range: This community occurs in glaciated areas ranging from New Jersey and Pennsylvania north through New York and New England to New Brunswick and possibly Nova Scotia, Canada.
Nations: CA, US
States/Provinces: CT, MA, ME, MI, NB, NH, NJ:S2, NS?, NY, PA, RI, VT:S2
TNC Ecoregions: 48:C, 49:C, 60:C, 61:C, 62:P, 63:C, 64:C
USFS Ecoregions (1994/95): 212Ea:CCC, 212Ec:CCC, 212Ed:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Bd:CCP, 221Ea:CCC, 221Fa:CCC, 221Fb:CCC, 222Ib:CCC, M212Ad:CCC, M212Ae:CCP, M212Af:CCP, M212Ba:CCP, M212C:CC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Ea:CCP, M212Fa:CCC, M212Fb:CCC, M221Ac:CCC, M221Ad:CCC, M221C:CC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Upper Delaware); USFWS (Erie, Iroquois)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FHHS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 1 observation point; 4 accuracy assessment points): APPA.0031, APPA.1467, APPA_AA_1798, APPA_AA_1904, APPA_AA_2265, APPA_AA_2432.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): J. Lundgren and E. Largay
References: Breden 1989, Breden et al. 2001, Cowardin et al. 1979, Davis 2011b, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Enser and Lundgren 2006, Eyre 1980, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Kost et al. 2007, Lundgren 2000, Messier 1980, Metzler and Barrett 2001, Metzler and Barrett 2006, Perles et al. 2008, Rawinski 1984a, Reschke 1990, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zimmerman et al. 2012

[CEGL006279] *Tsuga canadensis / Rhododendron maximum / Sphagnum* spp. Swamp Forest

Translated Name: **Eastern Hemlock / Great Laurel / Peatmoss species Swamp Forest**
Common Name: **Eastern Hemlock / Great Laurel Swamp Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Betula alleghaniensis* - *Tsuga canadensis* Swamp Forest Alliance (A3416)

ELEMENT CONCEPT

Global Summary: This hemlock swamp of the Central Appalachians, southeastern New York and northern New Jersey occurs on saturated acidic muck to imperfectly drained mineral soils in upland valleys, bedrock depressions, low slopes, and adjacent to streams and lakes. Mounds and depressions caused by uprooted trees are typical. The tree canopy is closed or nearly closed and is dominated by *Tsuga canadensis* with associates including *Acer rubrum, Nyssa sylvatica, Pinus strobus*, and *Betula alleghaniensis*. The well-developed shrub layer is strongly dominated by *Rhododendron maximum*. Other shrubs may include *Ilex verticillata, Rhododendron viscosum, Vaccinium corymbosum*, and *Lindera benzoin*. The sparse herb layer includes a variety of sedges such as *Carex folliculata, Carex trisperma, Carex intumescens*, as well as ferns and forbs such as *Osmunda cinnamomea, Thelypteris palustris, Onoclea sensibilis, Maianthemum canadense, Cornus canadensis, Coptis trifolia, Symplocarpus foetidus, Trientalis borealis*, and *Calla palustris*. The bryophyte layer is well-developed and strongly dominated by *Sphagnum* mosses. Other mosses may include *Aulacomnium palustre, Hypnum imponens*, and *Leucobryum glaucum* on drier hummocks.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This hemlock / laurel swamp forest occurs on saturated acidic muck to imperfectly drained mineral soils in upland valleys, bedrock depressions, low slopes, and adjacent to streams and lakes. It was sampled on low hummocks in an intermittently flooded seep with somewhat poorly drained muck soil. The unvegetated surface is dominated by leaf litter with some small rocks, downed wood, bare soil, and standing water.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This hemlock swamp forest occurs on saturated acidic muck to imperfectly-drained mineral soils. The sampled site has saturated poorly drained silt loam soil with hummock-and-hollow microtopography. Tip-up mounds and hummocks are vegetated, while hollows are largely unvegetated and are filled with litter and water.

Global Environment: This forest type occurs in saturated acidic muck to imperfectly drained mineral soils in upland valleys, bedrock depressions, low slopes, in small stream drainages, and adjacent to streams and lakes. The substrate is somewhat poorly to very poorly drained. Some areas are semipermanently to permanently flooded, especially where impacted by beaver or other impoundments, in which case the hemlocks may be in decline. The hemlocks may also be in decline due to hemlock woolly adelgid.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The canopy is dominated by *Tsuga canadensis* with *Pinus strobus* and *Acer rubrum* (not dominant). *Nyssa sylvatica, Betula alleghaniensis, Betula lenta*, and *Fraxinus nigra* are common in the subcanopy. Trees occur mostly on hummocks. *Rhododendron maximum* is dominant in the shrub layer. The herb layer is dominated by *Symplocarpus foetidus*. *Sphagnum* spp. are common.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Tsuga canadensis* is the sole canopy dominant with *Rhododendron maximum* dominant in the shrub layer. Hardwoods such as *Acer rubrum* and *Betula alleghaniensis* may also be present in canopy but low in cover (<25%). *Symplocarpus foetidus* and *Osmunda cinnamomea* are dominant herbs.

Global Vegetation: The tree canopy is closed or nearly closed (given healthy tress) and is dominated by *Tsuga canadensis* with associates including *Acer rubrum, Nyssa sylvatica, Pinus strobus*, and *Betula alleghaniensis*. (Actual foliar cover in stands where hemlocks are becoming defoliated due to hemlock woolly adelgid is much lower.) A subcanopy of *Tsuga canadensis* and *Acer rubrum* may be present. Mounds and depressions caused by uprooted trees are typical. The well-developed shrub layer is strongly dominated by *Rhododendron maximum*. Other shrubs may include *Ilex verticillata, Rhododendron viscosum, Hamamelis virginiana, Vaccinium corymbosum, Lindera benzoin*, and (in the northern part of the types range) *Nemopanthus mucronatus*. Herb cover varies from sparse to well-developed according to canopy closure and includes a variety of sedges such as *Carex folliculata, Carex trisperma, Carex disperma, Carex intumescens*, as well as ferns and forbs such as *Osmunda cinnamomea, Osmunda regalis, Thelypteris palustris, Onoclea sensibilis, Maianthemum canadense, Lycopus uniflorus, Cornus canadensis, Coptis trifolia, Symplocarpus foetidus, Trientalis borealis*, and *Calla palustris*. The bryophyte layer is well-developed and strongly dominated by *Sphagnum* mosses. Other mosses may include *Aulacomnium palustre, Hypnum imponens*, and *Leucobryum glaucum* on drier hummocks.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Rhododendron maximum*
Herb (field)	Flowering forb	*Symplocarpus foetidus*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron maximum*
Herb (field)	Flowering forb	*Symplocarpus foetidus*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron maximum*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Acer rubrum*, *Betula alleghaniensis*, *Nyssa sylvatica*, *Rhododendron maximum*, *Tsuga canadensis*
Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Betula alleghaniensis*, *Rhododendron maximum*, *Tsuga canadensis*
Global: *Acer rubrum*, *Betula alleghaniensis*, *Carex folliculata*, *Carex trisperma*, *Nyssa sylvatica*, *Osmunda cinnamomea*, *Rhododendron maximum*, *Tsuga canadensis*, *Vaccinium corymbosum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum caespitosum*, *Taraxacum officinale*
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (19-Jun-2006). This association is well-distributed through its range, but hemlock woolly adelgid may be threatening this as a type.

RELATED CONCEPTS

Global Similar Types:
- *Tsuga canadensis - Betula alleghaniensis / Ilex verticillata / Sphagnum* spp. Swamp Forest (CEGL006226)
- *Tsuga canadensis - Betula alleghaniensis* Swamp Forest (CEGL005003)
- *Tsuga canadensis - Liriodendron tulipifera - Platanus occidentalis / Rhododendron maximum - Xanthorhiza simplicissima* Wet Forest (CEGL007143)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Hemlock woolly adelgid-induced hemlock mortality is evident in this community.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: This community can occur in small patches across the landscape. Some examples along the Appalachian Trail may fall below the minimum map unit size.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This swamp is homogenous in the understory, but canopy dominance outside the plot seems to vary between *Tsuga canadensis* and *Acer rubrum*. This is a seepage swamp at the base of a slope surrounded by hemlock-northern hardwood forest in the uplands and shallow emergent marsh/sedge meadow to the east. Drainage in the landscape is affected by a railroad line to the east (bordering the shallow emergent marsh/sedge meadow); there are many exotics in the surrounding communities but none at the site.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is found in the Central Appalachians, southeastern New York and northern New Jersey. It was sampled in Cumberland County, Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This hemlock swamp was sampled at Corbin Hill in New York.
Global Range: This association is found in the northeastern United States from New York south to West Virginia and west to Ohio.
Nations: US
States/Provinces: MD, NJ:S1S2, NY, OH, PA, WV
TNC Ecoregions: 49:C, 59:C, 60:C, 61:C

USFS Ecoregions (1994/95): 212Fb:CCP, 212Fc:CCC, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Ba:CCC, 221Bd:CCC, 221Ea:CCP, 221F:CC, M221Ac:CCC, M221Bb:CCC, M221Bf:CCC, M221C:C?, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Delaware Water Gap); USFS (Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAHS, FCWH
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 6 accuracy assessment points): APPA.0508, APPA_AA_0293, APPA_AA_0477, APPA_AA_0490, APPA_AA_0639, APPA_AA_0898, APPA_AA_0905.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot): APPA.0675.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eichelberger 2011g, Fike 1999, Harrison 2004, Harrison 2011, Karlin 1988, ONHD unpubl. data, Perles et al. 2007, Zimmerman et al. 2012

A3418 *Picea rubens* Northern Appalachian Swamp Forest Alliance

Alliance Summary Description: This alliance includes swamp forests of the Northern Appalachians and southern Canada dominated by *Picea rubens*, often admixed with *Abies balsamea, Acer rubrum*, and *Betula alleghaniensis*. These swamp forests are generally not "boggy" in nature, and lack significant peat, although deep muck may overlie mineral soil. The shrub layer is characterized by *Nemopanthus mucronatus, Vaccinium corymbosum, Ilex verticillata*, and *Sorbus americana*. The herbaceous layer is characterized by *Carex trisperma, Clintonia borealis, Gaultheria hispidula*, and others of northern climates. This alliance includes red spruce-fir- or fir-dominated swamps of northern and/or montane regions of the eastern United States and Canada. Canopy associates may include *Acer rubrum, Betula alleghaniensis, Tsuga canadensis*, and *Larix laricina*. Communities of this alliance are "swamps" as opposed to "bog forests" in that they lack significant *Sphagnum* peat accumulation. Soils are saturated mucks over generally acidic outwash materials and other mineral soils in the glaciated and unglaciated portions of the range. Although *Picea rubens* is the predominant spruce, *Picea mariana* or *Picea glauca* are occasionally dominant in the northern portion of the range. Typical understory species include *Vaccinium corymbosum, Nemopanthus mucronatus, Viburnum nudum var. cassinoides (= Viburnum cassinoides)*, and, in the southern portion of the range, *Rhododendron maximum* or *Hypericum densiflorum*. Ground flora includes *Carex trisperma, Coptis trifolia, Cornus canadensis, Maianthemum canadense, Osmunda cinnamomea, Oxalis montana*, and *Gaultheria hispidula*. Feathermosses are common and *Sphagnum* is patchy.

[CEGL006361] *Picea mariana - Picea rubens / Pleurozium schreberi* Swamp Forest

Translated Name: **Black Spruce - Red Spruce / Schreber's Big Red-stem Moss Swamp Forest**
Common Name: **Northern Spruce - Fir Flats**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Picea rubens* Northern Appalachian Swamp Forest Alliance (A3418)

ELEMENT CONCEPT

Global Summary: This closed-canopy spruce-fir forest occurs in northern New England on imperfectly drained flats or stream drainages, often where cold air accumulates. This association is typically found along streams, swamp borders, low flats alongside lakes, or adjacent to boreal heathlands. Soils are acidic silts, loams, or sandy loams and imperfectly drained. In most settings they are seasonally wet; some may remain saturated. Only rarely are they peaty. The canopy is generally closed, but blowdown gaps are common. The dominant understory feature is the extensive bryoid layer. Shrubs are sparse, except in gaps. Herbs are well represented although rarely dense. The

canopy is dominated by some combination of *Picea rubens, Picea mariana*, and *Abies balsamea*. Associates include *Betula alleghaniensis, Abies balsamea, Acer rubrum*, or *Thuja occidentalis*. In the southern portion of this type's range, *Tsuga canadensis* and *Prunus serotina* may be present in the canopy. Characteristic shrubs include *Viburnum nudum var. cassinoides (= Viburnum cassinoides), Kalmia angustifolia, Amelanchier bartramiana, Vaccinium angustifolium*, and *Vaccinium myrtilloides*. The herbaceous layer is characterized by *Osmunda cinnamomea, Osmunda claytoniana, Gaultheria hispidula, Maianthemum canadense, Cornus canadensis, Coptis trifolia, Clintonia borealis*, and *Dalibarda repens*. A well-developed bryophyte layer is characteristic of this association and includes *Pleurozium schreberi, Hylocomium splendens, Ptilium crista-castrensis, Bazzania trilobata*, and species of *Sphagnum*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This community occurs on imperfectly drained flats or stream drainages, where cold air accumulates.
Global Environment: This closed-canopy spruce-fir forest occurs in northern New England on imperfectly drained flats or stream drainages, often where cold air accumulates. This association is typically found along streams, swamp borders, low flats alongside lakes, or adjacent to boreal heathlands. Soils are acidic silts, loams, or sandy loams and imperfectly drained. In most settings they are seasonally wet; some may remain saturated. Only rarely are they peaty.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: These are *Picea rubens - Abies balsamea* and/or *Picea mariana - Picea rubens* flats with a well-developed bryophyte layer that includes *Pleurozium schreberi, Hylocomium splendens, Ptilium crista-castrensis, Bazzania trilobata*, and *Sphagnum* spp. Both upland and wetland plants are found in the understory, including heath shrubs *Kalmia angustifolia, Vaccinium angustifolium*, and *Vaccinium myrtilloides*, as well as herbs *Osmunda cinnamomea, Osmunda claytoniana, Gaultheria hispidula, Maianthemum canadense*, and *Cornus canadensis*.
Global Vegetation: The canopy is generally closed, but blowdown gaps are common. The dominant understory feature is the extensive bryoid layer. Shrubs are sparse, except in gaps. Herbs are well-represented although rarely dense. The canopy is dominated by some combination of *Picea rubens, Picea mariana*, and *Abies balsamea*. Associates include *Betula alleghaniensis, Abies balsamea, Acer rubrum*, or *Thuja occidentalis*. In the southern portion of this type's range, *Tsuga canadensis* and *Prunus serotina* may be present in the canopy. Characteristic shrubs include *Viburnum nudum var. cassinoides (= Viburnum cassinoides), Kalmia angustifolia, Amelanchier bartramiana, Vaccinium angustifolium*, and *Vaccinium myrtilloides*. The herbaceous layer is characterized by *Osmunda cinnamomea, Osmunda claytoniana, Gaultheria hispidula, Maianthemum canadense, Cornus canadensis, Coptis trifolia, Clintonia borealis*, and *Dalibarda repens*. A well-developed bryophyte layer is characteristic of this association and includes *Pleurozium schreberi, Hylocomium splendens, Ptilium crista-castrensis, Bazzania trilobata*, and species of *Sphagnum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Picea mariana*
Nonvascular	Moss	*Pleurozium schreberi*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Picea mariana*, *Picea rubens*
Nonvascular	Moss	*Pleurozium schreberi*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Abies balsamea*, *Picea mariana*, *Picea rubens*, *Pleurozium schreberi*
Global: *Picea mariana*, *Picea rubens*, *Pleurozium schreberi*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Picea mariana / Pleurozium schreberi* Forest (CEGL002447)
- *Picea rubens - Abies balsamea / Gaultheria hispidula / Osmunda cinnamomea / Sphagnum* spp. Swamp Forest (CEGL006312)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: It may intergrade with Low-Elevation Spruce - Fir Forest (CEGL006273), depending on subtle changes in drainage.
Global Classification Comments: This association is differentiated by the characteristic presence of *Picea rubens, Amelanchier bartramiana*, and *Dalibarda repens*. Black spruce - red spruce flats with a woodland canopy and a well-developed heath shrub layer are differentiated as spruce - heath barrens, *Picea mariana - Picea rubens / Rhododendron canadense / Cladina* spp. Swamp Woodland (CEGL006421).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This community has been observed in New Hampshire and Maine.
Global Range: This spruce forest occurs in northern New England.
Nations: CA, US
States/Provinces: ME, NB, NH:S1, NY, ON, QC, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ia:CPP, 212La:CCC, 212Ma:CCC, 212Mb:CCP, 212Nb:C??, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cd:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFWS (Moosehorn?, Nulhegan Basin, Pondicherry)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FLSF
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (9 accuracy assessment points): APPA_AA_1948, APPA_AA_2268, APPA_AA_2469, APPA_AA_2515, APPA_AA_2646, APPA_AA_2669, APPA_AA_2925, APPA_AA_3138, APPA_AA_3188.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): E. Largay and M. Russo
Global Description Author(s): S.C. Gawler
References: Braun 1950, CDPNQ unpubl. data, Cogbill and White 1991, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, Heimburger 1934, Oosting and Reed 1944, Pease 1964, Reschke 1990, Royte et al. 1996, Sperduto 2000b, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

[CEGL006098] *Picea mariana / (Vaccinium corymbosum, Gaylussacia baccata) / Sphagnum* sp. Swamp Woodland

Translated Name: **Black Spruce / (Highbush Blueberry, Black Huckleberry) / Peatmoss species Swamp Woodland**
Common Name: **Black Spruce Swamp Woodland**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Picea rubens* Northern Appalachian Swamp Forest Alliance (A3418)

ELEMENT CONCEPT

Global Summary: This black spruce bog association represents the southern range limit of the alliance, ranging from central New England to just south of the glacial border. This vegetation generally occurs in kettlehole basins and other well-defined topographic depressions and is characterized by relatively deep peat accumulation, indicating acidic, nutrient-poor conditions. The tree canopy ranges widely in closure. The dominant tree is *Picea mariana*, with associates including *Larix laricina* and *Abies balsamea*. The shrubs *Vaccinium corymbosum* and *Nemopanthus mucronatus* form a patchy tall-shrub layer. The dwarf-shrub layer is well-developed and characterized by a number of heaths including *Chamaedaphne calyculata, Gaylussacia baccata, Kalmia angustifolia*, and *Vaccinium angustifolium*. Common herbs may include *Carex trisperma, Rhynchospora alba, Drosera rotundifolia, Sarracenia purpurea, Eriophorum virginicum, Coptis trifolia*, and *Maianthemum trifolium*. The well-developed bryophyte layer is dominated by *Sphagnum magellanicum, Sphagnum girgensohnii, Bazzania trilobata, Aulacomnium palustre*, and *Pleurozium schreberi*. This association is further characterized by the presence of one or more tree or shrub species of more southern distribution, including *Betula populifolia, Tsuga canadensis, Pinus rigida, Alnus incana, Rhododendron viscosum, Photinia* spp. (= *Aronia* spp.), or *Lyonia ligustrina*. Additional species that further indicate southern range affinity or the influence of slightly higher nutrient levels from adjacent uplands may be present, including *Carex folliculata, Carex crinita, Carex stricta, Osmunda cinnamomea, Symplocarpus foetidus, Iris versicolor*, or *Calla palustris*. Northern species, such as *Rhododendron canadense* or *Eriophorum vaginatum var. spissum (= Eriophorum spissum)*, are generally lacking.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This black spruce woodland bog occurs in kettlehole basins and other well-defined topographic depressions. It is characterized by relatively deep peat accumulation, indicating acidic, nutrient-poor conditions.

Global Environment: This vegetation generally occurs in kettlehole basins and other well-defined topographic depressions and is characterized by relatively deep peat accumulation, indicating acidic, nutrient-poor conditions. The tree canopy ranges widely in closure.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This forested bog is dominated by *Picea mariana* over heath shrubs and sphagnum mosses.

Global Vegetation: The dominant tree is *Picea mariana*, with associates including *Larix laricina* and *Abies balsamea*. The shrubs *Vaccinium corymbosum* and *Nemopanthus mucronatus* form a patchy tall-shrub layer. The dwarf-shrub layer is well-developed and characterized by a number of heaths including *Chamaedaphne calyculata, Gaylussacia baccata, Kalmia angustifolia*, and *Vaccinium angustifolium*. Common herbs may include *Carex trisperma, Rhynchospora alba, Drosera rotundifolia, Sarracenia purpurea, Eriophorum virginicum, Coptis trifolia*, and *Maianthemum trifolium*. The well-developed bryophyte layer is dominated by *Sphagnum magellanicum, Sphagnum girgensohnii, Bazzania trilobata, Aulacomnium palustre*, and *Pleurozium schreberi*. This association is further characterized by the presence of one or more tree or shrub species of more southern distribution, including *Betula populifolia, Tsuga canadensis, Pinus rigida, Alnus incana, Rhododendron viscosum, Photinia* spp. (= *Aronia* spp.), or *Lyonia ligustrina*. Additional species that further indicate southern range affinity or the influence of slightly higher nutrient levels from adjacent uplands may be present, including *Carex folliculata, Carex crinita, Carex stricta, Osmunda cinnamomea, Symplocarpus foetidus, Iris versicolor*, or *Calla palustris*. Northern species, such as *Rhododendron canadense* or *Eriophorum vaginatum var. spissum (= Eriophorum spissum)*, are generally lacking.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea mariana*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea mariana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Picea mariana*
Global: *Picea mariana*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Picea mariana - (Larix laricina) / Ledum groenlandicum / Sphagnum* spp. Swamp Forest (CEGL005271)
- *Picea mariana / Alnus incana / Sphagnum* spp. Swamp Forest (CEGL002452)
- *Picea mariana / Rubus chamaemorus / Sphagnum* spp. Swamp Woodland (CEGL006082)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was not sampled in the field; however, it was observed remotely in VT by the UMESC mapping team.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: This community covers *Picea mariana* bogs on the AT in Lower New England project area.
Global Classification Comments: This association is similar to *Picea mariana / Alnus incana / Sphagnum* spp. Swamp Forest (CEGL002452).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community ranges from southern New Hampshire to just south of the glacial border in Pennsylvania and New Jersey. It was observed remotely in Vermont by the UMESC mapping team.
Global Range: This black spruce bog association ranges from New England to just south of the glacial border.
Nations: CA, US
States/Provinces: CT, MA:S2, ME, NB, NH:S3, NJ:S1, NY, PA, QC, RI, VT
TNC Ecoregions: 60:C, 61:C, 62:?, 63:C
USFS Ecoregions (1994/95): 212B:CC, 212C:CC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Gb:CCC, 221Ae:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Bd:CCC, 221Dc:CPP, M212A:CC, M212Cc:CCC, M212Ea:CCC, M212Eb:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England]); USFS (White Mountain); USFWS (Aroostook?, Carlton Pond?, Moosehorn?, Nulhegan Basin)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FMSS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: None.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): L.A. Sneddon
References: Anderson and Davis 1998, Breden 1989, Breden et al. 2001, CDPNQ unpubl. data, Cowardin et al. 1979, Damman and French 1987, Davis 2011c, Davis 2011g, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Engstrom 1998, Enser and Lundgren 2006, Eyre 1980, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, MNAP 1991, Metzler and Barrett 2001, Metzler and Barrett 2006, Rawinski 1984a, Reschke 1990, Sperduto 1997a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zimmerman et al. 2012

[CEGL006312] *Picea rubens - Abies balsamea / Gaultheria hispidula / Osmunda cinnamomea / Sphagnum* spp. Swamp Forest

Translated Name: **Red Spruce - Balsam Fir / Creeping Snowberry / Cinnamon Fern / Peatmoss species Swamp Forest**
Common Name: **Northern Appalachian Spruce - Fir Swamp Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Picea rubens* Northern Appalachian Swamp Forest Alliance (A3418)

ELEMENT CONCEPT

Global Summary: These red spruce - balsam fir swamps occur on wetland flats and basins across the Northern Appalachians. They are typically found in small basins, or along the margins of larger drainage basins or lowland slopes, usually in areas with some surface seepage. The substrate is saturated mineral soils, sometimes with a shallow peat layer. Shrubs and herbs of boreal affinity reflect the cool environmental conditions. The canopy ranges from partial (50%) to dense, with shrub and herb layers sparse to well-developed depending on available light. Canopy gaps are common, and shrubs may be locally dense. The canopy is dominated by *Picea rubens* and *Abies balsamea*, with smaller amounts of *Picea mariana, Picea glauca*, or *Larix laricina*. *Abies balsamea* drops out at the southern end of the range. Characteristic shrubs are *Nemopanthus mucronatus, Sorbus americana, Alnus viridis*, and *Viburnum nudum var. cassinoides*. Heath shrubs such as *Gaultheria hispidula, Vaccinium angustifolium*, and *Kalmia angustifolia* are occasional, but not abundant. The most characteristic herb layer species are *Osmunda cinnamomea* and *Carex trisperma*; common associates include *Dalibarda repens, Coptis trifolia*, and *Clintonia borealis*. In coastal settings, *Symplocarpus foetidus* may be locally abundant. The bryophytes are dominated by *Sphagnum* spp. (typically including *Sphagnum girgensohnii*), but also include *Bazzania trilobata, Pleurozium schreberi*, and *Aulacomnium palustre*. This association is distinguished by the dominance of red spruce rather than black spruce, the mineral soil setting, and the low abundance of heath shrubs. *Picea mariana - Picea rubens / Pleurozium schreberi* Swamp Forest (CEGL006361) is similar, but has black spruce abundant and occurs in more boreal settings, on poorly drained but not usually saturated soils.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This Northern Appalachian red spruce - balsam fir swamp is peripheral to, but present in, Lower New England where it was sampled in Massachusetts and Vermont. The sites are flat basins that are semipermanently flooded or saturated. Soils are very poorly drained peat, muck and sandy loam. The unvegetated surface consists of leaf litter or sphagnum mosses, with standing water possible. Evidence of disturbance includes past logging, wind damage (tip-up mounds due to unstable saturated soil), and trampling.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is uncommon in the Northern Appalachian project area and occurs on gently sloping seepages and pond margins at elevations ranging from 450 to 1,000 m (1,475-3,280 feet). Soils are saturated to poorly drained organic matter and peat.

Global Environment: These red spruce - balsam fir swamps occur on wetland flats and basins across the Northern Appalachians. They are typically found in small basins, or along the margins of larger drainage basins or lowland slopes, usually in areas with some surface seepage. The substrate is saturated mineral soils, sometimes with a shallow peat layer. Shrubs and herbs of boreal affinity reflect the cool environmental conditions.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These red spruce - balsam fir swamps are codominated by *Picea rubens* and *Abies balsamea* with a continuous ground layer of *Sphagnum* spp. *Abies balsamea* is prevalent shrub tall shrub along with *Viburnum lantanoides, Nemopanthus mucronatus, Sorbus americana, Alnus viridis ssp. crispa*, and *Viburnum nudum var. cassinoides*. Characteristic herbs include *Carex disperma, Coptis trifolia, Cornus canadensis, Gaultheria hispidula, Oclemena acuminata*, and *Osmunda cinnamomea*. In addition, this community supports MA state-imperiled *Amelanchier bartramiana*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by closed-canopy evergreen forests dominated by *Picea rubens* and/or *Abies balsamea* with both species always at least present. Other canopy associates include *Acer rubrum, Betula alleghaniensis*, and *Betula papyrifera*. Shrubs are not a prominent feature of this association but may include *Ilex verticillata, Nemopanthus mucronatus, Vaccinium angustifolium*, and *Viburnum lantanoides* occurring at low cover. Herbaceous dominance is highly variable. Characteristic species include *Carex brunnescens, Carex disperma, Carex gynandra, Carex trisperma, Clintonia borealis, Coptis trifolia, Cornus canadensis, Dennstaedtia punctilobula, Dryopteris campyloptera, Dryopteris marginalis, Gaultheria hispidula, Maianthemum canadense, Oclemena acuminata*, and *Osmunda cinnamomea*. *Sphagnum* spp. often strongly dominate the ground layer with as much as >90% cover.

Global Vegetation: The canopy ranges from partial (50%) to dense, with shrub and herb layers sparse to well-developed depending on available light. Canopy gaps are common, and shrubs may be locally dense. The canopy is dominated by *Picea rubens* and *Abies balsamea*, with smaller amounts of *Picea mariana, Picea glauca*, or *Larix laricina*. Characteristic shrubs are *Nemopanthus mucronatus, Sorbus americana, Alnus viridis*, and *Viburnum nudum var. cassinoides*. Heath shrubs such as *Gaultheria hispidula, Vaccinium angustifolium*, and *Kalmia angustifolia* are occasional, but not abundant. The most characteristic herb layer species are *Osmunda cinnamomea*

and *Carex trisperma*; common associates include *Dalibarda repens, Coptis trifolia*, and *Clintonia borealis*. In coastal settings, *Symplocarpus foetidus* may be locally abundant. The bryophytes are dominated by *Sphagnum* spp. (typically including *Sphagnum girgensohnii*), but also include *Bazzania trilobata, Pleurozium schreberi*, and *Aulacomnium palustre*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Herb (field)	Flowering forb	*Coptis trifolia*
Herb (field)	Graminoid	*Carex trisperma*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*
Nonvascular	Moss	*Sphagnum* spp.

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Herb (field)	Graminoid	*Carex disperma*, *Carex trisperma*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Picea rubens*
Herb (field)	Flowering forb	*Coptis trifolia*
Herb (field)	Graminoid	*Carex disperma*, *Carex trisperma*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Abies balsamea*, *Carex trisperma*, *Coptis trifolia*, *Cornus canadensis*, *Gaultheria hispidula*, *Oclemena acuminata*, *Osmunda cinnamomea*, *Picea rubens*, *Sorbus americana*, *Sphagnum* spp., *Viburnum lantanoides*, *Viburnum nudum* var. *cassinoides*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Abies balsamea*, *Carex disperma*, *Coptis trifolia*, *Picea rubens*
Global: *Abies balsamea*, *Carex disperma*, *Carex trisperma*, *Coptis trifolia*, *Cornus canadensis*, *Gaultheria hispidula*, *Oclemena acuminata*, *Osmunda cinnamomea*, *Picea rubens*, *Sorbus americana*, *Viburnum lantanoides*, *Viburnum nudum* var. *cassinoides*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Amelanchier bartramiana* (G5, MA state-imperiled)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Picea mariana - Picea rubens / Pleurozium schreberi* Swamp Forest (CEGL006361) has black spruce abundant and occurs in more boreal settings, on poorly drained but not usually saturated soils.
- *Picea rubens - (Tsuga canadensis) / Rhododendron maximum* Swamp Forest (CEGL006277)
- *Picea rubens - Acer rubrum / Nemopanthus mucronatus* Swamp Forest (CEGL006198)
- *Picea rubens / Carex trisperma / Sphagnum* spp. - *Polytrichum* spp. Swamp Forest (CEGL006590)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Intact swamps are uncommon in Vermont where beaver have impounded many of these sites.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

Global Classification Comments: A continuum of Northern Appalachian acidic swamps, with very similar floristics, is expressed through three associations: the present type (coniferous), the mixed *Picea rubens - Acer rubrum / Nemopanthus mucronatus* Swamp Forest (CEGL006198), and the deciduous *Acer rubrum / Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest (CEGL006220), with all gradations possible.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This spruce-fir forest was sampled at Saddleball Ridge Natural Heritage Site in Massachusetts and at Sunderland, Stratton, and Mt. Tabor South in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from near Lonesome Lake in New Hampshire and east of Wachipauka Pond and Surplus Pond in Maine.
Global Range: This community occurs in New England and adjacent Canada south to Pennsylvania.
Nations: CA, US
States/Provinces: CT, MA, ME, NB, NH, NY, PA, QC:S4, VT:S3
TNC Ecoregions: 60:C, 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 212Fa:CCP, 212Fb:CCC, 212Fc:CCP, 212Fd:CCP, 212Ga:CCP, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cd:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCP, M212Ea:CCP, M212Eb:CCP, M212Fa:CPP
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFWS (Moosehorn?, Nulhegan Basin, Pondicherry?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FMSS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 plots; 2 observation points; 1 accuracy assessment point): APPA.0050, APPA.0804, APPA.0809, APPA.0815, APPA.1475, APPA.1566, APPA_AA_3322.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 1 observation point; 11 accuracy assessment points): APPA.0465, APPA.0783, APPA.1594, APPA_AA_1821, APPA_AA_1938, APPA_AA_1986, APPA_AA_2124, APPA_AA_2149, APPA_AA_2267, APPA_AA_2275, APPA_AA_2278, APPA_AA_2325, APPA_AA_2400, APPA_AA_2535.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Eyre 1980, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Gawler and Cutko 2010*, MNAP 1991, Metzler and Barrett 2001, Rawinski 1984a, Reschke 1990, Sperduto 2000b, Swain and Kearsley 2001, Swain and Kearsley 2011, Thompson 1996, Thompson and Sorenson 2000

[CEGL006198] *Picea rubens - Acer rubrum / Nemopanthus mucronatus* Swamp Forest

Translated Name: **Red Spruce - Red Maple / Catberry Swamp Forest**
Common Name: **Red Spruce - Red Maple Acidic Swamp Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Acidic Swamp (G045)
Alliance	*Picea rubens* Northern Appalachian Swamp Forest Alliance (A3418)

ELEMENT CONCEPT

Global Summary: This red spruce - red maple swamp occurs in the glaciated Northeast. It occurs most commonly in basins or low flats with poor drainage, characterized by soils that are poorly drained organic muck or shallow peat over clay loam. The substrate is characterized by pronounced hummock-and-hollow microtopography with abundant slowly decomposing leaf/needle litter. The tree canopy is closed to partly open, and the tall-shrub layer is often well-developed. Dwarf-shrubs are sparse, but herbs typically form high cover. The ground layer features extensive

Sphagnum and other bryophytes. The canopy is codominated by *Picea rubens* and *Acer rubrum*, in association with other trees such as *Betula alleghaniensis, Betula populifolia, Thuja occidentalis, Abies balsamea*, and, occasionally, *Tsuga canadensis*. The most abundant shrubs are *Vaccinium corymbosum, Nemopanthus mucronatus, Ilex verticillata, Spiraea alba*, and *Alnus incana*. The herbaceous layer is generally dominated by the ferns *Osmunda cinnamomea, Osmunda regalis, Onoclea sensibilis*, and *Thelypteris palustris*. Associated herbs include *Carex trisperma, Cornus canadensis, Doellingeria umbellata (= Aster umbellatus), Trientalis borealis, Oclemena acuminata (= Aster acuminatus), Carex intumescens*, and others. The bryophyte layer is dominated by *Sphagnum* spp. including *Sphagnum girgensohnii* and *Sphagnum magellanicum*. This association is differentiated from *Picea rubens - Abies balsamea / Gaultheria hispidula / Osmunda cinnamomea / Sphagnum* spp. Swamp Forest (CEGL006312) of the Northern Appalachian and adjacent ecoregions by its mixed canopy, lack of *Abies balsamea* and presence of *Vaccinium corymbosum* and *Ilex verticillata*. This association is differentiated from *Picea rubens - Acer rubrum / Ilex verticillata* Swamp Forest (CEGL006556) of the Central Appalachians by the presence of *Thuja occidentalis* and *Cornus canadensis*. Although *Nyssa sylvatica* may be present in some occurrences of the southern range limit, this species is not characteristic of this type. This association is differentiated from those of *Thuja occidentalis - Acer rubrum - Larix laricina* Swamp Forest Alliance (A3720) by its restriction to acidic wetlands and the lower importance of *Thuja occidentalis*. It can be compositionally similar to *Acer rubrum / Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest (CEGL006220), except in the reduced amount of red maple and the increased amount of conifers in the present type.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: Sites of this red spruce basin swamp are saturated basins with very poorly drained peat or muck soils, sometimes with hummock-and-hollow microtopography. The unvegetated surface includes leaf litter or sphagnum mosses, with some downed wood and standing water possible. No evidence of disturbance was reported.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is only known from several sites in the Northern Appalachian project area in basin floors, wet flats, headwaters and seepage slopes at elevations ranging from 500 to 750 m (1,640-2,460 feet). Soils are saturated peat.
Global Environment: This spruce - red maple swamp occurs in the glaciated Northeast. It occurs most commonly in basins or low flats with poor drainage, characterized by soils that are poorly drained organic muck or shallow peat over clay loam. The substrate is characterized by pronounced hummock-and-hollow microtopography with abundant slowly decomposing leaf/needle litter.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This basin swamp forest is dominated by *Picea rubens* with a mixed canopy that includes *Acer rubrum* and *Nyssa sylvatica*. *Abies balsamea* is generally lacking or very sparse. Shrubs include *Vaccinium corymbosum* and *Rhododendron maximum* (more common in southern examples), and *Nemopanthus mucronatus, Ilex verticillata*, and *Thuja occidentalis* (more common in northern examples). Herbs include *Carex trisperma, Osmunda cinnamomea, Gaultheria hispidula*, and *Carex folliculata*. *Sphagnum* spp. are common.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by open to closed mostly evergreen-dominated forests. Canopies are dominated by *Picea rubens* with minor amounts of *Acer rubrum* and *Tsuga canadensis*. The shrub layer is dominated by *Nemopanthus mucronatus*. Other shrubs present at low cover may include *Alnus incana ssp. rugosa, Amelanchier canadensis, Ilex verticillata*, and *Viburnum nudum var. cassinoides*. The herbaceous layer is typically dominated by the fern *Osmunda cinnamomea* in association with other forbs and graminoids, including *Aralia nudicaulis, Carex trisperma, Coptis trifolia*, and *Cornus canadensis*. *Sphagnum* spp. are prominent in the ground layer and may exceed 80% cover.
Global Vegetation: The tree canopy is closed to partly open, and the tall-shrub layer is often well-developed. Dwarf-shrubs are sparse, but herbs typically form high cover. The ground layer features extensive *Sphagnum* and other bryophytes. The canopy is codominated by *Picea rubens* and *Acer rubrum*, in association with other trees such as *Betula alleghaniensis, Betula populifolia, Thuja occidentalis, Abies balsamea*, and, occasionally, *Tsuga canadensis*. The most abundant shrubs are *Vaccinium corymbosum, Nemopanthus mucronatus, Ilex verticillata, Spiraea alba*, and *Alnus incana*. The herbaceous layer is generally dominated by the ferns *Osmunda cinnamomea, Osmunda regalis, Onoclea sensibilis*, and *Thelypteris palustris*. Associated herbs include *Carex trisperma, Cornus canadensis, Doellingeria umbellata (= Aster umbellatus), Trientalis borealis, Oclemena acuminata (= Aster acuminatus), Carex intumescens*, and others. The bryophyte layer is dominated by *Sphagnum* spp. including *Sphagnum girgensohnii* and *Sphagnum magellanicum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Picea rubens*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Nemopanthus mucronatus*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*
Nonvascular	Moss	*Sphagnum* spp.

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Picea rubens*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Nemopanthus mucronatus*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Picea rubens*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Nemopanthus mucronatus*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Carex trisperma*, *Nemopanthus mucronatus*, *Osmunda cinnamomea*, *Picea rubens*, *Sphagnum* spp.
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Nemopanthus mucronatus*, *Picea rubens*
Global: *Acer rubrum*, *Carex trisperma*, *Nemopanthus mucronatus*, *Osmunda cinnamomea*, *Picea rubens*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Picea rubens - Abies balsamea / Gaultheria hispidula / Osmunda cinnamomea / Sphagnum* spp. Swamp Forest (CEGL006312)
- *Picea rubens - Acer rubrum / Ilex verticillata* Swamp Forest (CEGL006556)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The site at October Mountain State Forest in Massachusetts was not wet to walk through even though the soil was saturated. The site at Bellvale Mountain South in New York has a dense understory of *Rhododendron maximum*, which is atypical for this association.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: A black bear was encountered at the New York site.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This swamp forest was sampled on October Mountain State Forest in Massachusetts, Bellvale Mountain South in New York, and at Kent Pond in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from four locations at Ore Hill in New Hampshire and Bog Pond, Little Swift River Pond Area and South Pond in Maine.

Global Range: This community occurs in New England north to New Brunswick and south to New York.
Nations: CA, US
States/Provinces: CT, MA, ME, NB, NH, NY, QC, VT:S3
TNC Ecoregions: 60:C, 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 212Ed:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Ag:CCP, 221Ah:CCP, 221Ai:CCC, 221Al:CCC, 221Bd:CCP, 221D:CC, 222I:CC, M212Ae:CCP, M212Ag:CCP, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212De:CCC, M212Df:CCP, M212Ea:CCC, M212Eb:CCC, M212Fa:CCC, M212Fb:CCP
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFS (Green Mountain, White Mountain); USFWS (Carlton Pond?, Moosehorn?, Pondicherry)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FCMS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 2 observation points; 2 accuracy assessment points): APPA.0968, APPA.1376, APPA.1483, APPA_AA_1739, APPA_AA_1946.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (3 plots; 2 observation points; 6 accuracy assessment points): APPA.0473, APPA.0777, APPA.0978, APPA.1542, APPA.1543, APPA_AA_1912, APPA_AA_2018, APPA_AA_2654, APPA_AA_2889, APPA_AA_2928, APPA_AA_3191.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Küchler 1956, Lubinski et al. 2003, Metzler and Barrett 2001, Metzler and Barrett 2006, Moore and Taylor 1927, Sperduto 2000b, Sperduto and Nichols 2004, Sperduto and Nichols 2004*, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

G046. LAURENTIAN-ACADIAN-APPALACHIAN ALKALINE SWAMP

Group Summary Description: These forested wetlands are found across the temperate regions of eastern to south-central Canada, southward from northern New England to the upper Midwest and down to the high plateau of the Allegheny Mountains. They occur in areas where circumneutral to alkaline pH and/or higher nutrient levels are associated with a rich flora. Examples of this group also occur within swales along the dunes of the Great Lakes. The substrate is typically mineral soil, but there may be extensive peat in examples occurring on the margins of peatland complexes. *Thuja occidentalis* is a diagnostic canopy species and may dominate the canopy or be mixed with other conifers or with deciduous trees, most commonly *Acer rubrum* or *Fraxinus nigra*. Some examples are strongly dominated by deciduous hardwoods, such as *Fraxinus nigra* (less often *Fraxinus americana*) and *Acer rubrum*. *Larix laricina*, a deciduous conifer, may dominate some stands within this group. Shrub species commonly occur and range in cover from sparse to dense depending on canopy cover. The herb layer tends to be more diverse than in acidic swamps and some examples may have extensive bryophytes. Examples of this group may occur on seepages, in a basin setting, or alluvial settings. A hummock-and-hollow topography is typical. Logging, especially of *Thuja occidentalis*, has influenced the structure and dominance of many examples of this group.

A0347 *Fraxinus nigra - Acer rubrum* Swamp Forest Alliance

Alliance Summary Description: This alliance, found in the upper midwestern and northeastern regions of the United States as well as parts of eastern temperate Canada, contains communities known as "calcareous seepage swamps," "hardwood swamps," and "red maple - black ash swamps" in which *Acer rubrum* and *Fraxinus nigra* are dominant or prominent canopy members. Total canopy cover ranges from nearly closed to open. Where the tree canopy is open, the understory vegetation is patchy, ranging from shrub-dominated patches to minerotrophic sedge meadows. Associated canopy trees are *Betula alleghaniensis, Ulmus rubra, Ulmus americana*, and *Pinus strobus*. Some examples are dominated by *Populus tremuloides* and *Populus balsamifera*. *Lindera benzoin* (east), *Toxicodendron vernix, Alnus incana* (north), *Salix* spp., and *Rhamnus alnifolia* often occur in the shrub layer. The herbaceous layer is often quite diverse. Stands are typically found in poorly drained depressions and in seepage zones. Soils are generally muck and, although *Sphagnum* spp. may occur, there is generally not substantial peat

development. Stands often occur in areas where soil pH is generally higher than that of other alliances containing *Acer rubrum*.

[CEGL006009] *Acer rubrum - Fraxinus nigra - (Larix laricina) / Rhamnus alnifolia* Swamp Forest

Translated Name: **Red Maple - Black Ash - (Tamarack) / Alderleaf Buckthorn Swamp Forest**
Common Name: **Red Maple - Black Ash Rich Seepage Swamp Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Alkaline Swamp (G046)
Alliance	*Fraxinus nigra - Acer rubrum* Swamp Forest Alliance (A0347)

Element Concept

Global Summary: These calcareous or circumneutral seepage swamps of the northeastern United States have moderate to closed canopies and a rich herb layer influenced by calcium-rich groundwater seepage. These can occur along streams or at headwaters in areas of calcareous bedrock. Soils are saturated, organic muck or peat that can be quite deep. The canopy is dominated by *Acer rubrum* and *Larix laricina*, with *Fraxinus nigra* sometimes prominent. Canopy associates include *Betula alleghaniensis, Tsuga canadensis, Pinus strobus, Carpinus caroliniana*, and *Picea rubens*, the latter especially in the north or at higher elevations. Shrub cover varies with canopy cover and can be quite dense; typical species include *Toxicodendron vernix, Rhamnus alnifolia, Cornus sericea, Salix candida, Ilex verticillata, Vaccinium corymbosum*, and occasionally *Dasiphora fruticosa ssp. floribunda* and *Betula pumila*. The diverse herb layer is characterized by *Saxifraga pensylvanica, Caltha palustris, Cardamine bulbosa, Geum rivale, Osmunda cinnamomea, Carex leptalea, Carex interior, Carex stricta, Carex lacustris, Carex flava, Solidago patula, Iris versicolor, Ranunculus hispidus var. caricetorum, Cardamine douglassii, Thelypteris palustris, Dryopteris cristata, Solidago patula, Packera aurea (= Senecio aureus*), and *Symplocarpus foetidus*; plus *Cypripedium reginae, Cypripedium parviflorum (= Cypripedium calceolus)*, and *Platanthera dilatata*.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This enriched red maple - black ash seepage swamp occurs north of the extent of glaciation (an approximate line that runs roughly east-west through southern Pennsylvania and northern New Jersey). Sites are saturated basins with very poorly drained muck soil. The unvegetated surface includes leaf litter, with some downed wood and standing water possible. No evidence of disturbance was reported.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: These seepage swamps occur along streams or at headwaters in areas of calcareous bedrock. Soils are saturated organic muck or peat that can be quite deep. These swamps are influenced by calcium-rich groundwater seepage.
Global Environment: These forests occur along streams or at headwaters in areas of calcareous bedrock. Soils are saturated organic muck or peat that can be quite deep. These swamps are influenced by calcium-rich groundwater seepage.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Acer rubrum* and *Fraxinus nigra* codominate with *Larix laricina* and *Pinus strobus* in the canopy. *Alnus incana* and *Rhamnus alnifolia* may occur in the shrub layer. Enriched seepage indicators are frequent and often abundant, especially calciphiles such as *Saxifraga pensylvanica, Carex leptalea, Carex flava, Solidago patula*, and *Ranunculus hispidus var. caricetorum*.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: Canopy associates include *Betula alleghaniensis, Tsuga canadensis, Pinus strobus, Carpinus caroliniana*, and *Picea rubens*, the latter especially in the north or at higher elevations. Shrub cover varies with canopy cover and can be quite dense; typical species include *Toxicodendron vernix, Rhamnus alnifolia, Cornus sericea, Salix candida, Ilex verticillata, Vaccinium corymbosum*, and occasionally *Dasiphora fruticosa ssp. floribunda* and *Betula pumila*. The diverse herb layer is characterized by *Saxifraga pensylvanica, Caltha palustris, Cardamine bulbosa, Geum rivale, Osmunda cinnamomea, Carex leptalea, Carex interior, Carex stricta, Carex lacustris, Carex flava, Solidago patula, Iris versicolor, Ranunculus hispidus var. caricetorum, Cardamine douglassii, Thelypteris palustris, Dryopteris cristata, Solidago patula, Packera aurea (= Senecio aureus*), and *Symplocarpus foetidus*, plus *Cypripedium reginae, Cypripedium parviflorum (= Cypripedium calceolus)*, and *Platanthera dilatata*.

Global Vegetation: The canopy is dominated by *Acer rubrum* and *Larix laricina*, with *Fraxinus nigra* sometimes prominent. Canopy associates include *Betula alleghaniensis, Tsuga canadensis, Pinus strobus, Carpinus caroliniana*, and *Picea rubens*, the latter especially in the north or at higher elevations. Shrub cover varies with canopy cover and can be quite dense; typical species include *Toxicodendron vernix, Rhamnus alnifolia, Cornus sericea, Salix candida, Ilex verticillata, Vaccinium corymbosum*, and occasionally *Dasiphora fruticosa ssp. floribunda* and *Betula pumila*. The diverse herb layer is characterized by *Saxifraga pensylvanica, Caltha palustris, Cardamine bulbosa, Geum rivale, Osmunda cinnamomea, Carex leptalea, Carex interior, Carex stricta, Carex lacustris, Carex flava, Solidago patula, Iris versicolor, Ranunculus hispidus var. caricetorum, Cardamine douglassii, Thelypteris palustris, Dryopteris cristata, Solidago patula, Packera aurea (= Senecio aureus*), and *Symplocarpus foetidus*; plus *Cypripedium reginae, Cypripedium parviflorum (= Cypripedium calceolus)*, and *Platanthera dilatata*.
Global Dynamics: The presence of *Larix laricina* indicates the maintenance of canopy gaps within these swamps.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Fraxinus nigra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus incana* ssp. *rugosa*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rhamnus alnifolia*
Herb (field)	Flowering forb	*Solidago patula*
Herb (field)	Graminoid	*Carex bromoides*, *Carex lacustris*, *Carex scabrata*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Larix laricina*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Rhamnus alnifolia*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Larix laricina*, *Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus incana* ssp. *rugosa*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rhamnus alnifolia*
Herb (field)	Flowering forb	*Solidago patula*
Herb (field)	Graminoid	*Carex bromoides*, *Carex lacustris*, *Carex scabrata*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Alnus incana* ssp. *rugosa*, *Carex flava*, *Carex leptalea*, *Larix laricina*, *Micranthes pensylvanica*, *Pinus strobus*, *Ranunculus hispidus* var. *caricetorum*, *Rhamnus alnifolia*, *Solidago patula*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer rubrum*, *Fraxinus nigra*, *Larix laricina*, *Rhamnus alnifolia*
Global: *Acer rubrum*, *Carex flava*, *Carex leptalea*, *Fraxinus nigra*, *Larix laricina*, *Micranthes pensylvanica*, *Ranunculus hispidus* var. *caricetorum*, *Rhamnus alnifolia*, *Solidago patula*, *Toxicodendron vernix*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Acer rubrum - Fraxinus nigra - (Tsuga canadensis) / Tiarella cordifolia* Swamp Forest (CEGL006502)
- *Fraxinus nigra - Acer rubrum / Rhamnus alnifolia / Carex leptalea* Swamp Forest (CEGL007441) occurs in unglaciated areas and lacks *Larix laricina*.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: *Larix laricina* and *Pinus strobus* may have high canopy cover.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: No plots or observation points have been collected for this association in the Northern Appalachian project area. The UMESC mapping team reported it in southern New Hampshire and then again in northern Maine.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Warner Hill in Massachusetts and at Lottery Road Swamp in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is currently listed as potentially occurring in the Northern Appalachian project area, but no plots or observation points have been collected. The UMESC mapping team reported it in southern New Hampshire and then again in northern Maine.
Global Range: This community is found in the northeastern United States from New Hampshire and Vermont to New Jersey.
Nations: CA, US
States/Provinces: CT, MA, ME, NH, NJ:S1S3, NY, PA?, QC, RI, VT:S2
TNC Ecoregions: 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 221Ae:CCC, 221Af:CCC, 221Ah:CCP, 221Ai:CCP, 221Al:CCP, 221Ba:CCC, 221Bb:CCP, 221Bc:CCP, 221Bd:CCC, M212Bc:CCP, M212Bd:CCP, M212Cb:CCP, M212Cc:CCP, M212Ea:CCC, M212Eb:CCC, M221A:P?, M221B:PP, M221C:PP
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFS (Green Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FRHS
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: The UMESC mapping team reported it in southern New Hampshire and then again in northern Maine and was sampled during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 4 accuracy assessment points): APPA.0950, APPA_AA_2174, APPA_AA_2403, APPA_AA_2772, APPA_AA_3102.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (3 accuracy assessment points): APPA_AA_2276, APPA_AA_2665, APPA_AA_2922.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): S.L. Neid
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, CDPNQ unpubl. data, Cowardin et al. 1979, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Fike 1999, Golet et al. 1993, Metzler and Barrett 2001, Metzler and Barrett 2006, Rawinski 1984a, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

[CEGL006502] *Acer rubrum - Fraxinus nigra - (Tsuga canadensis) / Tiarella cordifolia* Swamp Forest

Translated Name: **Red Maple - Black Ash - (Eastern Hemlock) / Heartleaf Foamflower Swamp Forest**
Common Name: **Northern Hardwood - Hemlock Seepage Swamp Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Alkaline Swamp (G046)
Alliance	*Fraxinus nigra - Acer rubrum* Swamp Forest Alliance (A0347)

ELEMENT CONCEPT

Global Summary: This is a northern hardwood-conifer seepage forest of central New England. It typically occurs in basins or along streamsides that are associated with groundwater discharge or seeps at the wetland margin; pH is often circumneutral or at least not highly acidic. Stands often form at stream headwaters. Soil substrate is well-decomposed peat or muck of variable thickness, ranging from 20 cm to several meters thick. The canopy is dominated by *Acer rubrum* or codominated with *Fraxinus nigra*, which is generally indicative of mineral enrichment from groundwater in this region. Typical canopy associates include *Betula alleghaniensis* and *Tsuga canadensis*; *Pinus strobus* and *Ulmus americana* may also be present. The shrub layer includes saplings of canopy tree species plus *Rhamnus alnifolia, Vaccinium corymbosum, Ribes americanum, Ilex verticillata*, and *Toxicodendron radicans*. In the southern extent of the range, *Toxicodendron vernix* and *Lindera benzoin* become more abundant. Common herbs include *Onoclea sensibilis, Osmunda cinnamomea, Impatiens capensis, Chrysosplenium americanum, Mitella nuda, Saxifraga pensylvanica, Rubus pubescens, Geum rivale, Tiarella cordifolia, Carex leptalea, Carex leptonervia, Carex interior, Glyceria striata*, and *Dryopteris cristata*. In some cases, the ferns form an herbaceous "canopy" with the forbs and graminoids scattered among and below them. The nonvascular layer is usually well-developed and includes *Thuidium delicatulum, Mnium* spp., *Rhytidiadelphus triquetrus*, and *Climacium dendroides* with *Calliergon cordifolium* in hollows.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This community is a seepage swamp with some enrichment. Sites are flat to gently sloping saturated basins with very poorly drained, unstable muck or loamy sand soil. The unvegetated surface includes leaf litter, with some downed wood. No evidence of disturbance was reported.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This seepage forest typically occurs in basins or along streamsides that are associated with groundwater discharge or seeps at the wetland margin. pH is often circumneutral or at least not highly acidic. Stands often form at stream headwaters. Soil substrate is well-decomposed peat of variable thickness, ranging from 20 cm to several meters thick.

Global Environment: Seepage forest that typically occurs in basins or along streamsides that are associated with groundwater discharge or seeps at the wetland margin. pH is often circumneutral or at least not highly acidic. Stands often form at stream headwaters. Soil substrate is well-decomposed peat of variable thickness, ranging from 20 cm to several meters thick.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: In the Vermont sites, *Tsuga canadensis* is dominant or codominant in the canopy with *Betula alleghaniensis, Fraxinus nigra, Tilia americana, Acer rubrum*, and *Ulmus americana* as canopy associates. Shrubs are sparse but include *Acer pensylvanicum, Acer rubrum, Alnus incana*, and *Picea rubens*. *Impatiens capensis, Onoclea sensibilis*, and *Osmunda cinnamomea* are the most abundant herbs. Mosses are various and abundant. In addition, this community supports VT state-critically imperiled *Stellaria alsine*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The canopy is dominated by *Acer rubrum* or codominated with *Fraxinus nigra*, which is generally indicative of mineral enrichment from groundwater in this region. Typical canopy associates include *Betula alleghaniensis* and *Tsuga canadensis*; *Pinus strobus* and *Ulmus americana* may also be present. The shrub layer includes saplings of canopy tree species plus *Rhamnus alnifolia, Vaccinium corymbosum, Ribes americanum, Ilex verticillata*, and *Toxicodendron radicans*. In the southern extent of the range, *Toxicodendron vernix* and *Lindera benzoin* become more abundant. Common herbs include *Onoclea sensibilis, Osmunda cinnamomea, Impatiens capensis, Chrysosplenium americanum, Mitella nuda, Saxifraga pensylvanica, Rubus pubescens, Geum rivale, Tiarella cordifolia, Carex leptalea, Carex leptonervia, Carex interior, Glyceria striata*, and *Dryopteris cristata*. In some cases, the ferns form an herbaceous "canopy" with the forbs and graminoids scattered among and below them. The nonvascular layer is usually well-developed and includes *Thuidium delicatulum, Mnium* spp., *Rhytidiadelphus triquetrus*, and *Climacium dendroides* with *Calliergon cordifolium* in hollows.

Global Vegetation: The canopy is dominated by *Acer rubrum* or codominated with *Fraxinus nigra*, which is generally indicative of mineral enrichment from groundwater in this region. Typical canopy associates include *Betula alleghaniensis* and *Tsuga canadensis*; *Pinus strobus* and *Ulmus americana* may also be present. The shrub layer includes saplings of canopy tree species plus *Rhamnus alnifolia, Vaccinium corymbosum, Ribes americanum, Ilex verticillata*, and *Toxicodendron radicans*. In the southern extent of the range, *Toxicodendron vernix* and *Lindera benzoin* become more abundant. Common herbs include *Onoclea sensibilis, Osmunda cinnamomea, Impatiens capensis, Chrysosplenium americanum, Mitella nuda, Saxifraga pensylvanica, Rubus pubescens, Geum rivale, Tiarella cordifolia, Carex leptalea, Carex leptonervia, Carex interior, Glyceria striata*, and *Dryopteris cristata*. In some cases, the ferns form an herbaceous "canopy" with the forbs and graminoids scattered among and below them. The nonvascular layer is usually well-developed and includes *Thuidium delicatulum, Mnium* spp., *Rhytidiadelphus triquetrus*, and *Climacium dendroides* with *Calliergon cordifolium* in hollows.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum*
Tree canopy	Needle-leaved tree	*Tsuga canadensis*
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis*, *Fraxinus nigra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus incana*
Herb (field)	Flowering forb	*Impatiens capensis*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*, *Osmunda cinnamomea*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Fraxinus nigra*
Tree subcanopy	Needle-leaved tree	*Tsuga canadensis*
Tree subcanopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Rhamnus alnifolia*, *Ribes americanum*, *Vaccinium corymbosum*
Shrub/sapling (tall & short)	Liana	*Toxicodendron radicans*
Short shrub/sapling	Broad-leaved deciduous shrub	*Ilex verticillata*
Herb (field)	Flowering forb	*Impatiens capensis*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*, *Osmunda cinnamomea*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Fraxinus nigra*
Tree subcanopy	Needle-leaved tree	*Tsuga canadensis*
Tree subcanopy	Broad-leaved deciduous tree	*Betula alleghaniensis*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Rhamnus alnifolia*, *Ribes americanum*, *Vaccinium corymbosum*
Shrub/sapling (tall & short)	Liana	*Toxicodendron radicans*
Short shrub/sapling	Broad-leaved deciduous shrub	*Ilex verticillata*
Herb (field)	Flowering forb	*Impatiens capensis*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*, *Osmunda cinnamomea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer rubrum*, *Fraxinus nigra*, *Tsuga canadensis*
Appalachian National Scenic Trail (Northern Appalachian Project Area):
Global: *Acer rubrum*, *Fraxinus nigra*, *Tiarella cordifolia*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Stellaria alsine* (G5, VT state-critically imperiled)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (15-Oct-1999).

RELATED CONCEPTS

Global Similar Types:
- *Acer rubrum - Fraxinus (pennsylvanica, americana) / Lindera benzoin / Symplocarpus foetidus* Swamp Forest (CEGL006406)
- *Acer rubrum - Fraxinus nigra - (Larix laricina) / Rhamnus alnifolia* Swamp Forest (CEGL006009)
- *Acer rubrum / Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest (CEGL006220)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: No plots or observation points were collected for this community in the Northern Appalachian project area but the UMESC mapping team reported it in southern New Hampshire and then again in northern Maine at low elevations.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This seepage swamp community was sampled twice at Spring Lake-Shrewsbury in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is currently listed as potentially occurring in the Northern Appalachian project area, but no plots or observation points have been collected. The UMESC mapping team reported it in southern New Hampshire and then again in northern Maine at low elevations.
Global Range: This type is currently described from Vermont and New Hampshire.
Nations: US
States/Provinces: ME?, NH:S2, VT
TNC Ecoregions: 61:C, 63:C
USFS Ecoregions (1994/95): 221Ai:CC?, 221Al:CCC, 221Bb:CCP, M212Ba:CCC, M212Bb:CCC, M212Bc:CCP, M212Cb:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Marsh-Billings-Rockefeller); USFWS (Pondicherry)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FRHS
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: The UMESC mapping team reported it in southern New Hampshire and then again in northern Maine at low elevations. It was sampled during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots): APPA.0831, APPA.0832.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (3 accuracy assessment points): APPA_AA_1759, APPA_AA_2385, APPA_AA_3118.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): S.L. Neid and S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Kost et al. 2007, Sperduto 2000a, Sperduto and Nichols 2004, Thompson and Sorenson 2000

[CEGL006395] *Acer rubrum / Alnus incana - Ilex verticillata / Osmunda regalis* Woodland

Translated Name: **Red Maple / Gray Alder - Common Winterberry / Royal Fern Woodland**
Common Name: **Red Maple Wooded Fen**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Alkaline Swamp (G046)
Alliance	*Fraxinus nigra - Acer rubrum* Swamp Forest Alliance (A0347)

ELEMENT CONCEPT

Global Summary: This open-canopy red maple wetland occurs as part of peatlands in central and northern New England. It occurs in basin peatlands at elevations below 305 m (1000 feet), typically in a peripheral area of a larger peatland. The soils are *Sphagnum*-derived organic soils that remain saturated. Some minerotrophy is evident; these are fens rather than true bogs. Canopy cover ranges from quite open to about 65%, and the shrub layer is generally well-developed. Herb cover varies, but may be as high as 80%. The bryoid layer is usually more-or-less continuous. *Acer rubrum* is the dominant tree; associates may include *Picea mariana, Abies balsamea*, and *Larix laricina*. *Larix laricina* may be codominant with *Acer rubrum*, or dominant in occasional cases. The shrub layer is dominated by *Ilex verticillata*, in variable association with other species such as *Nemopanthus mucronatus, Viburnum nudum var. cassinoides, Alnus incana, Myrica gale, Lyonia ligustrina*, and *Spiraea alba var. latifolia (= Spiraea latifolia)*. The herbaceous layer generally includes *Osmunda regalis, Osmunda cinnamomea, Coptis trifolia, Thelypteris palustris*, and *Onoclea sensibilis*. *Carex trisperma* is the most frequent and abundant sedge; *Carex canescens* is often present but less abundant. The bryophyte layer is characterized by *Sphagnum magellanicum, Sphagnum fimbriatum, Sphagnum centrale*, and others. This association is distinguished by its deep peat soils, peatland setting, open red maple-dominated canopy, and lack of any richness indicators.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This open-canopy red maple wetland occurs as part of peatlands in central and northern New England. It occurs in basin peatlands at elevations below 305 m (1,000 feet), typically in a peripheral area of a larger peatland. The soils are *Sphagnum*-derived organic soils that remain saturated. Some minerotrophy is evident; these are fens rather than true bogs.
Global Environment: This open-canopy red maple wetland occurs as part of peatlands in central and northern New England. It occurs in basin peatlands at elevations below 305 m (1000 feet), typically in a peripheral area of a larger peatland. The soils are *Sphagnum*-derived organic soils that remain saturated. Some minerotrophy is evident; these are fens rather than true bogs.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: Canopy cover ranges from quite open to about 65%, and the shrub layer is generally well-developed. Herb cover varies but may be as high as 80%. The bryoid layer is usually more-or-less continuous. *Acer rubrum* is the dominant tree; associates may include *Picea mariana, Abies balsamea*, and *Larix laricina*. *Larix laricina* may be codominant with *Acer rubrum*, or dominant in occasional cases. The shrub layer is dominated by *Ilex verticillata*, in variable association with other species such as *Nemopanthus mucronatus, Viburnum nudum var. cassinoides, Alnus incana, Myrica gale, Lyonia ligustrina*, and *Spiraea alba var. latifolia (= Spiraea latifolia)*. The herbaceous layer generally includes *Osmunda regalis, Osmunda cinnamomea, Coptis trifolia, Thelypteris palustris*, and *Onoclea sensibilis*. *Carex trisperma* is the most frequent and abundant sedge; *Carex canescens* is often present but less abundant. The bryophyte layer is characterized by *Sphagnum magellanicum, Sphagnum fimbriatum, Sphagnum centrale*, and others.
Global Vegetation: Canopy cover ranges from quite open to about 65%, and the shrub layer is generally well-developed. Herb cover varies, but may be as high as 80%. The bryoid layer is usually more-or-less continuous. *Acer rubrum* is the dominant tree; associates may include *Picea mariana, Abies balsamea*, and *Larix laricina*. *Larix laricina* may be codominant with *Acer rubrum*, or dominant in occasional cases. The shrub layer is dominated by *Ilex verticillata*, in variable association with other species such as *Nemopanthus mucronatus, Viburnum nudum var. cassinoides, Alnus incana, Myrica gale, Lyonia ligustrina*, and *Spiraea alba var. latifolia (= Spiraea latifolia)*. The herbaceous layer generally includes *Osmunda regalis, Osmunda cinnamomea, Coptis trifolia, Thelypteris palustris*, and *Onoclea sensibilis*. *Carex trisperma* is the most frequent and abundant sedge; *Carex canescens* is often present but less abundant. The bryophyte layer is characterized by *Sphagnum magellanicum, Sphagnum fimbriatum, Sphagnum centrale*, and others.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Larix laricina*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata*
Herb (field)	Graminoid	*Carex trisperma*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda regalis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Larix laricina*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata*
Herb (field)	Graminoid	*Carex canescens*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda regalis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer rubrum*, *Alnus incana*, *Ilex verticillata*, *Osmunda regalis*
Global: *Acer rubrum*, *Alnus incana*, *Carex canescens*, *Ilex verticillata*, *Osmunda regalis*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Acer rubrum / Rhododendron viscosum - Clethra alnifolia* Swamp Forest (CEGL006156)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is currently listed as potentially occurring in the Northern Appalachian project area, but no plots or observation points have been collected. Observed by the UMESC mapping team in northern Maine.
Global Range: This swamp type occurs at low elevations in central New England.
Nations: CA, US
States/Provinces: ME:S4, NB, NH, NY, QC?, VT?
TNC Ecoregions: 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCP, 212Dc:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, M212Ag:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAHS
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: Observed by the UMESC mapping team in northern Maine and sampled during accuracy assessment.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 accuracy assessment points): APPA_AA_1794, APPA_AA_2211.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): S.C. Gawler

References: Anderson and Davis 1997, CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 1998, Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, NAP pers. comm. 1998, Sperduto 2000b, Sperduto and Nichols 2004

A3720 *Thuja occidentalis - Acer rubrum - Larix laricina* Swamp Forest Alliance

Alliance Summary Description: This alliance is found in the upper midwestern and northeastern United States and eastern temperate Canada. The tree layer is dominated by a mix of conifers and deciduous species. Most of the deciduous species are not abundant, but taken together, they make up a substantial amount of the canopy. *Thuja occidentalis* is a consistently abundant tree. *Acer rubrum* can be absent to codominant. Other common trees include *Betula alleghaniensis, Fraxinus nigra*, and *Abies balsamea*. The shrub layer varies from sparse to moderately well-developed. The herbaceous layer can be diverse with a variable moss layer. Stands of this alliance are found on poorly drained, mostly mineral soils. It is commonly associated with wetlands influenced by calcareous groundwater, in poorly drained depressions with substantial peat accumulation, along streams, or on slopes with emergent groundwater seepage evident as rivulets at the surface. Soils range from organic to mineral. The groundwater is usually moderately to strongly minerotrophic and has circumneutral pH.

[CEGL006175] *Thuja occidentalis - (Picea rubens) / Tiarella cordifolia* Swamp Forest

Translated Name: **Northern White-cedar - (Red Spruce) / Heartleaf Foamflower Swamp Forest**
Common Name: **Northern White-cedar - Spruce Seepage Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Alkaline Swamp (G046)
Alliance	*Thuja occidentalis - Acer rubrum - Larix laricina* Swamp Forest Alliance (A3720)

Element Concept

Global Summary: These forests of northern white-cedar mixed with other boreal conifers are found on damp slopes in the cooler regions of the northeastern United States and adjacent Canada. They occur on gently sloping hillsides, or at slope bases, with significant seepage of cold calcium-enriched groundwater. The soils are mostly mineral, usually developed over circumneutral to calcareous bedrock, with little peat accumulation; peat is primarily sedge-derived. The canopy may be somewhat open but more often is closed (usually 65-95%), with a patchy shrub layer beneath. The herb layer is locally extensive and usually relatively species-rich. The bryoid layer is very well-developed, essentially continuous, with mossy hollows and hummocks of moss-covered decaying downed trees. The canopy may be strongly dominated by *Thuja occidentalis* or may be a mixture of *Thuja* with *Picea rubens*. Less abundant associates include *Abies balsamea, Acer rubrum, Fraxinus nigra*, and *Betula alleghaniensis*. Shrubs include *Lonicera canadensis, Lonicera oblongifolia, Viburnum nudum var. cassinoides*, and *Acer spicatum*. Particularly characteristic herbs are *Mitella nuda, Platanthera obtusata, Orthilia secunda (= Pyrola secunda)*, and *Dalibarda repens*; common associates in the herb layer include *Cornus canadensis, Clintonia borealis, Gaultheria hispidula, Coptis trifolia (= Coptis groenlandica), Oxalis montana, Linnaea borealis, Tiarella cordifolia*, and *Gymnocarpium dryopteris*. The bryophyte layer tends to have feathermosses (*Hylocomium splendens, Thuidium delicatulum*, and others), *Rhytidiadelphus triquetrus*, and *Bazzania trilobata* more abundant than *Sphagnum* spp., which are also present. This association is similar to *Thuja occidentalis / Sphagnum (girgensohnii, warnstorfii)* Swamp Forest (CEGL006007), but that type occurs in basins that have deeper peat soils and generally lacks the more upland herb species found in this type. A similar midwestern association, *Larix laricina - Thuja occidentalis* Swamp Forest (CEGL002455), lacks red spruce.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This northern white-cedar forest occurs on gentle to moderate slopes with groundwater seepage maintaining moist to saturated conditions. It is a small-patch swamp surrounded by lowland red spruce - balsam fir - northern hardwood forest. Soils are mineral with little peat accumulation and most often where the substrate is not strongly acidic. The sampled site is a gently sloping saturated flat with very poorly drained muck soil. There is a very slow current in the diffuse surface water. The unvegetated surface consists of leaf litter, with small amounts of downed wood and standing water. Scattered stumps from fairly recent logging were noted in the field.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is only known from two locations in the Northern Appalachian project area and occurs on gently sloping wetlands near ponds at 400 and 640 m (1,310-2,100 feet) in elevation. Soils are saturated poorly drained muck.
Global Environment: These forests of northern white-cedar mixed with other boreal conifers are found on damp slopes in the cooler regions of the northeastern United States and adjacent Canada. They occur on gently sloping hillsides, or at slope bases, with significant seepage of cold calcium-enriched groundwater. The soils are mostly mineral, usually developed over circumneutral to calcareous bedrock, with little peat accumulation; peat is primarily sedge-derived.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Thuja occidentalis* is mixed with *Picea rubens, Abies balsamea*, and *Acer rubrum* in the canopy. *Alnus incana* and *Spiraea alba* are dominant shrubs along with canopy species. Characteristic herbs include *Tiarella cordifolia, Ranunculus hispidus var. caricetorum, Solidago rugosa, Doellingeria umbellata, Chrysosplenium americanum*, and *Symphyotrichum puniceum*. Non-*Sphagnum* moss species are abundant.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is a closed-canopy evergreen forest dominated by *Thuja occidentalis* with *Abies balsamea, Acer rubrum, Betula papyrifera, Fraxinus pennsylvanica, Picea rubens*, and *Tsuga canadensis* occurring at lower cover. Shrub cover is low and varies among sites; species include *Acer pensylvanicum, Acer spicatum, Alnus incana, Corylus cornuta, Ilex verticillata, Lonicera canadensis*, and *Rubus pubescens*. Herbaceous species are also variable among sites without clear dominants. Species may include *Aralia nudicaulis, Calamagrostis canadensis, Carex debilis, Carex gracillima, Carex intumescens, Carex pedunculata, Carex trisperma, Dryopteris intermedia, Eupatorium maculatum, Maianthemum canadense, Onoclea sensibilis, Osmunda cinnamomea, Osmunda claytoniana, Thalictrum pubescens, Trientalis borealis, Trillium erectum*, and *Viola renifolia*. Mosses, including *Hylocomium splendens, Bazzania* spp., and *Sphagnum* spp., are abundant and may exceed 90% cover in the ground layer.
Global Vegetation: The canopy may be somewhat open but more often is closed (usually 65-95%), with a patchy shrub layer beneath. The herb layer is locally extensive and usually relatively species-rich. The bryoid layer is very well-developed, essentially continuous, with mossy hollows and hummocks of moss-covered decaying downed trees. The canopy may be strongly dominated by *Thuja occidentalis* or may be a mixture of *Thuja* with *Picea rubens*. Less abundant associates include *Abies balsamea, Acer rubrum, Fraxinus nigra*, and *Betula alleghaniensis*. Shrubs include *Lonicera canadensis, Lonicera oblongifolia, Viburnum nudum var. cassinoides*, and *Acer spicatum*. Particularly characteristic herbs are *Mitella nuda, Platanthera obtusata, Orthilia secunda (= Pyrola secunda)*, and *Dalibarda repens*; common associates in the herb layer include *Cornus canadensis, Clintonia borealis, Gaultheria hispidula, Coptis trifolia (= Coptis groenlandica), Oxalis montana, Linnaea borealis, Tiarella cordifolia*, and *Gymnocarpium dryopteris*. The bryophyte layer tends to have feathermosses (*Hylocomium splendens, Thuidium delicatulum*, and others), *Rhytidiadelphus triquetrus*, and *Bazzania trilobata* more abundant than *Sphagnum* spp., which are also present.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Abies balsamea*
Tree canopy	Needle-leaved tree	*Thuja occidentalis*
Shrub/sapling (tall & short)	Needle-leaved tree	*Abies balsamea*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus incana*
Herb (field)	Flowering forb	*Chrysosplenium americanum*, *Doellingeria umbellata*, *Ranunculus hispidus* var. *nitidus*, *Solidago rugosa*, *Symphyotrichum puniceum*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Thuja occidentalis*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus incana*, *Ilex verticillata*
Nonvascular	Moss	*Hylocomium splendens*, moss spp.

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Thuja occidentalis*
Shrub/sapling (tall & short)	Needle-leaved tree	*Abies balsamea*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus incana*
Herb (field)	Flowering forb	*Chrysosplenium americanum*, *Doellingeria umbellata*, *Ranunculus hispidus* var. *nitidus*, *Solidago rugosa*, *Symphyotrichum puniceum*
Nonvascular	Moss	*Hylocomium splendens*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Abies balsamea*, *Thuja occidentalis*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Hylocomium splendens*, *Picea rubens*, *Thuja occidentalis*, *Tiarella cordifolia*
Global: *Abies balsamea*, *Thuja occidentalis*, *Tiarella cordifolia*

OTHER NOTEWORTHY SPECIES

Global: Other Plants: *Picea rubens* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Larix laricina - Thuja occidentalis* Swamp Forest (CEGL002455)
- *Thuja occidentalis / Sphagnum (girgensohnii, warnstorfii)* Swamp Forest (CEGL006007)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: There is not very high cover of *Thuja occidentalis* at Kent Pond, but enough to warrant recognition of the community in the corridor. This is the southern limit of *Thuja occidentalis* in the Connecticut Valley.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Kent Pond in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Nahmakanta Lake and Jones Pond in Maine.
Global Range: These forests are found in the cooler regions of the northeastern United States and adjacent Canada.
Nations: CA, US
States/Provinces: ME:S4, NB, NH:S2, NY, VT
TNC Ecoregions: 61:C, 63:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCP, 212Dc:CCC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ae:CCC, M212Af:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FNWS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 observation point; 1 accuracy assessment point): APPA.1505, APPA_AA_2697.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 plot; 1 observation point; 22 accuracy assessment points): APPA.1626, APPA.1670, APPA_AA_1778, APPA_AA_1889, APPA_AA_1944, APPA_AA_1973, APPA_AA_1974, APPA_AA_1985, APPA_AA_1988, APPA_AA_2049, APPA_AA_2088, APPA_AA_2151, APPA_AA_2217, APPA_AA_2244, APPA_AA_2365, APPA_AA_2516, APPA_AA_2578,

APPA_AA_2602, APPA_AA_2870, APPA_AA_3085, APPA_AA_3146, APPA_AA_3156, APPA_AA_3215, APPA_AA_3272.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Sperduto 2000b, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

[CEGL006507] *Thuja occidentalis - Abies balsamea / Ledum groenlandicum / Carex trisperma* Swamp Woodland

Translated Name: **Northern White-cedar - Balsam Fir / Bog Labrador-tea / Three-seeded Sedge Swamp Woodland**
Common Name: **Northern White-cedar Wooded Fen**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Alkaline Swamp (G046)
Alliance	*Thuja occidentalis - Acer rubrum - Larix laricina* Swamp Forest Alliance (A3720)

Element Concept

Global Summary: These are northern white-cedar bog woodlands of basin peatlands in the northern Appalachian Mountains. They occur on shallow to deep peat in depressional wetlands in glacial till. The open canopy, usually under 60% closure, allows for development of fairly extensive dwarf-shrub and/or herbaceous layers. Tall shrubs are generally sparse, although they may be locally abundant. The bryoid layer is continuous. The partial canopy is dominated by *Thuja occidentalis*, in association with *Picea mariana, Larix laricina, Abies balsamea*, and *Acer rubrum*. The subcanopy contains a similar species array. The tall-shrub layer is characterized by *Alnus incana, Ilex verticillata*, and *Viburnum nudum*. Dwarf-shrubs typically include *Vaccinium angustifolium, Kalmia angustifolia*, and *Gaylussacia baccata*. *Morella pensylvanica (= Myrica pensylvanica)* is an associate at some coastal sites. The herbaceous layer includes *Maianthemum trifolium, Carex trisperma, Carex stricta, Calamagrostis canadensis, Osmunda cinnamomea, Coptis trifolia, Onoclea sensibilis*, and *Osmunda regalis*. The bryophyte layer is well-developed and characterized by *Sphagnum magellanicum, Sphagnum girgensohnii, Sphagnum papillosum, Sphagnum wulfianum, Sphagnum capillifolium, Sphagnum recurvum, Sphagnum compactum, Sphagnum flavicomans*, and *Pleurozium schreberi*. This association differs from northern white-cedar swamps, e.g., *Thuja occidentalis / Sphagnum (girgensohnii, warnstorfii)* Swamp Forest (CEGL006007), in its more open canopy and (typically) association with open peatlands; it also usually occurs on deeper peats than do the closed-canopy northern white-cedar swamps. These woodlands can grade into open fen vegetation with widely scattered *Thuja*.

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is only known from three locations in the Northern Appalachian project area and occurs on wet flats near ponds and streams, as wells as basins at elevations ranging from 350 to 420 m (1,150-1,380 feet). Sites are saturated to semi-permanently flooded with soils composed of poorly drained peat and muck. Pockets of standing water may be present at some sites.
Global Environment: These are northern white-cedar bog woodlands of basin peatlands in the northern Appalachian Mountains. They occur on shallow to deep peat in depressional wetlands in glacial till.

Vegetation Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is an open to closed-canopy evergreen forest and woodland where *Thuja occidentalis* is the most consistent dominant among sites. *Abies balsamea* and *Picea mariana* may codominate in some stands along with lesser amounts of *Acer rubrum*. The shrub layer may include significant regeneration of canopy species. Shrub species are inconsistent among stands, and local dominants may include *Alnus incana, Chamaedaphne calyculata, Myrica gale, Nemopanthus mucronatus*, and *Viburnum nudum*. The herbaceous layer is typically fern- or sedge-dominated by *Carex lasiocarpa, Carex stricta*, and/or *Osmunda cinnamomea*. Other herbaceous associates may include *Carex intumescens, Cornus canadensis, Dryopteris cristata, Gaultheria hispidula, Glyceria striata, Iris versicolor,*

Linnaea borealis, Lysimachia terrestris, Onoclea sensibilis, Osmunda regalis, Rubus pubescens, Symphyotrichum puniceum, Thalictrum pubescens, and *Triadenum virginicum*. Mosses are prevalent in the ground layer and may exceed 80% cover.

Global Vegetation: The open canopy, usually under 60% closure, allows for development of fairly extensive dwarf-shrub and/or herbaceous layers. Tall shrubs are generally sparse, although they may be locally abundant. The bryoid layer is continuous. The partial canopy is dominated by *Thuja occidentalis*, in association with *Picea mariana, Larix laricina, Abies balsamea*, and *Acer rubrum*. The subcanopy contains a similar species array. The tall-shrub layer is characterized by *Alnus incana, Ilex verticillata*, and *Viburnum nudum*. Dwarf-shrubs typically include *Vaccinium angustifolium, Kalmia angustifolia*, and *Gaylussacia baccata*. *Morella pensylvanica (= Myrica pensylvanica)* is an associate at some coastal sites. The herbaceous layer includes *Maianthemum trifolium, Carex trisperma, Carex stricta, Calamagrostis canadensis, Osmunda cinnamomea, Coptis trifolia, Onoclea sensibilis*, and *Osmunda regalis*. The bryophyte layer is well-developed and characterized by *Sphagnum magellanicum, Sphagnum girgensohnii, Sphagnum papillosum, Sphagnum wulfianum, Sphagnum capillifolium, Sphagnum recurvum, Sphagnum compactum, Sphagnum flavicomans*, and *Pleurozium schreberi*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Thuja occidentalis*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus incana*, *Nemopanthus mucronatus*, *Viburnum nudum*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*, *Myrica gale*
Herb (field)	Graminoid	*Carex lasiocarpa*, *Carex stricta*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Thuja occidentalis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Carex lasiocarpa*, *Osmunda cinnamomea*, *Thuja occidentalis*

Global: *Abies balsamea*, *Carex trisperma*, *Thuja occidentalis*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (2-Jul-1999).

RELATED CONCEPTS

Global Similar Types:

- *Thuja occidentalis - (Myrica gale) / Trichophorum alpinum / Drepanocladus* spp. Fen (CEGL005193)
- *Thuja occidentalis - (Picea mariana, Abies balsamea) / Alnus incana* Swamp Forest (CEGL002456) a related forest.
- *Thuja occidentalis - Acer rubrum / Cornus sericea* Swamp Forest (CEGL006199)
- *Thuja occidentalis / Sphagnum (girgensohnii, warnstorfii)* Swamp Forest (CEGL006007)

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Global Classification Comments: Information on Canadian distribution is needed.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from three locations at West Branch Pleasant River, Jones Pond, and Inlet Brook in Maine.

Global Range: This northern white-cedar bog woodland occurs in basin peatlands of the northern Appalachian Mountains from Vermont to New Brunswick, Canada.

Nations: CA, US

States/Provinces: ME:S4, NB, NH, VT

TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCP, M212Ae:CCC, M212Af:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WNWF
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 2 observation points; 12 accuracy assessment points): APPA.0746, APPA.0856, APPA.1623, APPA.1625, APPA_AA_1666, APPA_AA_1819, APPA_AA_1905, APPA_AA_2128, APPA_AA_2438, APPA_AA_2452, APPA_AA_2518, APPA_AA_2558, APPA_AA_2923, APPA_AA_3006, APPA_AA_3017, APPA_AA_3350.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Anderson and Davis 1997, Eastern Ecology Working Group n.d.*, Gawler 2002, Gawler and Cutko 2010, Hill 1923, Lubinski et al. 2003, Moore and Taylor 1927, Sperduto 2000b, Thompson and Sorenson 2000

[CEGL006007] *Thuja occidentalis / Sphagnum (girgensohnii, warnstorfii)* Swamp Forest

Translated Name: **Northern White-cedar / (Girgensohn's Peatmoss, Fen Peatmoss) Swamp Forest**
Common Name: **Northern White-cedar Peatland Swamp Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Laurentian-Acadian-Appalachian Alkaline Swamp (G046)
Alliance	*Thuja occidentalis - Acer rubrum - Larix laricina* Swamp Forest Alliance (A3720)

ELEMENT CONCEPT

Global Summary: These cedar swamps are closed-canopy forests in enriched peatland basins in the Northern Appalachians and possibly adjacent Canada. They typically occur in small forested basins, or along lakes or streams, but may rarely occur in the enriched portions of larger peatlands where there is an influence of minerotrophic groundwater. They often occur in areas of calcareous or at least circumneutral bedrock. The soils are organic and range widely in depth of the peat. Canopy closure ranges from somewhat open to closed, and the forest floor is typically dark and cool. Shrub and herb coverage may be sparse to locally dense, with increased cover in canopy gaps. Herbs are typically scattered thinly over the moss layer. Bryophytes are abundant and form a mossy carpet. *Thuja occidentalis* is the canopy dominant; associates include *Picea mariana, Abies balsamea*, and *Larix laricina*. *Tsuga canadensis, Picea rubens*, or *Pinus strobus* are occasionally present. Shrubs include *Lonicera canadensis, Ilex verticillata, Vaccinium corymbosum, Nemopanthus mucronatus*, and small amounts of *Kalmia angustifolia*. *Rhamnus alnifolia* is typical in the more enriched swamps. The herb layer is often diverse and features *Gaultheria hispidula, Carex trisperma, Carex disperma, Linnaea borealis, Mitella nuda, Mitella diphylla, Tiarella cordifolia, Orthilia secunda (= Pyrola secunda), Rumex acetosella, Gymnocarpium dryopteris, Phegopteris connectilis (= Thelypteris phegopteris), Chrysosplenium americanum, Moneses uniflora, Cornus canadensis, Trientalis borealis, Carex leptalea, Carex pedunculata*, and *Coptis trifolia (= Coptis groenlandica)*, with the uncommon *Calypso bulbosa, Cypripedium reginae*, and *Cypripedium parviflorum* in some swamps. *Sphagnum* mosses, especially *Sphagnum girgensohnii* and *Sphagnum warnstorfii*, form a mixed moss layer with *Hylocomium splendens, Pleurozium schreberi, Thuidium delicatulum, Rhytidiadelphus triquetrus*, and *Bazzania trilobata*, with *Calliergon cordifolium, Calliergon giganteum, Rhizomnium punctatum (= Mnium punctatum), Rhytidiadelphus squarrosus, Leptodictyum riparium (= Amblystegium riparium)*, and *Campylium stellatum* in wet hollows. This association is related to *Thuja occidentalis - (Picea rubens) / Tiarella cordifolia* Swamp Forest (CEGL006175), but occurs in basins rather than on slopes and has deeper peat soils.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: These cedar swamps are closed-canopy forests in enriched peatland basins in the Northern Appalachians and possibly adjacent Canada. They typically occur in small forested basins, or along lakes or streams, but may rarely occur in the enriched portions of larger peatlands where there is an influence of minerotrophic groundwater. They often occur in areas of calcareous or at least circumneutral bedrock. The soils are organic and range widely in depth of the peat.

Global Environment: These cedar swamps are closed-canopy forests in enriched peatland basins in the Northern Appalachians and possibly adjacent Canada. They typically occur in small forested basins, or along lakes or streams, but may rarely occur in the enriched portions of larger peatlands where there is an influence of minerotrophic groundwater. They often occur in areas of calcareous or at least circumneutral bedrock. The soils are organic and range widely in depth of the peat.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: Canopy closure ranges from somewhat open to closed, and the forest floor is typically dark and cool. Shrub and herb coverage may be sparse to locally dense, with increased cover in canopy gaps. Herbs are typically scattered thinly over the moss layer. Bryophytes are abundant and form a mossy carpet. *Thuja occidentalis* is the canopy dominant; associates include *Picea mariana, Abies balsamea*, and *Larix laricina*. *Tsuga canadensis, Picea rubens*, or *Pinus strobus* are occasionally present. Shrubs include *Lonicera canadensis, Ilex verticillata, Vaccinium corymbosum, Nemopanthus mucronatus*, and small amounts of *Kalmia angustifolia*. *Rhamnus alnifolia* is typical in the more enriched swamps. The herb layer is often diverse and features boreal species such as *Gaultheria hispidula, Carex trisperma, Carex disperma, Linnaea borealis, Mitella nuda, Mitella diphylla, Tiarella cordifolia, Orthilia secunda (= Pyrola secunda), Rumex acetosella, Gymnocarpium dryopteris, Phegopteris connectilis (= Thelypteris phegopteris), Chrysosplenium americanum, Moneses uniflora, Cornus canadensis, Trientalis borealis, Carex leptalea, Carex pedunculata*, and *Coptis trifolia (= Coptis groenlandica)*, with the uncommon *Calypso bulbosa, Cypripedium reginae*, and *Cypripedium parviflorum* in some swamps. *Sphagnum* mosses, especially *Sphagnum girgensohnii* and *Sphagnum warnstorfii*, form a mixed moss layer with *Hylocomium splendens, Pleurozium schreberi, Thuidium delicatulum, Rhytidiadelphus triquetrus*, and *Bazzania trilobata*, with *Calliergon cordifolium, Calliergon giganteum, Rhizomnium punctatum (= Mnium punctatum), Rhytidiadelphus squarrosus, Leptodictyum riparium (= Amblystegium riparium)*, and *Campylium stellatum* in wet hollows.

Global Vegetation: Canopy closure ranges from somewhat open to closed, and the forest floor is typically dark and cool. Shrub and herb coverage may be sparse to locally dense, with increased cover in canopy gaps. Herbs are typically scattered thinly over the moss layer. Bryophytes are abundant and form a mossy carpet. *Thuja occidentalis* is the canopy dominant; associates include *Picea mariana, Abies balsamea*, and *Larix laricina*. *Tsuga canadensis, Picea rubens*, or *Pinus strobus* are occasionally present. Shrubs include *Lonicera canadensis, Ilex verticillata, Vaccinium corymbosum, Nemopanthus mucronatus*, and small amounts of *Kalmia angustifolia*. *Rhamnus alnifolia* is typical in the more enriched swamps. The herb layer is often diverse and features boreal species such as *Gaultheria hispidula, Carex trisperma, Carex disperma, Linnaea borealis, Mitella nuda, Mitella diphylla, Tiarella cordifolia, Orthilia secunda (= Pyrola secunda), Rumex acetosella, Gymnocarpium dryopteris, Phegopteris connectilis (= Thelypteris phegopteris), Chrysosplenium americanum, Moneses uniflora, Cornus canadensis, Trientalis borealis, Carex leptalea, Carex pedunculata*, and *Coptis trifolia (= Coptis groenlandica)*, with the uncommon *Calypso bulbosa, Cypripedium reginae*, and *Cypripedium parviflorum* in some swamps. *Sphagnum* mosses, especially *Sphagnum girgensohnii* and *Sphagnum warnstorfii*, form a mixed moss layer with *Hylocomium splendens, Pleurozium schreberi, Thuidium delicatulum, Rhytidiadelphus triquetrus*, and *Bazzania trilobata*, with *Calliergon cordifolium, Calliergon giganteum, Rhizomnium punctatum (= Mnium punctatum), Rhytidiadelphus squarrosus, Leptodictyum riparium (= Amblystegium riparium)*, and *Campylium stellatum* in wet hollows.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Thuja occidentalis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Thuja occidentalis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Sphagnum girgensohnii*, *Sphagnum warnstorfii*, *Thuja occidentalis*
Global: *Sphagnum girgensohnii*, *Sphagnum warnstorfii*, *Thuja occidentalis*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Rumex acetosella* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Thuja occidentalis - (Picea mariana, Abies balsamea) / Alnus incana* Swamp Forest (CEGL002456)
- *Thuja occidentalis - (Picea rubens) / Tiarella cordifolia* Swamp Forest (CEGL006175)
- *Thuja occidentalis - Abies balsamea / Ledum groenlandicum / Carex trisperma* Swamp Woodland (CEGL006507)
- *Thuja occidentalis - Acer rubrum / Cornus sericea* Swamp Forest (CEGL006199)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: No plots or observation points were sampled for this association but the UMESC mapping team reported it in central and northern Maine.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is currently listed as potentially occurring in the Northern Appalachian project area, but no plots or observation points have been collected.
Global Range: This swamp forest is found from Maine to New York.
Nations: US
States/Provinces: CT, ME:S4, NH, NY, VT:S3
TNC Ecoregions: 60:C, 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 212E:CC, 212Fa:CCP, 212Fb:CCC, 212Fd:CCP, 221Ae:CCC, 221Bd:CCP, 222I:CC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cd:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212Eb:CCC, M212Fa:CCC, M212Fb:CCC, M221A:CC, M221B:CC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFWS (Aroostook?, Moosehorn?, Rachel Carson?)
Appalachian National Scenic Trail Map-Class Code:

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FNWS
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: The UMESC mapping team reported it in central and northern Maine and it was sampled during accuracy assessment.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (12 accuracy assessment points): APPA_AA_1673, APPA_AA_1674, APPA_AA_1809, APPA_AA_2077, APPA_AA_2172, APPA_AA_2387, APPA_AA_2419, APPA_AA_2427, APPA_AA_2589, APPA_AA_2918, APPA_AA_3049, APPA_AA_3088.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: Cowardin et al. 1979, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, MNAP 1991, Metzler and Barrett 2001, Metzler and Barrett 2006, Sperduto 2000b, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

G039. NORTHERN ATLANTIC COASTAL HARDWOOD - CONIFER SWAMP

Group Summary Description: This group encompasses coniferous to mixed swamp forests and wetland pine barrens on the northern Atlantic Coastal Plain, generally from Massachusetts south to Virginia. They occur on sandy, acidic, and nutrient-poor soils, mostly in settings that remain saturated throughout the growing season, but sometimes in settings that are only seasonally saturated. The characteristic overstory tree is either *Chamaecyparis thyoides* or *Pinus rigida*, generally not together. *Acer rubrum* can be an important associate, especially with *Chamaecyparis*, where cutting or other anthropogenic disturbance has altered the vegetation composition.

Associated shrubs and herbs indicative of the coastal plain setting include *Gaylussacia dumosa, Clethra alnifolia, Ilex glabra, Rhododendron viscosum, Leucothoe racemosa*, and *Carex striata*, as well as the more widespread *Vaccinium corymbosum, Gaylussacia baccata*, and *Chamaedaphne calyculata*. Fire has been an important ecological process in the vegetation of this group.

A3400 *Chamaecyparis thyoides* Northern Peat Swamp Forest Alliance

Alliance Summary Description: This alliance is characterized by peatlands dominated or codominated by *Chamaecyparis thyoides* occurring in saturated basins and, less commonly, along streamsides and seasonally flooded pondshores, from New Jersey north to southern Maine. Associates usually include *Acer rubrum, Clethra alnifolia*, and *Vaccinium corymbosum*. In the northern portion of the range, *Betula alleghaniensis, Larix laricina, Ledum groenlandicum, Nemopanthus mucronatus*, and *Picea rubens* may occur. In the south, *Rhododendron maximum, Ilex glabra*, and others are common associates. Gap succession is more important in this community than post-fire regeneration and accounts for the mixed, uneven-aged stands. Lightning strikes are the main cause of mortality in mature white-cedar trees within the range of this alliance. Atlantic white-cedar communities are early-successional but *Chamaecyparis thyoides* is a long-lived species (250+ years); gap regeneration is hypothesized to be the primary means of reproduction. The community often succeeds to itself following fire or other disturbance. In the absence of fire and adequate gap regeneration, Atlantic white-cedar forests may be replaced by bay forest. Known examples are generally neither flood-prone, nor exposed to frequent fire. One association is thought to become established following fire, with a return time of 25-100+ years.

[CEGL006189] *Chamaecyparis thyoides - (Tsuga canadensis, Betula alleghaniensis) / Clethra alnifolia* Swamp Forest

Translated Name: **Atlantic White-cedar - (Eastern Hemlock, Yellow Birch) / Coastal Sweet-pepperbush Swamp Forest**
Common Name: **Inland Atlantic White-cedar Swamp Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Northern Atlantic Coastal Hardwood - Conifer Swamp (G039)
Alliance	*Chamaecyparis thyoides* Northern Peat Swamp Forest Alliance (A3400)

Element Concept

Global Summary: An Atlantic white-cedar swamp that occurs on peat in poorly drained depressions of southern New England and the Hudson Highlands of New York. The canopy can be variable; it can be solely dominated by *Chamaecyparis thyoides* or mixed with *Acer rubrum, Betula alleghaniensis, Tsuga canadensis, Pinus strobus*, and occasionally *Nyssa sylvatica*. The shrub layer is diverse with *Ilex verticillata, Vaccinium corymbosum, Ilex laevigata, Rhododendron viscosum, Kalmia latifolia, Lyonia ligustrina, Viburnum nudum var. cassinoides*, and *Clethra alnifolia* common. Herbaceous cover is inversely proportional to canopy and shrub cover and commonly includes *Osmunda cinnamomea, Osmunda claytoniana, Osmunda regalis, Symplocarpus foetidus, Calla palustris, Trientalis borealis, Aralia nudicaulis, Coptis trifolia, Mitchella repens, Carex folliculata, Carex trisperma*, and occasionally *Carex intumescens* and *Carex stricta*. The nonvascular layer is usually well-developed and includes abundant *Sphagnum* including *Sphagnum angustifolium, Sphagnum palustre, Sphagnum fimbriatum, Sphagnum magellanicum, Thuidium delicatulum, Hypnum imponens*, and *Pallavicinia lyellii*. Localized seepage in these basins may be expressed with indicators such as *Lindera benzoin* and *Geum rivale*.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This rare Atlantic white-cedar swamp occurs on inland ridgetops. The sampled site is a saturated basin with very poorly drained peat soil. The unvegetated surface includes mosses with abundant downed wood and standing water. No evidence of disturbance was reported.
Global Environment: This association occurs on peat in poorly drained depressions underlain by various glacial deposits such as sand and gravel outwash, glacial lake sediments, or till. It occurs across a relatively wide elevational range, from approximately 40-1100 m. There is typically standing water from surface water movement or seepage for a significant portion of the growing season. Water and soil are nutrient-poor, acidic, and high in iron.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Chamaecyparis thyoides* (NY state-imperiled) dominates the canopy solely and the subcanopy along with *Acer rubrum*. *Vaccinium corymbosum* is the dominant shrub, occurring along with *Clethra alnifolia, Ilex verticillata, Lyonia ligustrina*, and *Nemopanthus mucronatus*. The herb layer is very sparse, but *Sphagnum* spp. form a dense carpet on the ground surface.

Global Vegetation: The canopy can be variable; it can be solely dominated by *Chamaecyparis thyoides* or mixed with *Acer rubrum, Betula alleghaniensis, Tsuga canadensis, Pinus strobus*, and occasionally *Nyssa sylvatica*. The shrub layer is diverse with *Ilex verticillata, Vaccinium corymbosum, Ilex laevigata, Rhododendron viscosum, Kalmia latifolia, Lyonia ligustrina, Viburnum nudum var. cassinoides*, and *Clethra alnifolia* common. Herbaceous cover is inversely proportional to canopy and shrub cover and commonly includes *Osmunda cinnamomea, Osmunda claytoniana, Osmunda regalis, Symplocarpus foetidus, Calla palustris, Trientalis borealis, Aralia nudicaulis, Coptis trifolia, Mitchella repens, Carex folliculata, Carex trisperma*, and occasionally *Carex intumescens* and *Carex stricta*. The nonvascular layer is usually well-developed and includes abundant *Sphagnum* including *Sphagnum angustifolium, Sphagnum palustre, Sphagnum fimbriatum, Sphagnum magellanicum, Thuidium delicatulum, Hypnum imponens*, and *Pallavicinia lyellii*. Localized seepage in these basins may be expressed with indicators such as *Lindera benzoin* and *Geum rivale*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Chamaecyparis thyoides*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Clethra alnifolia*, *Ilex verticillata*, *Lyonia ligustrina*, *Nemopanthus mucronatus*, *Vaccinium corymbosum*
Nonvascular	Moss	*Sphagnum* spp.

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Chamaecyparis thyoides*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata*, *Lyonia ligustrina*, *Nemopanthus mucronatus*, *Vaccinium corymbosum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Clethra alnifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Chamaecyparis thyoides*, *Sphagnum* spp.

Global: *Betula alleghaniensis*, *Chamaecyparis thyoides*, *Clethra alnifolia*, *Tsuga canadensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Chamaecyparis thyoides* (G4, NY state-imperiled)

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (4-Feb-2009). This community has a restricted range, from southern Maine and New Hampshire to New York. About 100-150 occurrences are estimated to cover approximately 5000 acres rangewide. This association is likely to have declined from its historic abundance due to logging.

RELATED CONCEPTS

Global Similar Types:

- *Chamaecyparis thyoides - Acer rubrum / Lycopus* spp. Swamp Forest (CEGL006364) Atlantic white-cedar swamps in alluvial settings with robust and diverse herbaceous layer
- *Chamaecyparis thyoides - Picea rubens / Gaylussacia baccata / Gaultheria hispidula* Swamp Forest (CEGL006363) distinguished by presence of boreal species.
- *Chamaecyparis thyoides / Chamaedaphne calyculata* Swamp Woodland (CEGL006321) Atlantic white-cedar bog with sparse *Chamaecyparis thyoides* over dense heath shrubs, especially *Chamaedaphne calyculata*.
- *Chamaecyparis thyoides / Ilex glabra - Rhododendron viscosum* Swamp Forest (CEGL006188) distinguished by coastal plain indicators.

- *Chamaecyparis thyoides / Rhododendron maximum* Swamp Forest (CEGL006355) distinguished by dense *Rhododendron maximum* in shrub layer.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The site on the AT is the best remaining example of this rare natural community in New York.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Bellvale Mountain South in New York.
Global Range: This association occurs from New Hampshire to New York.
Nations: US
States/Provinces: CT, MA, NH:S1, NY, RI
TNC Ecoregions: 60:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Ad:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ai:CCP, 221Ak:CCC, 221Al:CCP, 221Ba:CCC, 221Bd:CCP, 221Dc:CCC, M212Bd:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FAWS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 observation point; 3 accuracy assessment points): APPA.1375, APPA_AA_2477, APPA_AA_2524, APPA_AA_3030.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid
References: Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Enser 1993, Enser and Lundgren 2006, Laderman 1989, McCormick 1979, Metzler 1997, Metzler and Barrett 1992, Metzler and Barrett 2001, Metzler and Barrett 2004, Metzler and Barrett 2006, Motzkin 1990, Motzkin 1991, Rawinski 1984a, Reschke 1990, Sperduto 1996, Sperduto 2000b, Sperduto and Crowley 2002b, Sperduto and Nichols 2004, Sperduto and Ritter 1994, Swain and Kearsley 2001

G653. SILVER MAPLE - GREEN ASH - BLACK ASH FLOODPLAIN FOREST

Group Summary Description: This group occurs in the northeastern U.S. and temperate regions of eastern Canada, west to the upper Great Lakes region of Minnesota and Ontario. Forest canopy dominants can vary but typically are a combination of *Acer rubrum, Acer saccharinum, Acer saccharum, Fraxinus americana, Fraxinus nigra, Fraxinus pennsylvanica, Prunus serotina, Quercus rubra*, and *Ulmus americana*. Northward stands with *Picea glauca* or *Populus balsamifera* may occur. Shrub layer ranges from dense in patches to sparse. The herbaceous layer is typically diverse. Some common species include *Boehmeria cylindrica, Matteuccia struthiopteris*, and *Onoclea sensibilis*. It occurs along small and large rivers on slightly elevated alluvial terraces and active floodplains, along streams with small watersheds (<2 square miles), high-gradient or submontane portions of major rivers, and beside lakes. Soils range from alluvial sands to sand and alluvial loams to silt loams. Flooding occurs during spring runoff periods and during other peak floods.

A3715 *Acer saccharinum - Acer rubrum - Ulmus americana* Floodplain Forest Alliance

Alliance Summary Description: Characteristic dominant species include *Acer rubrum, Acer saccharinum, Ulmus americana*, and occasionally *Fraxinus pennsylvanica*. In the northern Great Lakes region of the Midwest and Canada, *Fraxinus nigra* can be dominant. Shrub layer ranges from high in patches to generally sparse. *Onoclea sensibilis* and *Boehmeria cylindrica* are characteristic in the herb layer. This alliance occurs in the northeastern U.S. and temperate regions of eastern Canada, west to the upper Great Lakes region of Minnesota and Ontario. It includes communities along small and large rivers, on higher terraces of river bottoms and floodplains and beside lakes and larger streams. The terrain is relatively flat, and hummock-and-hollow microtopography is absent or poorly

developed. The soils are alluvial loams to silt loams typically temporarily inundated during spring floods. The soils are well-drained to imperfectly drained mineral soils but a limited organic horizon may occur in some examples.

[CEGL006001] *Acer saccharinum - Ulmus americana / Onoclea sensibilis* Floodplain Forest

Translated Name: **Silver Maple - American Elm / Sensitive Fern Floodplain Forest**
Common Name: **Northeastern Silver Maple - Elm Floodplain Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Silver Maple - Green Ash - Black Ash Floodplain Forest (G653)
Alliance	*Acer saccharinum - Acer rubrum - Ulmus americana* Floodplain Forest Alliance (A3715)

Element Concept

Global Summary: This floodplain forest is currently described from higher terraces along the lower reaches of larger rivers of the northeastern United States where flood depth and duration are relatively less than immediately adjacent to the river channel. The canopy is strongly dominated by *Acer saccharinum*. *Ulmus rubra, Ulmus americana, Prunus serotina*, and *Fraxinus pennsylvanica* can occur in the subcanopy. *Populus deltoides* can occur sporadically, generally identifying locations of former sandy, drainage channels. The shrub layer is present, unlike adjacent areas on lower terraces. Species include *Viburnum recognitum, Viburnum dentatum, Lindera benzoin*, and *Cornus sericea*. The herb layer is strongly dominated by *Onoclea sensibilis* interspersed with lesser amounts of *Cinna arundinacea, Geum canadense, Chelone glabra, Impatiens capensis, Carex crinita, Carex lupulina*, and *Carex grayi*. Often occurs in association with *Acer saccharinum - Populus deltoides* floodplain forests, or on larger rivers than those supporting the *Quercus palustris - Acer rubrum*.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This silver maple floodplain forest is found higher in the floodplain (not immediately adjacent to river channel) of major rivers. It is associated with finer soils and relatively long flood duration.
Global Environment: This floodplain forest occurs on fine soils on upper terraces along the lower reaches of larger rivers of the northeastern United States where flood depth and duration are relatively less than immediately adjacent to the river channel.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This community represents *Acer saccharinum* floodplain forest from higher in the floodplain (not immediately adjacent to river channel) of major rivers with a well-developed shrub layer dominated by *Lindera benzoin*. *Onoclea sensibilis* dominates the lush herb layer along with *Cinna arundinacea, Geum canadense, Chelone glabra, Impatiens capensis, Carex lupulina, Carex crinita, Carex grayi*, and others. *Matteuccia struthiopteris* or *Laportea canadensis* are sparse, if present.
Global Vegetation: The canopy is strongly dominated by *Acer saccharinum*. *Ulmus rubra, Ulmus americana, Prunus serotina*, and *Fraxinus pennsylvanica* can occur in the subcanopy. *Populus deltoides* can occur sporadically, generally identifying locations of former sandy, drainage channels. The shrub layer is present, unlike adjacent areas on lower terraces. Species include *Viburnum recognitum, Viburnum dentatum, Lindera benzoin*, and *Cornus sericea*. The herb layer is strongly dominated by *Onoclea sensibilis* interspersed with lesser amounts of *Cinna arundinacea, Geum canadense, Chelone glabra, Impatiens capensis, Carex crinita, Carex lupulina*, and *Carex grayi*. Often occurs in association with *Acer saccharinum - Populus deltoides* floodplain forests, or on larger rivers than those supporting *Quercus palustris - Acer rubrum*.
Global Dynamics: This floodplain forest is found higher in the floodplain (not immediately adjacent to river channel) of major rivers.

Most Abundant Species

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Tree subcanopy	Broad-leaved deciduous tree	*Prunus serotina*, *Ulmus americana*, *Ulmus rubra*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area):
Global: *Acer saccharinum*, *Onoclea sensibilis*, *Ulmus americana*

OTHER NOTEWORTHY SPECIES

Global: Other Plants: *Fraxinus pennsylvanica* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed by UMESC along the Housatonic River at the New York / Connecticut border during summer 2012 mapping reconnaissance.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed by UMESC along the Housatonic River at the New York / Connecticut border during summer 2012 mapping reconnaissance.
Global Range: This floodplain forest is currently described from higher terraces along the lower reaches of larger rivers of the northeastern United States.
Nations: CA?, US
States/Provinces: CT, DE?, MA, MI, NJ, NY, QC?
TNC Ecoregions: 60:?, 61:C, 62:C, 64:?
USFS Ecoregions (1994/95): 212E:CP, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Ga:CCP, 221A:CC, 221Bc:CCC, 221Bd:CCP, 221D:CC, 222I:PP, 222O:PP, M212B:CC, M212Dc:CCC, M212Eb:CCP
Federal Lands: NPS (Appalachian Trail [Lower New England], Saratoga); USFWS (Great Meadows, Oxbow)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FMHF
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed by UMESC along the Housatonic River at the New York / Connecticut border during summer 2012 mapping reconnaissance and during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (17 accuracy assessment points): APPA_AA_1693, APPA_AA_1823, APPA_AA_1961, APPA_AA_1979, APPA_AA_2063, APPA_AA_2091, APPA_AA_2210, APPA_AA_2226, APPA_AA_2397, APPA_AA_2401, APPA_AA_2594, APPA_AA_2683, APPA_AA_2832, APPA_AA_2899, APPA_AA_3110, APPA_AA_3113, APPA_AA_3256.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid and E. Largay
References: CDPNQ unpubl. data, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Kost et al. 2007, Metzler and Barrett 2001, Metzler and Barrett 2006, NRCS 2004a, Rawinski 1984a, Swain and Kearsley 2001, Thompson 1996

[CEGL006176] *Acer saccharinum / Onoclea sensibilis - Boehmeria cylindrica* Floodplain Forest

Translated Name: **Silver Maple / Sensitive Fern - Small-spike False Nettle Floodplain Forest**
Common Name: **Silver Maple Floodplain Bottom Forest (Sensitive Fern Type)**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Silver Maple - Green Ash - Black Ash Floodplain Forest (G653)
Alliance	*Acer saccharinum - Acer rubrum - Ulmus americana* Floodplain Forest Alliance (A3715)

ELEMENT CONCEPT

Global Summary: These silver maple floodplain forests of the northeastern United States are typical of riverbottoms, lakeplains, and the inner floodplain of medium to large rivers, mostly at less than 245 m (800 feet) elevation. They are most typical of third- and fourth-order rivers. They are subjected to spring flooding of high frequency and duration; their soils are poorly drained and deep. They are generally associated with calcareous or sedimentary bedrock and with fine-grained surficial deposits but may occur in coarser soils or tills. The canopy ranges from closed to somewhat open (in small inclusions, it may be quite sparse) and is high and arching. Shrubs are few; the herb layer is very well-developed. Bryoids are minor. The overall effect is of tall, well-spaced trees over a lush carpet of herbs. The canopy is strongly dominated by *Acer saccharinum*. Associated trees include *Fraxinus pennsylvanica, Ulmus americana*, and occasionally *Quercus bicolor* or *Quercus macrocarpa*. *Prunus serotina, Picea glauca*, and *Acer rubrum* have been occasionally noted northward. The herb layer is seasonally variable, with spring ephemerals succeeded by dense cover of mixed ferns, forbs and graminoids. Summer-dominant herbs include *Onoclea sensibilis* and *Boehmeria cylindrica*. This type differs from *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Floodplain Forest (CEGL006147) in its somewhat more poorly drained soils, longer flood duration, and the reduced importance of *Matteuccia struthiopteris* relative to *Onoclea sensibilis* along with generally higher herb layer richness. It generally lacks *Populus deltoides* and *Salix nigra* in the canopy. It may be bordered on its upland edge by terrace forests dominated by *Acer saccharum*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: These silver maple floodplain forests of the northeastern United States are typical of riverbottoms, lakeplains, and the inner floodplain of medium to large rivers, mostly at less than 245 m (800 feet) elevation. They are most typical of third- and fourth-order rivers. They are subjected to spring flooding of high frequency and duration; their soils are poorly drained and deep. They are generally associated with calcareous or sedimentary bedrock and with fine-grained surficial deposits, but may occur in coarser soils or tills.

Global Environment: These silver maple floodplain forests of the northeastern United States are typical of riverbottoms, lakeplains, and the inner floodplain of medium to large rivers, mostly at less than 800 feet elevation. They are most typical of third- and fourth-order rivers. They are subjected to spring flooding of high frequency and duration; their soils are poorly drained and deep. They are generally associated with calcareous or sedimentary bedrock and with fine-grained surficial deposits, but may occur in coarser soils or tills.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The canopy ranges from closed to somewhat open and is high and arching. Shrubs are few; the herb layer is very well-developed. Bryoids are minor. The overall effect is of tall, well-spaced trees over a lush carpet of herbs. The canopy is strongly dominated by *Acer saccharinum*. Associated trees include *Fraxinus pennsylvanica, Ulmus americana*, and occasionally *Quercus bicolor* or *Quercus macrocarpa*. *Prunus serotina, Picea glauca*, and *Acer rubrum* have been occasionally noted northward. The herb layer is seasonally variable, with spring ephemerals, including *Erythronium americanum, Sanguinaria canadensis*, and *Arisaema triphyllum*, succeeded by dense cover of mixed ferns, forbs and graminoids. Summer-dominant herbs include *Onoclea sensibilis* and *Boehmeria cylindrica*. *Matteuccia struthiopteris* and *Laportea canadensis* may be present but are not abundant; other typical species include *Pilea pumila, Lycopus uniflorus, Scutellaria lateriflora, Thelypteris palustris, Osmunda regalis, Thalictrum pubescens, Bidens tripartita, Ludwigia palustris, Calamagrostis canadensis*, and *Cinna* spp. In more disturbed sites, non-native herbs such as *Lysimachia nummularia* and *Lythrum salicaria* may be common.

Global Vegetation: The canopy ranges from closed to somewhat open and is high and arching. Shrubs are few; the herb layer is very well-developed. Bryoids are minor. The overall effect is of tall, well-spaced trees over a lush carpet of herbs. The canopy is strongly dominated by *Acer saccharinum*. Associated trees include *Fraxinus pennsylvanica, Ulmus americana*, and occasionally *Quercus bicolor* or *Quercus macrocarpa*. *Prunus serotina, Picea glauca*, and *Acer rubrum* have been occasionally noted northward. The herb layer is seasonally variable, with spring ephemerals, including *Erythronium americanum, Sanguinaria canadensis*, and *Arisaema triphyllum*,

succeeded by dense cover of mixed ferns, forbs and graminoids. Summer-dominant herbs include *Onoclea sensibilis* and *Boehmeria cylindrica*. *Matteuccia struthiopteris* and *Laportea canadensis* may be present but are not abundant; other typical species include *Pilea pumila, Lycopus uniflorus, Scutellaria lateriflora, Thelypteris palustris, Osmunda regalis, Thalictrum pubescens, Bidens tripartita, Ludwigia palustris, Calamagrostis canadensis*, and *Cinna* spp. In more disturbed sites, non-native herbs such as *Lysimachia nummularia* and *Lythrum salicaria* may be common.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Herb (field)	Flowering forb	*Boehmeria cylindrica*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Herb (field)	Flowering forb	*Boehmeria cylindrica*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer saccharinum*, *Boehmeria cylindrica*
Global: *Acer saccharinum*, *Boehmeria cylindrica*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Floodplain Forest (CEGL006147)
- *Acer saccharinum* Floodplain Forest [Placeholder] (CEGL007304)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This community was observed along the Penobscot River in Maine by the UMESC mapping team. It is mapped in the same map class with Silver Maple Floodplain Levee Forest (CEGL006147) (not observed).
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association may possibly occur along the trail, but no plots or observation points were collected.
Global Range: This silver maple floodplain forest of the northeastern United States and adjacent Canada occurs from New Brunswick to New York.
Nations: CA, US
States/Provinces: CT, MA, ME:S3, NB, NH:S2, NJ?, NY, PA, QC?, VT
TNC Ecoregions: 48:C, 60:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212Aa:CPP, 212Ab:CPP, 212Ba:CCC, 212Bb:CCC, 212Ca:CPP, 212Da:CCC, 212E:CP, 212F:CP, 212G:CP, 221Aa:CCP, 221Ai:CCC, 221Ak:CCC, 221Bc:CCC, 221D:CC, 222Ib:CCC, 222Ic:CCC, 232A:PP, M212Ae:CCC, M212Ag:CCC, M212B:CP, M212C:CP, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CC?, M212Df:CCC, M212E:CP, M221A:PP, M221B:PP
Federal Lands: NPS (Appalachian Trail [Northern Appalachians], Minute Man, Saratoga); USFWS (Carlton Pond?, Great Meadows?, Iroquois, Montezuma, Moosehorn?, Oxbow, Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FMHF
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: This community was observed along the Penobscot River in Maine by the UMESC mapping team. It is mapped in the same map class with Silver Maple Floodplain Levee Forest (CEGL006147) (not observed).
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 accuracy assessment point): APPA_AA_1791.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: Breden et al. 2001, CDPNQ unpubl. data, Cowardin et al. 1979, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Eyre 1980, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Gawler et al. 2005, Metzler 1984, Metzler and Barrett 2001, Metzler and Barrett 2006, NAP pers. comm. 1998, NRCS 2004a, Rawinski 1984a, Sperduto 2000b, Sperduto and Crowley 2002a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Jenkins 1992, Thompson and Sorenson 2000, Zimmerman 2011k, Zimmerman et al. 2012

A3714 *Acer saccharum - Tilia americana* Mesic Floodplain Forest Alliance

Alliance Summary Description: The canopy dominants can vary from site to site but are usually some combination of *Acer saccharum, Tilia americana, Quercus rubra, Ulmus americana, Fraxinus americana, Fraxinus pennsylvanica*, and *Prunus serotina*. Shrubs are typically minor. The herbaceous layer is typically diverse and often features *Matteuccia struthiopteris* along with a variety of graminoids, ferns and forbs. This alliance ranges across the northeastern United States and the St. Lawrence and Atlantic regions of southern Canada. It occurs along slightly elevated alluvial terraces and active floodplains, streams with small watersheds (<2 square miles), high-gradient or submontane portions of major rivers. Soils range from alluvial sands to sand and silt loams.

[CEGL006114] *Acer saccharum - Fraxinus* spp. - *Tilia americana / Matteuccia struthiopteris - Ageratina altissima* Floodplain Forest

Translated Name: **Sugar Maple - Ash species - American Basswood / Ostrich Fern - White Snakeroot Floodplain Forest**
Common Name: **Terrace Hardwood Floodplain Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Silver Maple - Green Ash - Black Ash Floodplain Forest (G653)
Alliance	*Acer saccharum* - *Tilia americana* Mesic Floodplain Forest Alliance (A3714)

ELEMENT CONCEPT

Global Summary: These rich floodplain forests are found on slightly elevated alluvial terraces and active floodplains of larger rivers throughout the glaciated Northeast. The setting is a raised river terrace; however, this forest may occur very close to the riverbank, if the water channel is well-entrenched, and may even be on sloping banks along some river reaches. The alluvial soils are coarse and less regularly inundated than the soils supporting silver maple floodplain forests. Many of our examples occur on circumneutral to slightly calcareous soils. The canopy is closed to somewhat open, and unlike lower elevation floodplain forests, a subcanopy is often present. Shrubs are occasional but do not form high cover. The herb layer is well-developed and seasonally variable, with spring ephemerals giving way to taller ferns, graminoids and forbs. Bryoids are very minor. The canopy dominants can vary from site to site but are usually some combination of *Acer saccharum, Tilia americana, Quercus rubra, Ulmus americana, Fraxinus americana, Fraxinus pennsylvanica*, and *Prunus serotina*. Minor canopy associates include *Acer saccharinum, Juglans cinerea, Fraxinus nigra*, and *Acer rubrum*. Shrubs include *Corylus americana, Viburnum lentago*, and *Prunus virginiana*; vines, such as *Toxicodendron radicans, Parthenocissus* spp., or *Vitis* spp., may be locally common. The herb layer usually features *Matteuccia struthiopteris* and a mixture of other ferns, forbs and graminoids. Characteristic species include *Ageratina altissima (= Eupatorium rugosum), Allium tricoccum, Allium canadense, Athyrium filix-femina, Caulophyllum thalictroides, Carex gracillima, Carex intumescens, Carex sprengelii, Deparia acrostichoides, Elymus virginicus, Elymus riparius, Elymus wiegandii (=*

Elymus canadensis var. wiegandii), Onoclea sensibilis, Sanguinaria canadensis, Solidago flexicaulis, Solidago rugosa, and *Solidago gigantea*, in addition to abundant spring ephemerals in the early growing season. Exotic species, such as *Lysimachia nummularia, Glechoma hederacea*, and *Hesperis matronalis*, may be abundant, especially in disturbed areas. These terrace forests are distinguished from lower floodplain forests by the reduced importance of *Acer saccharinum*; they differ from enriched northern hardwood forests, e.g., *Acer saccharum - Fraxinus americana / Acer spicatum / Caulophyllum thalictroides* Forest (CEGL006636) and *Acer saccharum - Tilia americana / Acer pensylvanicum / Caulophyllum thalictroides* Forest (CEGL006637), in their alluvial soils and flooding regime; also, *Matteuccia struthiopteris* is generally not found in enriched northern hardwood forests.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This hardwood terrace floodplain forest of the glaciated Northeast occurs on slightly elevated alluvial terraces and active floodplains of medium and larger rivers ranging from Connecticut north to Maine.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This uncommon association is known only from a few locations in the Northern Appalachian project area on intermittently flooded alluvial terraces and floodplains of rivers and streams. It occurs at low elevations ranging from 170 to 200 m (560-655 feet). Soils tend to be poorly drained silt loam and loamy sand.
Global Environment: These rich floodplain forests are found on slightly elevated alluvial terraces as well as active floodplains of larger rivers throughout the glaciated Northeast. The setting is a raised river terrace; however, this forest may occur very close to the riverbank if the water channel is well entrenched, and may even be on sloping banks along some river reaches. The alluvial soils are coarse and less regularly inundated than the soils supporting silver maple floodplain forests. Many of our examples occur on circumneutral to slightly calcareous soils.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy is dominated by *Acer saccharum* with associates *Tilia americana, Quercus rubra, Ulmus americana, Fraxinus americana, Fraxinus pennsylvanica, Juglans cinerea*, and *Prunus serotina*. This community lacks southern species. Shrubs include *Corylus americana, Viburnum lentago*, and *Prunus virginiana*. The herb layer usually features *Matteuccia struthiopteris, Ageratina altissima, Allium tricoccum, Allium canadense, Athyrium filix-femina, Caulophyllum thalictroides, Carex gracillima, Carex intumescens, Carex sprengelii, Deparia acrostichoides, Elymus virginicus, Onoclea sensibilis, Sanguinaria canadensis, Solidago flexicaulis, Solidago rugosa*, and/or *Solidago gigantea*.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by closed-canopy deciduous forests dominated by *Acer saccharum* and/or *Fraxinus americana*. Other canopy associates occurring at lower cover include *Acer rubrum, Betula alleghaniensis, Fagus grandifolia, Fraxinus nigra*, and *Tilia americana*. The shrub layer is mainly composed of saplings of canopy species, although *Corylus cornuta* occurs at low cover and appears diagnostic. The herbaceous layer is dominated by a mixture of the ferns *Matteuccia struthiopteris, Onoclea sensibilis*, and *Osmunda claytoniana*. Many forbs and graminoids may occur as associates, including *Anemone quinquefolia, Arisaema triphyllum, Brachyelytrum erectum, Carex gracillima, Carex intumescens, Carex projecta, Galium asprellum, Thalictrum pubescens, Tiarella cordifolia*, and *Uvularia sessilifolia*.
Global Vegetation: The canopy is closed to somewhat open, and unlike lower-elevation floodplain forests, a subcanopy is often present. Shrubs are occasional, but do not form high cover. The herb layer is well-developed and seasonally variable, with spring ephemerals giving way to taller ferns, graminoids, and forbs. Bryoids are very minor. The canopy dominants can vary from site to site, but are usually some combination of *Acer saccharum, Tilia americana, Quercus rubra, Ulmus americana, Fraxinus americana, Fraxinus pennsylvanica*, and *Prunus serotina*. Minor canopy associates include *Acer saccharinum, Juglans cinerea, Fraxinus nigra*, and *Acer rubrum*. Shrubs include *Corylus americana, Viburnum lentago*, and *Prunus virginiana*; vines such as *Toxicodendron radicans, Parthenocissus* spp., or *Vitis* spp. may be locally common. The herb layer usually features *Matteuccia struthiopteris* and a mixture of other ferns, forbs, and graminoids. Characteristic species include *Ageratina altissima (= Eupatorium rugosum), Allium tricoccum, Allium canadense, Athyrium filix-femina, Caulophyllum thalictroides, Carex gracillima, Carex intumescens, Carex sprengelii, Deparia acrostichoides, Elymus virginicus, Elymus riparius, Elymus wiegandii (= Elymus canadensis var. wiegandii), Onoclea sensibilis, Sanguinaria canadensis, Solidago flexicaulis, Solidago rugosa*, and *Solidago gigantea* in addition to abundant spring ephemerals in the early growing season. Exotic species, such as *Lysimachia nummularia, Glechoma hederacea*, and *Hesperis matronalis*, may be abundant, especially in disturbed areas.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fraxinus americana*, *Fraxinus pennsylvanica*, *Tilia americana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Corylus americana*, *Prunus virginiana*, *Viburnum lentago*
Short shrub/sapling	Liana	*Toxicodendron radicans*
Herb (field)	Fern (Spore-bearing forb)	*Matteuccia struthiopteris*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fraxinus americana*
Herb (field)	Fern (Spore-bearing forb)	*Matteuccia struthiopteris*, *Onoclea sensibilis*, *Osmunda claytoniana*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Fraxinus americana*, *Fraxinus pennsylvanica*, *Tilia americana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Corylus americana*, *Prunus virginiana*
Short shrub/sapling	Liana	*Toxicodendron radicans*
Herb (field)	Fern (Spore-bearing forb)	*Matteuccia struthiopteris*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Acer saccharum*, *Ageratina altissima*, *Fraxinus americana*, *Fraxinus pennsylvanica*, *Matteuccia struthiopteris*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer saccharum*, *Corylus cornuta*, *Fraxinus americana*, *Matteuccia struthiopteris*
Global: *Acer saccharum*, *Ageratina altissima*, *Fraxinus americana*, *Fraxinus pennsylvanica*, *Matteuccia struthiopteris*, *Tilia americana*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Glechoma hederacea* (Low), *Hesperis matronalis* (Medium/Low), *Lysimachia nummularia* (Medium/Low); **Other Plants**: *Viburnum lentago* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Floodplain Forest (CEGL006147)
- *Acer saccharum - Fraxinus americana / Carpinus caroliniana / Podophyllum peltatum* Forest (CEGL006459)
- *Acer saccharum - Juglans cinerea / Carpinus caroliniana / Matteuccia struthiopteris* Forest (CEGL006430)
- *Liriodendron tulipifera - Fraxinus* spp. / *Lindera benzoin - Viburnum prunifolium / Podophyllum peltatum* Floodplain Forest (CEGL006314)
- *Tilia americana - Acer saccharum - Acer nigrum / Laportea canadensis* Floodplain Forest (CEGL006405)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed by UMESC during summer 2012 mapping reconnaissance in Connecticut.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: Similar floodplain vegetation and setting to the south is classified as Mid-Atlantic Terrace Hardwood Floodplain Forest (CEGL006459).
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

Global Classification Comments: Drastically reduced from original extent, as most make excellent fertile farmland. Originally probably a large patch type; now small patch.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed by UMESC during summer 2012 mapping reconnaissance in Connecticut. It is expected from Connecticut north through Maine.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from three locations on Big Wilson Stream, Nahmakanta Lake and the Piscataquis River in Maine.
Global Range: This association occurs in the glaciated Northeast from New Brunswick, Canada, to New Jersey.
Nations: CA, US
States/Provinces: CT, MA:S2, MD, ME, NB, NH:S1S2, NY, PA, QC, VT
TNC Ecoregions: 60:C, 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Aa:CPP, 212Ab:CPP, 212Ba:CCC, 212Bb:CCC, 212Ca:CPP, 212Da:CCC, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 221Ak:CCC, 221Bc:CCC, 221Bd:CCP, 221D:C?, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cd:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Saratoga)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FFAW, FFTH
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed by UMESC during summer 2012 mapping reconnaissance in Connecticut and during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (5 accuracy assessment points): APPA_AA_1822, APPA_AA_2254, APPA_AA_2650, APPA_AA_3175, APPA_AA_3308.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 1 observation point; 8 accuracy assessment points): APPA.0732, APPA.0739, APPA.1675, APPA_AA_1834, APPA_AA_2082, APPA_AA_2115, APPA_AA_2394, APPA_AA_2492, APPA_AA_2572, APPA_AA_2747, APPA_AA_3303.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Breden 1989, Breden et al. 2001, CDPNQ unpubl. data, Cowardin et al. 1979, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, Harrison 2004, Harrison 2011, Harrison and Stango 2003, Metzler and Barrett 2001, Metzler and Barrett 2006, NAP pers. comm. 1998, NRCS 2004a, PNHP 2002, Rawinski 1984a, Rhoads and Block 2008a, Sperduto 2000a, Sperduto 2000b, Sperduto and Crowley 2002a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zimmerman 2011j, Zimmerman and Podniesinski 2008, Zimmerman et al. 2012

[CEGL006504] *Acer saccharum / Ostrya virginiana / Brachyelytrum erectum* Floodplain Forest

Translated Name: **Sugar Maple / Hophornbeam / Bearded Shorthusk Floodplain Forest**
Common Name: **High-gradient Hardwood Floodplain Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest (M504)
Group	Silver Maple - Green Ash - Black Ash Floodplain Forest (G653)
Alliance	*Acer saccharum* - *Tilia americana* Mesic Floodplain Forest Alliance (A3714)

ELEMENT CONCEPT

Global Summary: Flashy, sugar maple-dominated floodplain forests on high-gradient or submontane portions of major rivers in northern New England. Floods tend to be short-duration and high-disturbance events. Soils are alluvial sands or sandy loams over coarser substrates, sometimes interspersed with buried organic layers. *Acer saccharum* dominates the canopy, with other upland trees including *Quercus rubra* and *Betula alleghaniensis*. *Ostrya virginiana* is a common smaller tree. Shrubs are minor. The herb layer is lush, and features *Brachyelytrum erectum, Carex intumescens, Solidago caesia*, and *Danthonia spicata*. Unlike other floodplain forests, ferns are limited.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This uncommon association occurs on intermittently flooded alluvial terraces levees and floodplains of rivers and streams. Elevation ranges from 170 to 500 m (560-1,640 feet) and slopes are flat to gentle. Soils may be moderately well-drained to poorly drained silt loams, sandy loams and loams. The unvegetated surface is primarily litter and duff.
Global Environment: These flashy, sugar maple-dominated floodplain forests occur on high-gradient or sub-montane portions of major rivers in northern New England. Floods tend to be short-duration and high-disturbance events. Soils are alluvial sands or sandy loams over coarser substrates, sometimes interspersed with buried organic layers.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by a closed-canopy deciduous forest with variable composition, the most constant dominant species being *Acer saccharum*. Species that may share the canopy include *Betula alleghaniensis, Fagus grandifolia, Fraxinus americana*, and *Fraxinus nigra*. *Acer pensylvanicum* may be prominent in the subcanopy. No shrub species occur with high constancy, and the shrub layer mostly consists of saplings of canopy species. The herbaceous layer is a variable mixture of ferns, forbs, clubmosses and graminoids, including *Aralia nudicaulis, Arisaema triphyllum, Athyrium filix-femina, Brachyelytrum erectum, Doellingeria umbellata, Dryopteris campyloptera, Dryopteris intermedia, Gymnocarpium dryopteris, Lycopodium dendroideum, Lycopodium digitatum, Maianthemum racemosum ssp. racemosum, Matteuccia struthiopteris, Oclemena acuminata, Onoclea sensibilis, Osmunda claytoniana, Polystichum acrostichoides, Prenanthes altissima, Thalictrum pubescens, Thelypteris noveboracensis*, and *Uvularia sessilifolia*.
Global Vegetation: *Acer saccharum* dominates the canopy, with other upland trees including *Quercus rubra* and *Betula alleghaniensis*. *Ostrya virginiana* is a common smaller tree. Shrubs are minor. The herb layer is lush, and features *Brachyelytrum erectum, Carex intumescens, Solidago caesia*, and *Danthonia spicata*. Unlike other floodplain forests, ferns are limited.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*, *Betula alleghaniensis*, *Fagus grandifolia*, *Fraxinus americana*
Herb (field)	Fern (Spore-bearing forb)	*Matteuccia struthiopteris*, *Polystichum acrostichoides*, *Thelypteris noveboracensis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum*
Tree subcanopy	Broad-leaved deciduous tree	*Ostrya virginiana*
Herb (field)	Graminoid	*Brachyelytrum erectum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Acer saccharum*, *Brachyelytrum erectum*, *Uvularia sessilifolia*
Global: *Acer saccharum*, *Brachyelytrum erectum*, *Ostrya virginiana*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Epipactis helleborine* (Medium/Low, exotic/invasive)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (2-Jul-1999).

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from streams and rivers in the Northern Appalachian project area and appears limited to Maine. Known locations include Big Wilson Stream, West Branch Penobscot River, West Branch of the Piscataquis River, Caratunk, Dunn Falls, and Bemis Stream.
Global Range: This association is currently described from Maine, New Hampshire, Vermont and Pennsylvania.
Nations: US
States/Provinces: ME, NH:S1, VT
TNC Ecoregions: 59:C, 61:C, 63:C
USFS Ecoregions (1994/95): M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Ag:CCC, M212Bc:CCC, M221Ac:CCC
Federal Lands: NPS (Allegheny Portage Railroad, Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FFHH
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (5 plots; 1 observation point; 13 accuracy assessment points): APPA.0731, APPA.0738, APPA.0883, APPA.0973, APPA.0981, APPA.1632, APPA_AA_1757, APPA_AA_1888, APPA_AA_1924, APPA_AA_2442, APPA_AA_2478, APPA_AA_2648, APPA_AA_2712, APPA_AA_2816, APPA_AA_2896, APPA_AA_3094, APPA_AA_3246, APPA_AA_3286, APPA_AA_3318.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Perles et al. 2006d, Sperduto and Crowley 2002a, Sperduto and Nichols 2004, Thompson and Sorenson 2000

2. Shrub & Herb Vegetation

2.B.2. Temperate Grassland & Shrubland

2.B.2.NC. EASTERN NORTH AMERICAN GRASSLAND & SHRUBLAND

M506. Appalachian Rocky Felsic & Mafic Scrub & Grassland

G180. APPALACHIAN MAFIC GLADE

Group Summary Description: This group consists of vegetation associated with shallow soils over predominantly mafic and ultramafic bedrock substrates in the Piedmont and Blue Ridge, usually with significant areas of rock outcrop. Bedrock includes a variety of igneous and metamorphic rock types such as greenstone, shale, diabase, serpentine, and amphibolite. These areas on gentle to moderate slopes support a patchy mosaic of open woodland and grassy herbaceous vegetation sometimes with a predominant woody short-shrub community present. Shallow soils impede tree growth and help to distinguish this group from forests. The vegetation is structurally intermediate between other rock outcrop groups and forests. The unusual and extreme soil chemistry determines the special flora of the type. Most examples are open woodlands with *Pinus rigida, Pinus virginiana, Juniperus virginiana var. virginiana*, and/or *Quercus alba, Quercus marilandica*, and *Quercus stellata* in the often stunted canopy. Trees can include *Fraxinus americana, Ulmus alata*, and *Cercis canadensis* on basic soil examples. Shrubs may be dense, with species determined by soil chemistry. The herb layer is usually fairly dense and may be dominated by grasses or by a mix of grasses and forbs, both in treeless areas and beneath open canopies. The forbs include species characteristic of other rock outcrops and grassland species, with a smaller number of forest species present. Plant species richness may be fairly high. Extreme edaphic conditions lead to locally xerophytic growing conditions that contribute to relatively open canopies and a ground cover dominated by prairie grasses and a variety of forbs. Disjunct species from drier regions and some endemic plant taxa are often present.

A2074 *Fraxinus americana - Quercus stellata / Carex pensylvanica* Appalachian Mafic-Circumneutral Scrub Alliance

Alliance Summary Description: This Appalachian shale barrens vegetation is dominated by native graminoids such as *Andropogon* sp., *Carex pensylvanica, Danthonia spicata, Piptochaetium avenaceum, Schizachyrium scoparium*, and *Sporobolus compositus*, with some scattered *Juniperus virginiana var. virginiana, Quercus prinus, Quercus stellata*, and/or *Quercus velutina* in the open to sparse canopy. This alliance occurs on shale and other geologic substrates with high available base status. These substrates include shales, calcareous shales, calcareous Silurian sandstones, metabasalt (greenstone), diabase, charnockite, amphibolite, metasiltstone and phyllite. This vegetation is found in the Appalachian region of the eastern United States. The physiognomy is generally maintained in a relatively open condition by a combination of dry thin soils and management practices. The physiognomy may vary from entirely herbaceous to sparse scrub or woodland.

[CEGL008529] ***Fraxinus americana / Physocarpus opulifolius / Carex pensylvanica - Allium cernuum - (Phacelia dubia)*** **Wooded Grassland**

Translated Name: **White Ash / Common Ninebark / Pennsylvania Sedge - Nodding Onion - (Small-flower Phacelia) Wooded Grassland**

Common Name: **Central Appalachian Mafic Barrens (Ninebark / Pennsylvania Sedge Type)**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Appalachian Mafic Glade (G180)
Alliance	*Fraxinus americana - Quercus stellata / Carex pensylvanica* Appalachian Mafic-Circumneutral Scrub Alliance (A2074)

ELEMENT CONCEPT

Global Summary: This community is known only from the northern Virginia Blue Ridge and possibly the higher adjacent foothills, in areas underlain by Catoctin metabasalt (greenstone) and Middle Proterozoic plutonic rocks. Sites are located on steep (up to 37°), xeric, middle-elevation slopes where exposed outcrops effectively limit the establishment and normal development of trees. Underlying bedrock at most sites is metabasalt (greenstone). Three documented sites are underlain by charnockite, a pyroxene-bearing granitic rock, and it is likely that additional stands occur on this and related plutonic formations. Elevation of plot-sampled stands ranges from 543 to 1050 m (1782-3450 feet), with a mean of 835 m (2740 feet). Middle-slope topographic positions are typical, with slopes convex in at least one direction. Aspect varies from southeast to northwest, with westerly aspects prevalent. This vegetation type is dominated by herbaceous plants with scattered shrub patches and stunted trees. The herb layer usually ranges from 25-60% total cover (occasionally higher or lower), and from scattered to locally dense where soil and organic matter have accumulated. *Carex pensylvanica* and *Schizachyrium scoparium* are consistently dominant herbs. *Phacelia dubia* is an abundant spring ephemeral in about two-thirds of the plots, and this species may have been missed in late-season sampling of other plots.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This uncommon patchy herbaceous and scrub vegetation occurs on middle-elevation (550-1,050 m [1,800-3,450 feet]) metabasalt and calcium-bearing granitic outcrops. This community was sampled at four locations in the Central Appalachian project area. Sites are moderate to steep, lower to upper slopes with rapidly to well-drained silt, silt loam and loam soils. The unvegetated surface may be dominated by leaf litter or be codominated by leaf litter and exposed bedrock with some large/small rocks, downed wood and/or bare soil. Evidence of disturbance includes the presence of trails and exotic plant species.

Global Environment: Sites are located on steep (up to 37°), xeric, middle-elevation slopes where exposed outcrops effectively limit the establishment and normal development of trees. Underlying bedrock at most sites is metabasalt (greenstone). Three documented sites are underlain by charnockite, a pyroxene-bearing granitic rock, and it is likely that additional stands occur on this and related plutonic formations. Elevation of plot-sampled stands ranges from 543 to 1050 m (1782-3450 feet), with a mean of 835 m (2740 feet). Middle-slope topographic positions are typical, with slopes convex in at least one direction. Aspect varies from southeast to northwest, with westerly aspects prevalent. Surface cover of exposed outcrops and loose rocks averages >50% and soil development is limited to depositional crevices and thin veneers on ledges. Soil samples collected from plots are very strongly acidic (mean pH = 4.5), with substantial organic matter content (mean = 26%), but have moderately high levels of calcium (mean = 1185 ppm) and magnesium (mean = 174 ppm).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: Stunted *Fraxinus americana* is common but relatively sparse in the canopy. *Physocarpus opulifolius, Rosa carolina var. carolina* and *Rhus typhina* are common shrubs. *Symphyotrichum laeve var. concinnum* and *Hylotelephium telephioides* are usually present and characteristic herbs. *Carex pensylvanica, Danthonia spicata, Deschampsia flexuosa*, and/or *Schizachyrium scoparium* are common along with *Polygonatum biflorum, Carex pensylvanica, Heuchera americana*, and *Viola* spp. *Phacelia dubia* is common in the spring. Common herbs included here are known only from the northern Virginia Blue Ridge. One example of this community also supports VA-state critically imperiled *Heuchera caroliniana* and VA-state imperiled *Muhlenbergia glomerata*.

Global Vegetation: This vegetation type is dominated by herbaceous plants with scattered shrub patches and stunted trees. The herb layer usually ranges from 25-60% total cover (occasionally higher or lower), and from scattered to locally dense where soil and organic matter have accumulated. *Carex pensylvanica* and *Schizachyrium scoparium* are consistently dominant herbs. *Phacelia dubia* is an abundant spring ephemeral in about two-thirds of the plots, and this species may have been missed in late-season sampling of other plots. Other relatively frequent (>50% constancy) herbs are *Agrostis perennans, Allium cernuum, Ambrosia artemisiifolia, Danthonia spicata,*

Dichanthelium acuminatum, Elymus hystrix, Helianthus divaricatus, Hylotelephium telephioides (= Sedum telephioides), and *Polygonatum biflorum*. *Deschampsia flexuosa, Festuca rubra*, and *Symphyotrichum laeve var. concinnum (= Aster laevis var. concinnus)* are each common locally. Herbaceous species that are characteristic of gravelly or mossy crevices and depressions with ephemeral spring seepage or periodic moisture accumulation include *Draba ramosissima, Muhlenbergia glomerata, Polygonum tenue, Saxifraga virginiensis, Talinum teretifolium*, and *Woodsia ilvensis*. Stunted trees (<10 m tall) of *Fraxinus americana* are consistent features of the community type. *Physocarpus opulifolius* and *Rosa carolina* are the most frequent shrubs, but *Chionanthus virginicus, Rhus typhina, Juniperus virginiana, Amelanchier sanguinea, Ptelea trifoliata*, and *Spiraea alba var. latifolia* are each important in a subset of plots. Species richness of plot-sampled stands ranges from 28 to 58 taxa per 400 square meters (mean = 40).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Physocarpus opulifolius*
Herb (field)	Graminoid	*Danthonia spicata*, *Deschampsia flexuosa*, *Schizachyrium scoparium*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Physocarpus opulifolius*
Herb (field)	Graminoid	*Carex pensylvanica*, *Danthonia spicata*, *Deschampsia flexuosa*, *Schizachyrium scoparium*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Carex pensylvanica*, *Fraxinus americana*, *Hylotelephium telephioides*, *Phacelia dubia*, *Symphyotrichum laeve* var. *concinnum*
Global: *Allium cernuum*, *Amelanchier sanguinea*, *Carex pensylvanica*, *Chionanthus virginicus*, *Fraxinus americana*, *Hylotelephium telephioides*, *Phacelia dubia*, *Physocarpus opulifolius*, *Rhus typhina*, *Rosa carolina*, *Symphyotrichum laeve* var. *concinnum*, *Talinum teretifolium*, *Woodsia ilvensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Heuchera caroliniana* (G3, globally vulnerable & VA state-critically imperiled), *Muhlenbergia glomerata* (G5, VA state-imperiled); **Invasive/Exotic Plants**: *Anthoxanthum odoratum*, *Berberis thunbergii* (High/Medium), *Digitaria ischaemum*, *Elaeagnus umbellata* (High), *Ligustrum sinense* (High/Medium), *Lonicera japonica* (High/Medium), *Lonicera morrowii* (High/Medium), *Myosotis stricta*, *Rosa multiflora* (Medium/Low), *Rubus phoenicolasius* (Medium), *Rumex acetosella* (Medium/Low), *Stellaria media* (Low), *Trifolium campestre*, *Trifolium repens* (Medium/Low), *Viburnum plicatum*, *Vicia sativa* ssp. *nigra*
Global: Vulnerable Plants: *Cuscuta coryli* (G5?, VA state-rare), *Heuchera caroliniana* (G3), *Liatris turgida* (G3), *Muhlenbergia glomerata* (G5, VA state-rare), *Paxistima canbyi* (G2), *Potentilla arguta* (G5, VA state-rare), *Taenidia montana* (G3), *Trillium rugelii* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (1-Feb-2008). This vegetation is naturally rare, being restricted to special edaphic habitats on metavolcanic and plutonic rocks of limited geographic extent. There are probably at least 20 occurrences in Virginia and globally. Patches are small (generally <0.5 ha), but there are few threats to this community since most occurrences are on steep, remote sites in federally protected areas.

RELATED CONCEPTS

Global Similar Types:
- *Fraxinus americana - Carya glabra / Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland (CEGL003683)
- *Juniperus virginiana - Fraxinus americana / Carex pensylvanica - Cheilanthes lanosa* Open Woodland (CEGL006037)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: See Global Comments.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Although this community type has been referred to as a "greenstone glade" (Fleming 1993), this name is inappropriate given the occasional occurrence of the type on granitic rocks. Additional inventory and data collection are needed to determine the extent of this association on plutonic substrates. This community often occurs adjacent to, or nested within, a larger patch of *Fraxinus americana - Carya glabra / Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland (CEGL003683). It is also similar to *Juniperus virginiana - Fraxinus americana / Carex pensylvanica - Cheilanthes lanosa* Open Woodland (CEGL006037), which occurs at lower elevations, on a wider variety of substrates (including calcareous shales), and has a large component of elevation-limited lithophytes absent from this association (CEGL008529).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled in Virginia at Oteen, French Broad River, Cedar Cliffs (Laurel Springs Gap), and Upper Rose River.
Global Range: This community is known only from the northern Virginia Blue Ridge and possibly the higher adjacent foothills, in areas underlain by Catoctin metabasalt (greenstone) and Middle Proterozoic plutonic rocks.
Nations: US
States/Provinces: VA:S2
TNC Ecoregions: 59:C
USFS Ecoregions (1994/95): M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Shenandoah); USFS (George Washington)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HCAB
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (4 plots; 4 accuracy assessment points): APPA.0110, APPA.0111, APPA.0230, APPA.0336, APPA_AA_0076, APPA_AA_0209, APPA_AA_0270, APPA_AA_0510.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming and P.P. Coulling
References: Fleming 1993, Fleming and Coulling 2001, Fleming and Patterson 2009b, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2007a, Southeastern Ecology Working Group n.d.*, VDNH 2003, Young et al. 2006, Young et al. 2007a, Young et al. 2009

A3470 Southern Appalachian Mafic Shrubland Alliance

Alliance Summary Description: This shrub-dominated vegetation occurs on mafic rock outcrops or thin soil areas. Common shrubs include *Diervilla lonicera, Gaylussacia baccata, Kalmia latifolia, Philadelphus hirsutus, Photinia melanocarpa, Physocarpus opulifolius*, and *Ptelea trifoliata var. mollis*. Areas of bare rock outcrops and grassy areas with *Schizachyrium scoparium, Carex pensylvanica*, or *Deschampsia flexuosa* are scattered. These are found on montane slopes in the Appalachians, from the Blue Ridge of Virginia to Kennesaw Mountain in Georgia, and may also occur in Maryland, Pennsylvania, and West Virginia.

[CEGL008536] *Diervilla lonicera - Solidago simplex var. randii - Deschampsia flexuosa - Hylotelephium telephioides - Saxifraga michauxii* Grassland

Translated Name: **Northern Bush-honeysuckle - Rand's Goldenrod - Wavy Hairgrass - Allegheny Stonecrop - Michaux's Saxifrage Grassland**
Common Name: **High-Elevation Greenstone Barrens**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Appalachian Mafic Glade (G180)
Alliance	Southern Appalachian Mafic Shrubland Alliance (A3470)

ELEMENT CONCEPT

Global Summary: This association is known only from a few high-elevation mafic rock outcrops in the northern Virginia Blue Ridge. All known sites are located in Shenandoah National Park. This community type is associated with exposed rocky summits and upper slope outcrops of Catoctin Formation metabasalt (greenstone) at elevations from 870 to 1230 m (2860-4040 feet). Slope shape is typically convex in at least one direction, and aspect varies from west to north. The vegetation is characterized by a patchwork of shrub thickets (typically <25% cover), herbaceous mats (typically <40% cover), and crustose lichen colonies on exposed rock surfaces. The most frequent woody species include extremely stunted, wind-blasted specimens of the trees *Betula alleghaniensis* and *Sorbus americana*; characteristic shrubs and woody vines are *Diervilla lonicera, Physocarpus opulifolius, Prunus pensylvanica, Prunus virginiana, Kalmia latifolia*, and *Smilax tamnoides*. *Deschampsia flexuosa* and *Solidago simplex var. randii* are the most frequent dominant herbaceous species, but *Sibbaldiopsis tridentata, Saxifraga michauxii, Carex pensylvanica*, and *Hylotelephium telephioides* dominate in some areas.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This rare high-elevation barrens occurs on exposed rocky summits and upper-slope outcrops of Catoctin Formation metabasalt (greenstone) at elevations from 870 to 1,230 m (2,860-4,040 feet). It was sampled at eight locations in the park, all in the Central Appalachian project area. Sites are moderate to steep, mid to upper slopes and summits (bedrock outcrops) with mostly western or eastern aspects. Soils are well-drained. The unvegetated surface consists of a mix of exposed bedrock, large/small rocks, leaf litter, downed wood, and/or bare soil. Evidence of disturbance includes the presence of exotic plant species.

Global Environment: This community type is associated with exposed rocky summits and upper slope outcrops of Catoctin Formation metabasalt (greenstone) at elevations from 870 to 1230 m (2860-4040 feet). Mean elevation of nine plot-sampled stands is 1068 m (3506 feet); an exceptional occurrence on the north slope of Mount Marshall is situated at an unusually low elevation of 870 m (2860 feet). Slope shape is typically convex in at least one direction, and aspect varies from west to north. Mean surface cover of bedrock and loose rocks at sample sites is 69%, while mean lichen / moss cover on these rocks is 42%. The moisture regime of these sites is xeric, and soil development is limited to shallow accumulations of disintegrated rock and humus on shelves and in crevices. However, an ephemeral spring seep with seasonally wet moss mats is present at one site (Stony Man Mountain). These habitats are periodically exposed to extreme winter temperatures, high winds, and ice. Soil samples extracted from plot locations are extremely acidic (mean pH = 4.0) but often have moderately high levels of calcium, magnesium, and manganese and high levels of aluminum (mean = 1577 ppm).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This community is a patchwork of shrub thickets (typically <25% cover), herbaceous mats (typically <40% cover), and crustose lichen colonies. *Deschampsia flexuosa var. flexuosa, Sibbaldiopsis tridentata, Solidago simplex var. randii*, *Hylotelephium telephioides*, and *Polypodium appalachianum* are common species. Shrubs can include *Physocarpus opulifolius var. opulifolius, Diervilla lonicera, Kalmia latifolia*, and *Photinia melanocarpa*. Stunted trees may include *Betula alleghaniensis, Sorbus americana*, and *Prunus* spp. This community supports VA-state critically imperiled *Abies balsamea* and *Heuchera caroliniana* and VA-state imperiled *Huperzia appalachiana* and *Sibbaldiopsis tridentata*.

Global Vegetation: The vegetation is characterized by a patchwork of shrub thickets (typically <25% cover), herbaceous mats (typically <40% cover), and crustose lichen colonies on exposed rock surfaces. The most frequent woody species include extremely stunted, wind-blasted specimens of the trees *Betula alleghaniensis* and *Sorbus americana*; stunted trees of *Abies balsamea* also occur at several sites. Characteristic shrubs and woody vines are *Diervilla lonicera, Physocarpus opulifolius, Prunus pensylvanica, Prunus virginiana, Kalmia latifolia*, and *Smilax tamnoides*. *Deschampsia flexuosa* and *Solidago simplex var. randii* are usually the dominant herbaceous species, with mean cover in plot samples of 10-25% and 5-10%, respectively. *Sibbaldiopsis tridentata* is abundant (up to 25% cover) in a subset of sites but is absent from about half of the known sites. Other relatively constant and characteristic herbaceous species are *Campanula divaricata, Carex pensylvanica, Heuchera pubescens, Hylotelephium telephioides (= Sedum telephioides), Phlox subulata, Poa compressa, Polypodium appalachianum*,

and *Saxifraga michauxii*. Inconstant but locally prominent herbaceous species include *Allium cernuum, Angelica triquinata, Arabis lyrata, Houstonia longifolia, Danthonia spicata, Liatris turgida*, and *Saxifraga virginiensis*. The grass *Calamagrostis canadensis* is abundant in the local seepage area on Stony Man Mountain, Virginia. Mean species richness of 15 plot-sampled stands is 27 taxa per 100 square meters. Several boreal lichens, including *Melanelia stygia, Porpidia lowiana, Porpidia tuberculosa*, and *Rhizocarpon geographicum* occur abundantly on metabasalt outcrops within this community type. The following Virginia state-rare plants are associated with this community: *Abies balsamea, Clematis occidentalis, Conioselinum chinense, Gymnocarpium appalachianum, Huperzia appalachiana, Juncus trifidus, Rubus idaeus ssp. strigosus, Sibbaldiopsis tridentata, Solidago simplex var. randii*, and *Trisetum spicatum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Sibbaldiopsis tridentata*
Herb (field)	Flowering forb	*Hylotelephium telephioides*
Herb (field)	Graminoid	*Deschampsia flexuosa*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Sibbaldiopsis tridentata*
Herb (field)	Graminoid	*Deschampsia flexuosa*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Betula alleghaniensis*, *Deschampsia flexuosa*, *Hylotelephium telephioides*, *Sibbaldiopsis tridentata*, *Solidago simplex* var. *randii*, *Sorbus americana*
Global: *Deschampsia flexuosa*, *Diervilla lonicera*, *Heuchera pubescens*, *Huperzia appalachiana*, *Hylotelephium telephioides*, *Liatris turgida*, *Micranthes petiolaris*, *Physocarpus opulifolius*, *Sibbaldiopsis tridentata*, *Solidago simplex* var. *randii*, *Sorbus americana*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Abies balsamea* (G5, VA state-critically imperiled), *Heuchera caroliniana* (G3, globally vulnerable & VA state-critically imperiled), *Huperzia appalachiana* (G5, VA state-imperiled), *Sibbaldiopsis tridentata* (G5, VA state-imperiled);
Invasive/Exotic Plants: *Hieracium caespitosum* (Medium/Insignificant), *Poa compressa* (High/Low), *Poa pratensis* (Medium), *Rumex acetosella* (Medium/Low), *Verbascum thapsus* (Medium), *Veronica arvensis*
Global: Vulnerable Plants: *Abies balsamea* (G5, VA state-rare), *Clematis occidentalis* (G5, VA state-rare), *Conioselinum chinense* (G5, VA state-rare), *Gymnocarpium appalachianum* (G3), *Heuchera caroliniana* (G3), *Huperzia appalachiana* (G5, VA state-rare), *Juncus trifidus* (G5, VA state-rare), *Liatris turgida* (G3), *Melanelia stygia* (G5, VA state-rare), *Porpidia tuberculosa* (G2G4, VA state-rare), *Rubus idaeus* ssp. *strigosus* (G5T5, VA state-rare), *Sibbaldiopsis tridentata* (G5, VA state-rare), *Solidago simplex* var. *randii* (G5T4, VA state-rare), *Trisetum spicatum* (G5, VA state-rare); **Invasive/Exotic Plants**: *Poa compressa* (High/Low), *Rumex acetosella* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (3-Oct-2001). This is a naturally rare, small-patch community type limited by special habitat requirements. Currently, habitats supporting this unit are known from less than 20 discrete outcrops which together form five complexes or occurrences (Franklin Cliffs, Hawksbill, Crescent Rocks, Stony Man Mountain, Mount Marshall). Total coverage of all known occurrences is probably <12 hectares (30 acres). It is unlikely that any additional occurrences will be found, and these would not significantly increase the aggregate acreage of the type.

RELATED CONCEPTS

Global Similar Types:
- *Minuartia groenlandica - Paronychia argyrocoma - Saxifraga michauxii* Grassland (CEGL008509)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: See Global Comments.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: This type (CEGL008536) was formerly represented, in part, by the now-obsolete *Saxifraga michauxii - Solidago simplex var. randii - Sibbaldiopsis tridentata* Herbaceous Vegetation (CEGL004941). Recent multivariate analyses of a 956-plot dataset by the Virginia Dept. of Conservation / Division of Natural Heritage strongly supports the segregation of this type from vegetation documented south of Shenandoah National Park on the granitic summit of Spy Rock (Nelson County) and the amphibolite summit of Buffalo Mountain (Floyd County). The barrens of these two sites have been classified as *Minuartia groenlandica - Paronychia argyrocoma - Saxifraga michauxii* Grassland (CEGL008509). Several additional high-elevation greenstone outcrops in the park (e.g., Pass Mountain, Mount Marshall, Hightop) and elsewhere (e.g., Humpback Rocks, Nelson County) support *Photinia melanocarpa - Gaylussacia baccata / Carex pensylvanica* Shrubland (CEGL008508). Vegetation of CEGL008508 is characterized by rhizomatous colonies of the low shrubs *Photinia melanocarpa* and *Gaylussacia baccata* and has a lower herb diversity and overall species richness than CEGL008536. Vegetation of the Stony Man seepage area was formerly recognized as a distinct type, *Physocarpus opulifolius / Calamagrostis canadensis* Shrub Herbaceous Vegetation (CEGL004253) but is now regarded as a variant of CEGL008536.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: All known sites along the Appalachian Trail are located in Shenandoah National Park. It was sampled in Virginia at Crescent Rock, Franklin Cliffs, Hawksbill Mountain, and Stony Man.
Global Range: This association is known only from a few high-elevation mafic rock outcrops in the northern Virginia Blue Ridge. All known sites are located in Shenandoah National Park. Most occurrences are in the higher, central section of the park, from the Big Meadows Area on the south to Stony Man Mountain on the north. A somewhat disjunct stand occurs on Mount Marshall in the northern section of the park.
Nations: US
States/Provinces: TN?, VA:S1
TNC Ecoregions: 59:C
USFS Ecoregions (1994/95): M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Shenandoah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HHGB
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (8 plots; 3 accuracy assessment points): APPA.0209, APPA.0214, APPA.0216, APPA.0218, APPA.0386, APPA.0391, APPA.0392, APPA.0393, APPA_AA_0843, APPA_AA_0870, APPA_AA_1378.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2007a, TDNH unpubl. data, Young et al. 2006, Young et al. 2009

[CEGL008508] *Photinia melanocarpa - Gaylussacia baccata / Carex pensylvanica* Shrubland

Translated Name: **Black Chokeberry - Black Huckleberry / Pennsylvania Sedge Shrubland**
Common Name: **High-Elevation Outcrop Barrens (Black Chokeberry Igneous / Metamorphic Type)**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Appalachian Mafic Glade (G180)
Alliance	Southern Appalachian Mafic Shrubland Alliance (A3470)

ELEMENT CONCEPT

Global Summary: This community type is known from scattered localities along nearly the full length of the Blue Ridge in Virginia and could potentially occur in North Carolina, West Virginia, Maryland, and Pennsylvania. This vegetation type is associated with medium- to high-elevation exposed outcrops of igneous and metamorphic rocks, including metabasalt (greenstone), porphyritic leucocharnockite, amphibolite, and rhyolite. Elevation ranges from about 880 to 1400 m (2900-4600 feet). Habitats are typically on strongly convex, upper slopes and rocky summits with west to northwest or flat aspects. The community is a patchwork of shrub thickets, small herbaceous mats, and exposed, lichen-covered rock surfaces. *Photinia melanocarpa (= Aronia melanocarpa)* is the dominant shrub, or is codominant with *Gaylussacia baccata, Hamamelis virginiana, Smilax tamnoides*, and/or *Kalmia latifolia*. Minor woody components include *Sorbus americana, Rhododendron catawbiense*, and *Menziesia pilosa*, as well as severely stunted *Betula alleghaniensis* and *Quercus rubra*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This rare shrubland occurs on medium- to high-elevation igneous outcrop barrens and rocky summits from about 880 to 1,400 m (2,900-4,600 feet) elevation. It was sampled at six locations in the park. Sites are gentle to steep upper-slope and summit bedrock outcrops with northwestern and northeastern aspects. Soils are rapidly drained. The unvegetated surface is dominated by leaf litter and/or exposed bedrock with some downed wood and large rocks. Evidence of disturbance includes possible past logging, wind/ice damage, and the presence of exotic plant species.
Global Environment: This vegetation type is associated with medium- to high-elevation exposed outcrops of igneous and metamorphic rocks, including metabasalt (greenstone), porphyritic leucocharnockite, amphibolite, and rhyolite. The elevation range of plot-sampled stands is from about 880 to 1400 m (2900-4600 feet). Habitats are typically on strongly convex, upper slopes and rocky summits with west to northwest or flat aspects. Surface cover of bedrock and loose boulders in plot-sampled stands averages 80%, with mean lichen cover of 44% on these rocks. Soil development and moisture potential at these sites are minimal, and habitats may also be subject to severe winter temperatures, high winds, and ice.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This shrubland is dominated by *Photinia melanocarpa* and *Gaylussacia baccata*. *Kalmia latifolia* may be present but is not dominant. *Vaccinium pallidum* and *Sorbus americana* may be common. Herbaceous patches are usually sparse or limited. *Carex pensylvanica, Hylotelephium telephioides*, and *Maianthemum canadense* are most characteristic. Scattered *Quercus rubra* and/or *Betula alleghaniensis* are possible. This community also supports VA-state imperiled *Sibbaldiopsis tridentata*.
Global Vegetation: The community is a patchwork of shrub thickets, small herbaceous mats, and exposed, lichen-covered rock surfaces. *Photinia melanocarpa (= Aronia melanocarpa)* is the dominant shrub, or is codominant with *Gaylussacia baccata, Hamamelis virginiana, Smilax tamnoides*, and/or *Kalmia latifolia*. Minor woody components include *Sorbus americana, Rhododendron catawbiense*, and *Menziesia pilosa*, as well as severely stunted *Betula alleghaniensis* and *Quercus rubra*. The most frequent herbaceous species are *Carex pensylvanica, Saxifraga michauxii, Dennstaedtia punctilobula, Polypodium appalachianum, Agrostis perennans, Paronychia argyrocoma, Solidago simplex var. randii, Hylotelephium telephioides (= Sedum telephioides), Heuchera villosa, Campanula divaricata*, and *Danthonia spicata*. Species richness of plot-sampled stands ranges from 12 to 37 taxa per 100 square meters (mean = 22).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Photinia melanocarpa*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Gaylussacia baccata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Carex pensylvanica*, *Gaylussacia baccata*, *Hylotelephium telephioides*, *Maianthemum canadense*, *Photinia melanocarpa*
Global: *Carex pensylvanica*, *Gaylussacia baccata*, *Hylotelephium telephioides*, *Micranthes petiolaris*, *Paronychia argyrocoma*, *Photinia melanocarpa*, *Smilax tamnoides*, *Solidago simplex* var. *randii*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Sibbaldiopsis tridentata* (G5, VA state-imperiled); **Invasive/Exotic Plants**: *Rumex acetosella* (Medium/Low)
Global: Vulnerable Plants: *Huperzia appalachiana* (G5, VA state-rare), *Minuartia groenlandica* (G5, VA state-rare), *Sibbaldiopsis tridentata* (G5, VA state-rare), *Solidago simplex* var. *randii* (G5T4, VA state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1? (20-Jun-2001). This is a naturally rare, small-patch vegetation type limited by special habitat requirements. Currently, there are only 10 known occurrences of this vegetation, in aggregate covering less than 4 hectares (10 acres). Additional occurrences are likely but would not significantly increase the aggregate acreage of the type.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: All sampled plots occur in Shenandoah National Park in Virginia.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Additional data collection from known stands that have not been plot-sampled would increase the robustness of this type's classification. Examples of this community should be sought outside the Virginia Blue Ridge.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is known from Shenandoah National Park, Virginia, south to central Virginia. It was sampled at Bearfence Mountain, Blackrock (Big Meadows), Loft Mountain, and South Marshall.
Global Range: This community type is known from scattered localities along nearly the full length of the Blue Ridge in Virginia. It is of potential occurrence in North Carolina, West Virginia, Maryland, and Pennsylvania.
Nations: US
States/Provinces: MD?, NC?, PA?, VA:S1
TNC Ecoregions: 51:C, 59:C
USFS Ecoregions (1994/95): M221Da:CCC, M221Db:CCC, M221Dc:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Shenandoah); USFS (George Washington)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SHOB
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (6 plots; 5 accuracy assessment points): APPA.0242, APPA.0382, APPA.0383, APPA.0384, APPA.0385, APPA.0388, APPA_AA_0188, APPA_AA_0482, APPA_AA_1089, APPA_AA_1233, APPA_AA_1297.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Coulling and Rawinski 1999, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2007a, Rawinski and Wieboldt 1993, Young et al. 2006, Young et al. 2009

G670. CENTRAL & SOUTHERN APPALACHIAN ROCKY OUTCROP

Group Summary Description: These are treeless rock outcrops of the southern and central Appalachian Mountains, best developed in western North Carolina and eastern Tennessee. The vegetation is generally characterized by a mixture of low-growing lifeforms, especially lichens, mosses, and short-statured forbs. Less commonly, graminoids and low shrubs are encountered. Species common to all outcrop vegetation types include *Carex misera, Saxifraga michauxii*, and *Vaccinium corymbosum*. Outcrops may be vertical to horizontal, rugged or fractured rock outcrops of peaks, ridgetops, upper slopes, and other topographically exposed locations. Higher elevation examples occur from 1200 to 2030 m in elevation; other examples may be found at elevations of 305 m (1000 feet) or lower on foothills. These outcrops occur on felsic to mafic rocks and are distinguished from

surrounding systems by the prevalence of bare or lichen-encrusted rocks. This group unifies several vegetation types with widely differing physiognomies, ranging from woodland to low shrubland, to perennial grassland, to lichen-dominated with low vascular plant cover. They are unified by their common environments, which include rock outcrops, boulderfields, exfoliation outcrops, consolidated cliffs, unconsolidated bouldery talus, and rocky domes and summits in the Central and Southern Appalachians.

A1621 *Saxifraga michauxii - Carex misera - Schizachyrium scoparium* Rocky Grassland Alliance

Alliance Summary Description: This alliance consists of moderate- to high-elevation rocky summit communities of the Southern and Central Blue Ridge (metamorphic rock portions of the Southern and Central Appalachians), as well as in the adjacent southern Piedmont. The vegetation will typically have *Saxifraga michauxii* as a component; other species may include *Carex* spp., *Saxifraga micranthidifolia, Saxifraga virginiensis, Schizachyrium scoparium*, and others. There are several globally rare communities contained in this alliance. One association placed here is dominated by *Carex biltmoreana, Krigia montana, Pycnanthemum beadlei*, and *Saxifraga michauxii*. Examples are found on various rock types, including amphibolite, metabasalt (greenstone), gneiss, and others. It is found on steeply sloping outcrops of felsic to mafic rock, primarily south of the Asheville Basin, North Carolina. These are small exfoliated (spalled) outcrops surrounded by forests or woodlands.

[CEGL004279] *Saxifraga michauxii - Carex misera - Danthonia spicata - Krigia montana* Grassland

Translated Name: **Michaux's Saxifrage - Wretched Sedge - Poverty Oatgrass - Mountain Dwarf-dandelion Grassland**

Common Name: **Southern Appalachian High-Elevation Rocky Summit (Typic Type)**

USNVC Classification

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Central & Southern Appalachian Rocky Outcrop (G670)
Alliance	*Saxifraga michauxii - Carex misera - Schizachyrium scoparium* Rocky Grassland Alliance (A1621)

Element Concept

Global Summary: This association consists of rock outcrops with sparse vegetative cover of forbs, grasses and shrubs which are rooted in rock fissures. This vegetation occurs in the Southern Appalachians of Tennessee and North Carolina at 1350-1870 m elevation within a matrix of *Quercus rubra* forest or high-elevation grasslands and shrublands. Typical species include *Saxifraga michauxii, Danthonia spicata, Krigia montana, Carex misera, Angelica triquinata, Athyrium filix-femina ssp. asplenioides, Rhododendron catawbiense*, and *Heuchera villosa*. Other characteristic species are *Sanguisorba canadensis, Sibbaldiopsis tridentata, Hylotelephium telephioides (= Sedum telephioides), Houstonia purpurea var. montana, Geum radiatum, Solidago spithamaea*, and *Huperzia appalachiana*.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This high-elevation rocky summit type is found between 1,065 and 1,810 m (3,500-5,940 feet) elevation, occupying vertical to horizontal rock outcrops of peaks, ridges, upper slopes, and other topographically exposed positions, often with western aspects.

Global Environment: This association consists of rock outcrops with sparse vegetative cover of forbs, grasses and shrubs which are rooted in rock fissures. It occurs at 1350-1870 m elevation within a matrix of *Quercus rubra* forest or high-elevation grasslands and shrublands. The rock types on which it may occur include amphibolite, metabasalt, metagabbro, and metagraywacke.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: Short-statured herbs, mosses, and lichens are the most prevalent lifeforms in this community, with shrubs and graminoids sometimes encountered. Common and/or abundant herbs include *Agrostis perennans, Carex debilis, Danthonia spicata, Heuchera villosa var. villosa, Minuartia glabra, Minuartia groenlandica* (TN-state critically imperiled), *Potentilla canadensis, Saxifraga michauxii*, and *Sibbaldiopsis tridentata* (TN-state imperiled). *Rumex acetosella* is a

ubiquitous exotic weed. In addition, this community supports TN-state critically imperiled *Alnus viridis ssp. crispa* and *Krigia montana* (also a regional endemic) and TN-state imperiled *Ageratina altissima var. roanensis*.
Global Vegetation: Typical species in stands of this type include *Saxifraga michauxii, Danthonia spicata, Krigia montana, Carex misera, Angelica triquinata, Athyrium filix-femina ssp. asplenioides, Rhododendron catawbiense*, and *Heuchera villosa var. villosa*. Other characteristic species are *Sanguisorba canadensis, Sibbaldiopsis tridentata, Hylotelephium telephioides (= Sedum telephioides), Houstonia purpurea var. montana, Geum radiatum, Solidago spithamaea*, and *Huperzia appalachiana*. In addition, some examples contain *Agrostis perennans, Alnus viridis ssp. crispa, Carex debilis, Krigia montana, Minuartia glabra, Minuartia groenlandica*, and *Potentilla canadensis*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Danthonia spicata*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Micranthes petiolaris*
Herb (field)	Graminoid	*Danthonia spicata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Danthonia spicata*, *Micranthes petiolaris*, *Rumex acetosella*
Global: *Carex misera*, *Danthonia spicata*, *Krigia montana*, *Micranthes petiolaris*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4, TN state-imperiled), *Alnus viridis* ssp. *crispa* (G5T5, TN state-critically imperiled), *Krigia montana* (G3, TN state-critically imperiled), *Minuartia groenlandica* (G5, TN state-critically imperiled), *Sibbaldiopsis tridentata* (G5, TN state-critically imperiled), *Solidago glomerata* (G3, TN state-imperiled); **Invasive/Exotic Plants**: *Rumex acetosella* (Medium/Low)
Global: Vulnerable Plants: *Allium allegheniense* (G3?), *Carex misera* (G3), *Geum radiatum* (G2, Southern Appalachian endemic), *Gymnocarpium appalachianum* (G3), *Houstonia purpurea* var. *montana* (G5T2, Southern Blue Ridge endemic), *Krigia montana* (G3), *Liatris helleri* (G2Q, NC/Southern Appalachian endemic), *Prenanthes roanensis* (G3), *Solidago glomerata* (G3), *Solidago spithamaea* (G2)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (30-Apr-1998). This high-elevation community is associated with amphibolite, metabasalt, metagabbro, or metagraywacke bedrock outcrops in the Southern Appalachians of Tennessee and North Carolina. This community is naturally rare, representing a tiny fraction of the high-mountain landscape. It is known from scattered, small acreage occurrences. Heavy recreational use in these fragile communities has damaged, and continues to threaten, many examples. Additionally, atmospheric deposition of air pollutants may have an adverse effect on these high-elevation communities.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: *Carex misera* has very low constancy in plots.
Global Classification Comments: This community is associated with amphibolite, metabasalt, metagabbro, or metagraywacke bedrock. In an 1134-plot regional analysis (Georgia, North Carolina, Tennessee, Virginia) for the Southern Appalachian portion of the Appalachian Trail, nine plots were classified as this association (Fleming and Patterson 2009a). These plots are all from various localities on the Roan Mountain Massif (NC and TN), and five are located along the Appalachian Trail. The most constant species (>50%) in this group are *Danthonia spicata, Minuartia groenlandica, Rumex acetosella, Saxifraga michauxii, Heuchera villosa var. villosa, Athyrium filix-femina ssp. asplenioides, Sibbaldiopsis tridentata, Krigia montana, Solidago glomerata, Deschampsia flexuosa, Alnus viridis ssp. crispa* (seedlings), and *Rhododendron catawbiense* (seedlings).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled on Roan Mountain in Cherokee National Forest, North Carolina, and Pisgah National Forest, Tennessee.
Global Range: This high-elevation community is restricted to the Southern Appalachians of Tennessee and North Carolina.
Nations: US
States/Provinces: NC, TN
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Cherokee, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HBGF
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (5 observation points; 1 accuracy assessment point): APPA.0125, APPA.0126, APPA.0127, APPA.0128, APPA.0129, APPA_AA_0759.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A.S. Weakley, M.P. Schafale and K.D. Patterson
References: Allard 1990, Fleming and Patterson 2009a, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Wiser 1993, Wiser et al. 1996

[CEGL004277] *Saxifraga michauxii - Carex misera - Oclemena acuminata - Solidago glomerata* Grassland

Translated Name: **Michaux's Saxifrage - Wretched Sedge - Whorled Wood Aster - Clustered Goldenrod Grassland**
Common Name: **Southern Appalachian High-Elevation Rocky Summit (High Peak Type)**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Central & Southern Appalachian Rocky Outcrop (G670)
Alliance	*Saxifraga michauxii - Carex misera - Schizachyrium scoparium* Rocky Grassland Alliance (A1621)

ELEMENT CONCEPT

Global Summary: This association covers high-elevation (greater than 1980 m) vegetated rock outcrops of highly fractured felsic to mafic bedrock of the southern Appalachian Mountains in North Carolina and Tennessee. The vegetative cover is sparse with grasses, forbs and shrubs rooted in rock fissures. Typical species in stands of this type are *Carex misera, Abies fraseri, Menziesia pilosa, Heuchera villosa, Rhododendron catawbiense, Saxifraga michauxii, Sorbus americana, Oclemena acuminata (= Aster acuminatus)*, and *Solidago glomerata*. This community occurs in a matrix of *Picea rubens - Abies fraseri* forest. Other characteristic species are *Minuartia glabra* and *Polypodium appalachianum*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This sparsely vegetated community is found above 1,810 m (5,940 feet) elevation and occupies vertical to horizontal rock outcrops of peaks, ridges, upper slopes, and other topographically exposed positions. Sampled stands are north-facing.
Global Environment: This association covers high-elevation (greater than 1980 m) on rock outcrops of highly fractured felsic to mafic bedrock. This community occurs in a matrix of *Picea rubens - Abies fraseri* forest.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: Short-statured herbs, mosses, and lichens are the most prevalent lifeforms in this community, with shrubs and graminoids sometimes encountered. Common and/or abundant herbs include *Athyrium filix-femina ssp. asplenioides, Carex brunnescens ssp. sphaerostachya, Carex misera, Clintonia borealis, Oclemena acuminata, Oxalis montana*, and *Saxifraga michauxii*. Woody species include *Abies fraseri, Ribes glandulosum*, and *Sorbus americana*. This community also supports TN-state imperiled *Carex misera* and *Menziesia pilosa*.

Global Vegetation: Typical species in stands of this type are *Carex misera, Abies fraseri, Menziesia pilosa, Heuchera villosa, Rhododendron catawbiense, Saxifraga michauxii, Sorbus americana, Oclemena acuminata (= Aster acuminatus)*, and *Solidago glomerata*. Other characteristic species are *Minuartia glabra* and *Polypodium appalachianum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Menziesia pilosa*
Herb (field)	Flowering forb	*Clintonia borealis*, *Oclemena acuminata*
Herb (field)	Graminoid	*Carex misera*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Menziesia pilosa*
Herb (field)	Flowering forb	*Heuchera villosa*, *Micranthes petiolaris*, *Oclemena acuminata*
Herb (field)	Graminoid	*Carex misera*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Carex brunnescens* ssp. *sphaerostachya*, *Carex misera*, *Clintonia borealis*, *Menziesia pilosa*, *Micranthes petiolaris*, *Oclemena acuminata*
Global: *Carex misera*, *Micranthes petiolaris*, *Minuartia glabra*, *Oclemena acuminata*, *Polypodium appalachianum*, *Solidago glomerata*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Abies fraseri* (G2, globally imperiled & TN-state critically imperiled), *Carex misera* (G3, TN state-imperiled), *Clintonia borealis* (G5, TN state-imperiled), *Menziesia pilosa* (G4G5, TN state-imperiled)
Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Calamagrostis cainii* (G1), *Carex misera* (G3), *Geum radiatum* (G2, Southern Appalachian endemic), *Houstonia purpurea* var. *montana* (G5T2, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Selaginella tortipila* (G3, Southern Appalachian endemic), *Solidago glomerata* (G3), *Solidago spithamaea* (G2); **Other Plants**: *Anaptychia setifera* (GU)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (15-Jan-1995). This community is naturally rare, representing a tiny fraction of the high-mountain landscape. It is known from scattered, small acreage occurrences. Heavy recreational use in these fragile communities has damaged, and continues to threaten, many examples. Additionally, atmospheric deposition of air pollutants may have an adverse effect on these high-elevation communities.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: *Solidago glomerata* is minor to absent in plots.
Global Classification Comments: This community occurs on the highest summits of Grandfather Mountain, Mount Craig, Roan High Bluff, Mount Buckley (Great Smoky Mountains National Park), and Craggy Pinnacle. In an 1134-plot regional analysis Georgia, North Carolina, Tennessee, Virginia) for the Southern Appalachian portion of the Appalachian Trail, only two plots were classified as this association (Fleming and Patterson 2009a). Both plots are from Mount Buckley (TN) and are located along the Appalachian Trail at a mean elevation of 1986 m (6514 feet). The most constant species (100%) in this group are *Carex misera, Abies fraseri, Clintonia borealis, Carex brunnescens ssp. sphaerostachya, Menziesia pilosa, Sorbus americana, Oxalis montana, Oclemena acuminata, Athyrium filix-femina ssp. asplenioides*, and *Saxifraga michauxii*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled at Mount Buckley in Great Smoky Mountains National Park, Tennessee.
Global Range: Occurs on high summits of the southern Appalachian Mountains in North Carolina and Tennessee.
Nations: US
States/Provinces: NC:S1, TN
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HBGF
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 1 observation point): APPA.0130, APPA.0132.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A.S. Weakley, M.P. Schafale and K.D. Patterson
References: Allard 1990, Fleming and Patterson 2009a, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Wiser 1993, Wiser et al. 1996

A3961 *Selaginella rupestris - Selaginella tortipila - Schizachyrium scoparium* Rocky Grassland Alliance

Alliance Summary Description: This vegetation is found on granitic exfoliation domes of the Piedmont and at lower, intermediate, and high elevations in the Southern Blue Ridge of the Carolinas and Georgia. It occurs on gently sloping to steep exposures of smooth, exfoliating granite or similar massive igneous or metamorphic rock, such as granitic gneiss. The sites are typically exposed and south-facing, with smooth, primarily steep to vertical exfoliation surfaces and few cracks or crevices for soil accumulation. Some flat areas may also be present. This community occurs in large patches, ranging in size from a few acres to over 100 acres. Vegetation consists primarily of lichens on bare rock or of shallow mats generally dominated by *Selaginella rupestris* occurring with other distinctive species.

[CEGL007690] *Selaginella rupestris - Schizachyrium scoparium - Hypericum gentianoides - Bulbostylis capillaris* Rocky Grassland

Translated Name: **Rock Spikemoss - Little Bluestem - Orange-grass - Dense-tuft Hairsedge Rocky Grassland**
Common Name: **Appalachian Low-Elevation Granitic Dome**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Central & Southern Appalachian Rocky Outcrop (G670)
Alliance	*Selaginella rupestris - Selaginella tortipila - Schizachyrium scoparium* Rocky Grassland Alliance (A3961)

ELEMENT CONCEPT

Global Summary: This association includes vegetation found on granitic exfoliation domes of the Piedmont and lower elevation portions of the Blue Ridge. It occurs on gently sloping to steep exposures of smooth, exfoliating granite or similar massive igneous or metamorphic rock, such as granitic gneiss. The substrate has few cracks or irregularities for soil accumulation, and most of the areal extent is bare rock. This association typically occurs at elevations below 915 m (3000 feet) but may be found at slightly higher elevations. This community occurs in large patches, ranging in size from a few acres to over 100 acres. Vegetation consists primarily of lichens on bare rock or of shallow mats generally dominated by *Selaginella rupestris* occurring with other distinctive species. Woody species from adjacent woodlands and shrublands may be scattered components, rooted in deeper soil pockets, older stable vegetation mats, and in marginal zones between the exposed rock and adjacent forests. *Selaginella rupestris* is almost always a major dominant of the vegetation mats. However, distribution of *Selaginella rupestris* can be spotty,

so there are examples of this association that do not contain this species. Other characteristic herbaceous species are *Baptisia tinctoria, Cheilanthes lanosa, Coreopsis major, Corydalis sempervirens, Danthonia sericea, Lindernia monticola, Phlox nivalis, Schizachyrium scoparium, Scleria triglomerata*, and *Talinum teretifolium*. Common woody species include *Carya pallida, Chionanthus virginicus, Fraxinus americana, Juniperus virginiana, Kalmia latifolia, Pinus echinata, Pinus rigida, Quercus prinus (= Quercus montana), Rhododendron minus, Ulmus alata*, and *Vaccinium stamineum*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This sparse vegetation is found on granitic exfoliation domes. Sites are gently sloping ridgetops (including rock outcrops) with soils that may at times be very wet due to fog and rain or may be extremely dry during periods of drought. The unvegetated surface is dominated by exposed bedrock with small amounts of leaf litter, downed wood, small rocks and bare soil. Evidence of disturbance includes trails, impacts from hikers, and wind/ice damage due to exposure to severe weather.

Global Environment: This association occurs on gently sloping to steep exposures of smooth, exfoliating granite or similar massive igneous or metamorphic rock, such as granitic gneiss. The substrate has few cracks or irregularities for soil accumulation, and most of the areal extent is bare rock. This association typically occurs at elevations below 915 m (3000 feet) but may be found at slightly higher ones.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: Trees are at low cover (generally below 35%), and may be scattered individuals or small patches. Vegetation consists primarily of lichens on bare rock, or of shallow mats generally dominated by *Selaginella rupestris*. Other characteristic herbaceous species are *Baptisia tinctoria, Bulbostylis capillaris, Cheilanthes lanosa, Coreopsis major, Corydalis sempervirens, Croton elliottii* (regional endemic), *Danthonia sericea, Danthonia spicata, Deschampsia flexuosa, Juncus tenuis, Lindernia monticola, Phlox nivalis, Scleria triglomerata, Schizachyrium scoparium*, and *Talinum teretifolium*. Woody species are scattered but may include *Betula lenta, Carya pallida, Chionanthus virginicus, Fraxinus americana, Juniperus virginiana, Kalmia latifolia, Pinus rigida, Rosa carolina, Rubus flagellaris, Quercus alba*, and *Quercus prinus*. This community also supports GA-state critically imperiled *Paronychia argyrocoma* and *Sibbaldiopsis tridentata*.

Global Vegetation: In stands of this type, the vegetation consists primarily of lichens on bare rock, or of shallow mats generally dominated by *Selaginella rupestris* occurring with other distinctive species. Woody species from adjacent woodlands and shrublands may be scattered components, rooted in deeper soil pockets, older stable vegetation mats, and in marginal zones between the exposed rock and adjacent forests. *Selaginella rupestris* is almost always a major dominant of the vegetation mats. However, distribution of *Selaginella rupestris* can be spotty, so there are examples of this association that do not contain this species. Other characteristic herbaceous species are *Baptisia tinctoria, Cheilanthes lanosa, Coreopsis major, Corydalis sempervirens, Danthonia sericea, Lindernia monticola, Phlox nivalis, Schizachyrium scoparium, Scleria triglomerata*, and *Talinum teretifolium*. Common woody species include *Carya pallida, Chionanthus virginicus, Fraxinus americana, Juniperus virginiana, Kalmia latifolia, Pinus rigida, Quercus prinus (= Quercus montana), Rhododendron minus, Ulmus alata*, and *Vaccinium stamineum*.

In an example of this association in the Chattahoochee National Forest (upper Piedmont of Stephens County, Georgia, 231Ad34, ca. 303-350 m elev.), mats of *Selaginella rupestris* dominate the stand. Widely scattered trees include *Pinus virginiana* and *Quercus prinus*. A prevalent shrub is *Rhus aromatica*. Other herbs include *Ageratina aromatica, Agrostis perennans, Andropogon* sp. *Cheilanthes lanosa, Packera anonyma (= Senecio anonymus), Solanum ptychanthum*?, and the characteristic *Talinum teretifolium*. Examples of this association on granite gneiss at Carl Sandburg Home National Historic Site also contained patches of *Amelanchier laevis* and *Pinus virginiana* scattered in pockets of deeper soil.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Danthonia spicata*, *Deschampsia flexuosa*, *Schizachyrium scoparium*
Herb (field)	Fern (Spore-bearing forb)	*Selaginella rupestris*

Global

Stratum	Lifeform	Species
Herb (field)	Fern (Spore-bearing forb)	*Selaginella rupestris*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Selaginella rupestris*
Global: *Selaginella rupestris*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Croton elliottii* (G3, globally imperiled), *Paronychia argyrocoma* (G4, GA state-critically imperiled), *Sibbaldiopsis tridentata* (G5, GA state-critically imperiled); **Invasive/Exotic Plants**: *Poa compressa* (High/Low), *Rumex acetosella* (Medium/Low)
Global: Vulnerable Plants: *Croton elliottii* (G3), *Krigia montana* (G3), *Packera millefolia* (G3), *Pycnanthemum curvipes* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (30-Apr-1998). Granitic domes are uncommon communities. Only 20 percent of the Piedmont Plateau is granite (Radford and Martin 1975), and only a small percentage of this granite occurs as massive, unweathered bodies that produce flatrocks and domes. Past quarrying has leveled many former granite domes (McVaugh 1943). This community provides open vistas that are attractive to humans, thus these fragile areas are threatened by pressures of recreational use. Given the island-like nature of this community, it is the habitat for many rare and endemic species and provides a unique contribution to biodiversity.

RELATED CONCEPTS

Global Similar Types:
- *(Quercus prinus) / Vaccinium pallidum / Schizachyrium scoparium - Danthonia spicata / Cladonia* spp. Scrub Grassland (CEGL004990)
- *Oxypolis rigidior - Drosera rotundifolia - Platanthera clavellata - Rhexia mariana var. mariana* Herbaceous Seep (CEGL007043)
- *Packera tomentosa - Croton willdenowii - Schizachyrium scoparium - (Selaginella rupestris)* Flatrock Vegetation (CEGL004298)
- *Selaginella rupestris - Schizachyrium scoparium - Hylotelephium telephioides - Allium cernuum* Granitic Glade Vegetation (CEGL004991)
- *Selaginella tortipila - Krigia montana - Houstonia longifolia* Rocky Grassland (CEGL004283)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Two plots from gneissic outcrops on the Georgia Blue Ridge, both with somewhat sparse but grass-rich herbaceous vegetation. Additional plant species were added to the local description by map validation field crews.
Global Classification Comments: Occurrences of this community have structural and compositional similarities to *Selaginella tortipila - Krigia montana - Houstonia longifolia* Rocky Grassland (CEGL004283), which is typically at higher elevations (over 915 m [3000 feet]) and contains a suite of species not found at lower elevations. Occurrences vary locally based on slope steepness, aspect, age of vegetation mats, and smoothness of rock substrate. Some occurrences may be difficult to distinguish from *Selaginella rupestris - Schizachyrium scoparium - Hylotelephium telephioides - Allium cernuum* Granitic Glade Vegetation (CEGL004991), which is characterized by the presence of plants characteristic of higher pH conditions, better developed soils, and flat to gently sloping rock surfaces. This community is floristically similar to granitic flatrock communities which are scattered throughout the Piedmont from Virginia to Alabama. However, the steep domes described here lack the shallow pools and other microhabitats characteristic of the fractured rock in granitic flatrock communities, and thus have different vegetative components.

In an 1134-plot regional analysis (Georgia, North Carolina, Tennessee, Virginia) for the Southern Appalachian portion of the Appalachian Trail, two plots from Union County, GA, were classified as this association. Both plots are at an unusually high elevation for the type and may be transitional to a higher-elevation association, but contain the characteristic species *Selaginella rupestris, Schizachyrium scoparium*, and *Bulbostylis capillaris*, along with *Danthonia spicata, Deschampsia flexuosa, Hypericum prolificum*, and *Croton willdenowii* (Fleming and Patterson 2009a).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled on Chattahoochee National Forest in Georgia.
Global Range: This community is known from the Piedmont region of Georgia and North Carolina, and lower elevations of the Blue Ridge Mountains, where steep, dome-shaped outcrops of granitic rock occur. Notable examples are in DeKalb County, Georgia, and in Alexander County, North Carolina.
Nations: US
States/Provinces: AL:S1, GA, NC, SC?
TNC Ecoregions: 51:C, 52:C
USFS Ecoregions (1994/95): 231Ad:CCC, M221Dc:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Carl Sandburg Home, Kennesaw Mountain); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HALD
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 4 accuracy assessment points): APPA.0540, APPA.0554, APPA_AA_0046, APPA_AA_0141, APPA_AA_0737, APPA_AA_1242.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): Southeast Ecology Group
References: ALNHP unpubl. data, Fleming and Patterson 2009a, Keever 1942, Keever et al. 1951, McVaugh 1943, Peet et al. unpubl. data, Quarterman et al. 1993, Radford and Martin 1975, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d.*, Taggart 1973, Wharton 1978, White 2003

G789. NORTH-CENTRAL APPALACHIAN ACIDIC SCRUB & GRASSLAND

Group Summary Description: This group is characterized by non-forested vegetation of acidic / nutrient-poor acidic bedrock outcrops and summits, or dry, sandy, nutrient-poor soils occurring on barrens or on sandy eroding river bluffs. Physiognomy is variable, ranging from graminoid-dominated, to shrublands, with or without very scattered, usually stunted, trees. Vegetation is usually patchy, with bare, or lichen-covered substrate of variable cover. Vegetation includes "pine plains" dominated by a dwarf-shrub variant of *Pinus rigida* associated with pine barrens, as well as taller shrublands, often quite dense, dominated by *Quercus ilicifolia*. This group also includes "heathlands" comprising dwarf-shrublands of low ericaceous shrubs such as *Gaylussacia baccata, Vaccinium angustifolium*, and *Vaccinium pallidum*; *Vaccinium myrtilloides, Sibbaldiopsis tridentata (= Potentilla tridentata)*, and *Sorbus americana* also occur at higher elevations and in the north at lower elevations. Associations characterized by graminoids *Carex lucorum, Carex pensylvanica, Danthonia spicata, Deschampsia flexuosa*, or *Schizachyrium scoparium* are also included in this group. Although there is significant overlap in floristic composition, there are two distinct environmental settings supporting this group: acidic bedrock outcrops and summits, and relatively flat plains with dry to xeric sandy soils. This group also includes small mafic bedrock associations characterized by *Asplenium trichomanes, Adiantum aleuticum*, and *Cerastium arvense*, as well as vegetation occurring on sandy river bluffs characterized by widely scattered early-successional trees and dwarf-shrubs, including *Hudsonia ericoides*.

A3910 *Danthonia spicata - Deschampsia flexuosa - Deschampsia caespitosa* Bedrock Grassland Alliance

Alliance Summary Description: This alliance, ranging from the Great Lakes to the Appalachian Mountains, is characterized by acidic or serpentine bedrock outcrops supporting dry, patchy grasslands usually dominated by *Danthonia spicata, Deschampsia flexuosa, Poa compressa, Schizachyrium scoparium*, or *Deschampsia caespitosa*. It also includes mafic bedrock outcrops also characterized by these grasses but also supporting ferns and forbs such as *Asplenium trichomanes, Adiantum aleuticum*, and *Cerastium arvense*. The combination of sloping sites and thin soil lead to poor water retention and droughty conditions.

[CEGL006544] *Schizachyrium scoparium - Danthonia spicata - Carex pensylvanica / Cladonia* spp. Grassland

Translated Name: **Little Bluestem - Poverty Oatgrass - Pennsylvania Sedge / Cup Lichen species Grassland**
Common Name: **Low- to Mid-Elevation Little Bluestem - Poverty Oatgrass Outcrop Opening**

USNVC Classification

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	North-Central Appalachian Acidic Scrub & Grassland (G789)
Alliance	*Danthonia spicata - Deschampsia flexuosa - Deschampsia caespitosa* Bedrock Grassland Alliance (A3910)

Element Concept

Global Summary: These grassy openings are found on rock outcrops and summits at 365-1220 m (1200-4000 feet) elevation in the Central Appalachians and adjacent regions. Settings include flat summits, outcrops, plateaus and southwest-facing upper slopes. Bare rock (acidic sandstone and conglomerates) typically makes up a large part of the cover. *Danthonia spicata, Schizachyrium scoparium*, and *Deschampsia flexuosa* are all typical. Total herbaceous cover is usually 25-50%. Other associates include *Carex pensylvanica, Piptatherum pungens (= Oryzopsis pungens), Piptatherum racemosum (= Oryzopsis racemosa), Prunus pumila, Rumex acetosella, Rubus* spp., *Sibbaldiopsis tridentata, Cladonia* sp., and *Umbilicaria* sp. There may be small patches of shrubs within the graminoid matrix, including *Vaccinium* spp., *Gaylussacia baccata*, and *Photinia melanocarpa (= Aronia melanocarpa)*.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: These grassy openings are found on rock outcrops and summits at 365-1,220 m (1,200-4,000 feet) elevation in the Central Appalachians and adjacent regions. Settings include flat summits, outcrops, plateaus and southwest-facing upper slopes. Bare rock (acidic sandstone and conglomerates) typically makes up a large part of the cover.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: These grassy openings are found on rock outcrops and summits at 202 to 417 m (662-1,368 feet) elevation. Sites are gentle to steep upper slopes and summits (ridgetop bedrock outcrops) with north or southeast aspects. Soils are dry to xeric, rapidly drained sandy loam. The unvegetated surface includes exposed bedrock often with lesser amounts of large/small rocks, bare soil, leaf litter and/or downed wood. Lichens may cover much of the rock surfaces. No evidence of disturbance was reported.
Global Environment: This association occurs on rock outcrops and summits at 365-1220 m (1200-4000 feet) elevation in the Central Appalachians and adjacent regions. Settings include flat summits, outcrops, plateaus and southwest-facing upper slopes. Bare rock (acidic sandstone and conglomerates) typically makes up a large part of the cover.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Schizachyrium scoparium, Danthonia spicata, Deschampsia flexuosa*, and *Carex pensylvanica* are characteristic herbs. There is high *Cladonia* spp. cover on exposed rocks. Other associates include *Carex pensylvanica, Piptatherum pungens (= Oryzopsis pungens), Piptatherum racemosum (= Oryzopsis racemosa), Prunus pumila, Rumex acetosella, Rubus* spp., *Sibbaldiopsis tridentata, Cladonia* sp., and *Umbilicaria* sp. There may be small patches of shrubs within the graminoid matrix, including *Vaccinium* spp., *Gaylussacia baccata*, and *Photinia melanocarpa (= Aronia melanocarpa)*.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Deschampsia flexuosa, Schizachyrium scoparium, Danthonia spicata, Carex pensylvanica, Dichanthelium boscii*, and *Potentilla simplex* are dominant and/or characteristic herbs. *Vaccinium pallidum, Gaylussacia baccata, Rubus flagellaris*, and *Quercus ilicifolia* are characteristic short shrubs. Tall shrubs may include *Amelanchier* spp. and *Prunus serotina*. There is high cover of *Cladonia* spp. on exposed rocks.
Global Vegetation: *Danthonia spicata, Schizachyrium scoparium*, and *Deschampsia flexuosa* are all typical. Total herbaceous cover is usually 25-50%. Other associates include *Carex pensylvanica, Piptatherum pungens (= Oryzopsis pungens), Piptatherum racemosum (= Oryzopsis racemosa), Prunus pumila, Rumex acetosella, Rubus* spp., *Sibbaldiopsis tridentata, Cladonia* sp., and *Umbilicaria* sp. There may be small patches of shrubs within the

graminoid matrix, including *Vaccinium* spp., *Gaylussacia baccata*, and *Photinia melanocarpa (= Aronia melanocarpa)*.
Global Dynamics: This type is probably fire-initiated.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Rumex acetosella*
Herb (field)	Graminoid	*Danthonia spicata*, *Deschampsia flexuosa*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium pallidum*
Herb (field)	Graminoid	*Carex pensylvanica*, *Deschampsia flexuosa*, *Schizachyrium scoparium*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Rumex acetosella*
Herb (field)	Graminoid	*Danthonia spicata*, *Deschampsia flexuosa*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Carex pensylvanica*, *Danthonia spicata*, *Deschampsia flexuosa*, *Gaylussacia baccata*, *Schizachyrium scoparium*
Appalachian National Scenic Trail (Lower New England Project Area): *Carex pensylvanica*, *Deschampsia flexuosa*, *Gaylussacia baccata*, *Schizachyrium scoparium*, *Vaccinium pallidum*
Global: *Carex pensylvanica*, *Danthonia spicata*, *Deschampsia flexuosa*, *Gaylussacia baccata*, *Schizachyrium scoparium*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Rumex acetosella* (Medium/Low)
Global: Invasive/Exotic Plants: *Rumex acetosella* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (20-May-2011). Although an estimated 385 occurrences occupy 3600 acres rangewide, there are substantial threats to this association. Fire suppression and utility lines, including cell phone towers, and possibly wind turbines, threaten this vegetation throughout its range. Where trails cross these grasslands, trampling also poses a threat.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Some sites are mostly bedrock outcrops with grass clumps in cracks and scattered trees and shrubs.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: These grassy openings are found on rock outcrops and summits in the Central Appalachians and adjacent regions from Massachusetts to Pennsylvania. It was observed within the Appalachian Trail corridor in Lebanon County, Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Culvers Gap South in New Jersey and at Harriman State Park, Sterling Forest and Bellvale Mountain South in New York.
Global Range: These grassy openings are found on rock outcrops and summits in the Central Appalachians and adjacent regions from Massachusetts to Pennsylvania.
Nations: CA?, US

States/Provinces: CT, MA, NJ, NY:S3, PA:S3S4, QC?
TNC Ecoregions: 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Am:CCC, 221Ba:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, M221Ad:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Delaware Water Gap, Upper Delaware)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HLMO
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: UMESC mappers observed this community in the field in Lebanon County, Pennsylvania, during the summer of 2011 and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 accuracy assessment point): APPA_AA_0033.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 plots; 3 observation points; 9 accuracy assessment points): APPA.0566, APPA.0571, APPA.0572, APPA.1341, APPA.1342, APPA.1380, APPA_AA_1683, APPA_AA_1947, APPA_AA_2005, APPA_AA_2539, APPA_AA_2698, APPA_AA_2859, APPA_AA_2874, APPA_AA_2969, APPA_AA_3325.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Metzler and Barrett 2001, Metzler and Barrett 2006, NYNHP unpubl. data, Perles et al. 2007, Perles et al. 2008, Swain and Kearsley 2001

A3909 *Quercus ilicifolia - Photinia melanocarpa* Bedrock Shrubland Alliance

Alliance Summary Description: This alliance, ranging from Pennsylvania and New Jersey discontinuously to southeastern Canada, includes shrublands dominated by *Quercus ilicifolia* occurring on rock outcrops and summits. *Quercus ilicifolia* occurs with variable cover depending on site conditions. Associated shrubs include low *Comptonia peregrina, Gaylussacia baccata, Kalmia angustifolia, Photinia melanocarpa (= Aronia melanocarpa), Prunus pumila, Salix humilis*, and *Vaccinium* spp. Herbaceous species are generally sparse, but include *Arctostaphylos uva-ursi, Carex pensylvanica, Comandra umbellata, Corydalis sempervirens, Danthonia spicata, Deschampsia flexuosa, Gaultheria procumbens, Hypericum gentianoides, Melampyrum lineare, Pteridium aquilinum, Schizachyrium scoparium, Sibbaldiopsis tridentata (= Potentilla tridentata)*, plus *Andropogon gerardii* at some sites. Scattered trees are common and include species from the surrounding ridgetop forests.

[CEGL006121] *Quercus ilicifolia - Prunus pumila* Shrubland

Translated Name: **Bear Oak - Sandcherry Shrubland**
Common Name: **Ridgetop Bear Oak Barrens**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	North-Central Appalachian Acidic Scrub & Grassland (G789)
Alliance	*Quercus ilicifolia - Photinia melanocarpa* Bedrock Shrubland Alliance (A3909)

ELEMENT CONCEPT

Global Summary: This *Quercus ilicifolia* shrubland occurs on ridgetops, summits and rock outcrops in the northeastern United States. It occurs on extremely shallow, stable acidic soils over bedrock. Open bedrock is common. This shrubland is dominated by *Quercus ilicifolia*, which occurs with variable cover depending on site conditions. Associated shrubs include *Vaccinium angustifolium, Vaccinium pallidum, Comptonia peregrina, Kalmia angustifolia, Gaylussacia baccata, Photinia melanocarpa (= Aronia melanocarpa), Quercus prinoides*, and *Prunus pumila*. The herbaceous layer varies from sparse to well-developed depending on the density of shrub cover. Typical herbs include *Deschampsia flexuosa, Carex pensylvanica, Danthonia spicata, Schizachyrium scoparium, Pteridium aquilinum, Gaultheria procumbens, Comandra umbellata, Melampyrum lineare, Hypericum gentianoides, Corydalis*

sempervirens, Sibbaldiopsis tridentata (= Potentilla tridentata), plus *Andropogon gerardii* or *Polygonatum biflorum* at some sites. Scattered and stunted trees are common and include species from the surrounding ridgetop forests, such as *Quercus prinus, Quercus rubra, Quercus alba, Pinus rigida, Populus tremuloides, Betula populifolia*, and *Carya glabra*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This bear oak barrens community occurs along ridgelines from southern New England south to interior New Jersey and Pennsylvania at elevations ranging from 347-448 m (1,138-1,470 feet). Plots were sampled at Delaware Water Gap and in New York in the Lower New England project area. Sites are moderate to steep upper slopes and ridges with northwest, north and southwest aspects. Soils are rapidly drained silt loam. The unvegetated surface includes leaf litter or rocks (rock outcrop), with small amounts of downed wood, bare soil, exposed bedrock and large/small rocks. These sites may burn on a regular basis. Evidence of disturbance includes the presence of exotic plants.
Global Environment: This shrubland occurs on extremely shallow, stable acidic soils over bedrock, typically on ridges. Open bedrock is common. Fire is a secondary influence.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Quercus ilicifolia* is dominant and may be stunted; associated shrubs include *Vaccinium angustifolium, Vaccinium pallidum, Gaylussacia baccata, Photinia melanocarpa, Quercus prinoides*, and/or *Amelanchier arborea*. Typical herbs include *Deschampsia flexuosa, Carex pensylvanica, Danthonia spicata, Schizachyrium scoparium*, and/or *Pteridium aquilinum*.
Global Vegetation: This shrubland is dominated by *Quercus ilicifolia*, which occurs with variable cover depending on site conditions. Associated shrubs include *Vaccinium angustifolium, Vaccinium pallidum, Comptonia peregrina, Kalmia angustifolia, Gaylussacia baccata, Photinia melanocarpa (= Aronia melanocarpa), Quercus prinoides*, and *Prunus pumila*. The herbaceous layer varies from sparse to well-developed depending on the density of shrub cover. Typical herbs include *Deschampsia flexuosa, Carex pensylvanica, Danthonia spicata, Schizachyrium scoparium, Pteridium aquilinum, Gaultheria procumbens, Comandra umbellata, Melampyrum lineare, Hypericum gentianoides, Corydalis sempervirens, Sibbaldiopsis tridentata (= Potentilla tridentata)*, plus *Andropogon gerardii* or *Polygonatum biflorum* at some sites. Scattered and stunted trees are common and include species from the surrounding ridgetop forests, such as *Quercus prinus, Quercus rubra, Quercus alba, Pinus rigida, Populus tremuloides, Betula populifolia*, and *Carya glabra*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Quercus ilicifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium angustifolium*, *Vaccinium pallidum*
Herb (field)	Graminoid	*Carex pensylvanica*, *Deschampsia flexuosa*, *Schizachyrium scoparium*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Quercus ilicifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium angustifolium*, *Vaccinium pallidum*
Herb (field)	Graminoid	*Carex pensylvanica*, *Deschampsia flexuosa*, *Schizachyrium scoparium*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Amelanchier arborea*, *Danthonia spicata*, *Deschampsia flexuosa*, *Quercus ilicifolia*, *Vaccinium angustifolium*, *Vaccinium pallidum*
Global: *Amelanchier arborea*, *Comandra umbellata*, *Danthonia spicata*, *Deschampsia flexuosa*, *Melampyrum lineare*, *Prunus pumila*, *Pteridium aquilinum*, *Quercus ilicifolia*, *Quercus prinus*, *Vaccinium angustifolium*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Anthoxanthum odoratum*, *Rumex acetosella* (Medium/Low)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (20-May-2011). There are an estimated 100-105 occurrences of this vegetation rangewide, occupying an area of 6200 acres. The open, exposed rocky summits that support this association are attractive for cell phone tower and wind turbine construction. In addition, recreational hikers pose a threat of trampling, although this is mitigated somewhat by the density of this vegetation. More inventory and documentation of this association are required to determine the conservation status rank.

RELATED CONCEPTS

Global Similar Types:
- *Quercus ilicifolia - Quercus prinoides* Scrub (CEGL006111)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: One of the Delaware Water Gap sites is an open woodland to shrubland on top of the Kittatinny Ridge, and probably burns on a regular basis. The trees are very stunted. It is similar to Red Oak / Heath Woodland Rocky Summit (CEGL006134) which has more tree cover.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in New Jersey and at Black Mountain - Harriman State Park in New York.
Global Range: This association is known from ridgelines from southern New England south to interior New Jersey and Pennsylvania.
Nations: US
States/Provinces: CT, MA, NJ, NY, PA:S3
TNC Ecoregions: 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fa:CCP, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCC, 221A:CP, 221Bd:CCP, 221D:CP, M212Ea:CCP, M212Eb:CCP
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap, Upper Delaware)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SBOB
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 plots; 1 observation point; 11 accuracy assessment points): APPA.0015, APPA.0069, APPA.0070, APPA.1388, APPA_AA_2048, APPA_AA_2150, APPA_AA_2223, APPA_AA_2269, APPA_AA_2306, APPA_AA_2605, APPA_AA_2701, APPA_AA_2740, APPA_AA_2818, APPA_AA_3194, APPA_AA_3234.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): E. Largay and S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Metzler and Barrett 2001, Metzler and Barrett 2006, Perles et al. 2007, Perles et al. 2008, Swain and Kearsley 2000, Swain and Kearsley 2001

A4111 *Vaccinium angustifolium - Vaccinium pallidum* Rocky Heath Alliance

Alliance Summary Description:

[CEGL003939] *Kalmia latifolia - Gaylussacia baccata - Vaccinium (angustifolium, pallidum) - Menziesia pilosa* Shrubland

Translated Name: **Mountain Laurel - Black Huckleberry - (Lowbush Blueberry, Blue Ridge Blueberry) - Minniebush Shrubland**
Common Name: **Central Appalachian Heath Barrens**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	North-Central Appalachian Acidic Scrub & Grassland (G789)
Alliance	*Vaccinium angustifolium - Vaccinium pallidum* Rocky Heath Alliance (A4111)

ELEMENT CONCEPT

Global Summary: This shrubland community is restricted to high-elevation, acidic bedrock exposures in the Central Appalachians of eastern West Virginia and northwestern Virginia. It occurs on upper-slope and ridgetop outcrops, pavements, and clifftops of acidic bedrock (quartzite and granitic) at elevations from about 950 to 1460 m (3100-4800 feet). Surface cover of bedrock and loose boulders averages about 80% in plot samples, and soil development is minimal. These habitats have distinctly xeric moisture regimes and are subject to year-round microclimatic extremes, including high solar exposure and temperatures in summer, high winds, periodic ice, and low winter temperatures. *Kalmia latifolia, Gaylussacia baccata*, and *Vaccinium* spp. are codominant shrubs in variable proportions, with *Vaccinium angustifolium* the principal species of high-elevation sites (all >1200 m [4000 feet]) in West Virginia and *Vaccinium pallidum* the characteristic species of somewhat lower-elevation (950-1200 [3100-4000 feet]) sites in Virginia. Other woody plants occurring frequently in the type include *Menziesia pilosa, Sorbus americana, Photinia melanocarpa (= Aronia melanocarpa), Gaultheria procumbens, Hamamelis virginiana, Prunus pensylvanica, Ilex montana, Nemopanthus mucronatus* (West Virginia only), and extremely stunted (<3 m tall) *Betula alleghaniensis*. Herbaceous plants are typically very sparse, but occasional dense colonies of *Deschampsia flexuosa* occur on open ledges with thin mats of moss and organic matter. The vegetation is floristically quite depauperate and plot-sampled stands have a mean species richness of only 15 vascular taxa.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This heath barrens shrubland occurs on upper-slope and ridgetop outcrops, pavements, and clifftops of acidic bedrock (quartzite and granitic) at elevations from about 950 to 1,460 m (3,100-4,800 feet). It was sampled at three locations within in the corridor. The sites range from moderate to steep bedrock outcrops with northern aspects. Soils are rapidly drained. The unvegetated surface is dominated by leaf litter and exposed bedrock with some large and small rocks. Evidence of disturbance includes wind/ice damage and the presence of exotic plant species.

Global Environment: Stands occur on nearly level to steeply sloping (>30°) outcrops, pavements, and clifftops of acidic bedrock, including Tuscarora quartzite, charnockite, leucocharnockite, Old Rag granite, and sandstones of the Allegheny Formation and Pottsville group. Habitats are situated on upper slopes and summits with south to northwest aspects, at elevations ranging from about 950 to 1460 m (3100-4800 feet) in the Central Appalachians. Surface cover of bedrock and loose boulders averages about 80% in plot samples, and lichen cover on exposed rock surfaces is generally >75%. Soil development is minimal, consisting of localized crevices and mats of disintegrated rock and organic matter. These habitats have distinctly xeric moisture regimes and are subject to year-round microclimatic extremes, including high solar exposure and temperatures in summer, high winds, periodic ice, and low winter temperatures.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This heath barrens community is dominated by *Kalmia latifolia*. *Sorbus americana* and *Vaccinium* spp. are common in the shrub layer. *Menziesia pilosa* and *Prunus pensylvanica* may also be present. Herbaceous patches may be absent or sparse. When present, *Carex pensylvanica* and *Dennstaedtia punctilobula* are common herbs. This community also supports VA-state imperiled *Aralia hispida* and *Huperzia appalachiana*.

Global Vegetation: Total vegetation cover varies from <25% to >75% and consists of dense shrub thickets and small herbaceous mats among the exposed rocks. *Kalmia latifolia, Gaylussacia baccata*, and *Vaccinium* spp. are codominant shrubs in variable proportions, with *Vaccinium angustifolium* the principal species of high-elevation sites (all >1200 m [4000 feet]) in West Virginia and *Vaccinium pallidum* the characteristic species of somewhat lower-elevation (950-1200 m [3100-4000 feet]) sites in Virginia. Patch-dominance of these ericads may occur in pronounced zonation or in extremely dense, stratified mixtures. Other woody plants occurring frequently in the type include *Menziesia pilosa, Sorbus americana, Photinia melanocarpa (= Aronia melanocarpa), Photinia pyrifolia* (West Virginia only), *Gaultheria procumbens, Hamamelis virginiana, Prunus pensylvanica, Rubus hispidus* (West Virginia only), *Ilex montana, Nemopanthus mucronatus* (West Virginia only), and extremely stunted (<3 m tall) *Betula alleghaniensis*. Additional stunted trees occasionally found in this type at low cover include *Acer rubrum, Amelanchier laevis, Amelanchier sanguinea, Betula lenta, Picea rubens* (West Virginia only), *Pinus rigida, Pinus*

pungens, Rhododendron prinophyllum, Quercus rubra, and *Tsuga canadensis*. Herbaceous plants are typically very sparse, but occasional dense colonies of *Deschampsia flexuosa* occur on open ledges with thin mats of moss and organic matter. Other herbs that are sometimes important in this type are *Aralia nudicaulis, Lysimachia quadrifolia, Maianthemum canadense, Polypodium appalachianum, Pteridium aquilinum var. latiusculum, Carex pensylvanica, Dennstaedtia punctilobula, Melampyrum lineare, Lycopodium annotinum, Lycopodium dendroideum* (West Virginia only), *Polygonum cilinode, Oryzopsis asperifolia, Carex polymorpha, Aralia hispida*, and *Paronychia argyrocoma*. Species richness of 13 Virginia and West Virginia plot samples ranges from 5 to 22 taxa per 100 square meters (mean = 15).

Global Dynamics: There are few threats to this vegetation at remote sites. However, several Virginia occurrences on public lands (e.g., Old Rag Mountain and Mary's Rock in Shenandoah National Park) have been significantly impacted by heavy trampling at high-elevation overlooks near trails. In addition, susceptible lichen species may have been eliminated from these sites due to air pollution, but no baseline data are available to document this.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium angustifolium*, *Vaccinium pallidum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Carex pensylvanica*, *Dennstaedtia punctilobula*, *Kalmia latifolia*, *Menziesia pilosa*, *Sorbus americana*
Global: *Kalmia latifolia*, *Vaccinium angustifolium*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Aralia hispida* (G5, VA state-imperiled), *Huperzia appalachiana* (G5, VA state-imperiled); **Invasive/Exotic Plants**: *Rumex acetosella* (Medium/Low)
Global: Vulnerable Plants: *Aralia hispida* (G5, VA state-rare), *Carex polymorpha* (G3, VA & WV state-rare), *Minuartia groenlandica* (G5, VA state-rare), *Oryzopsis asperifolia* (G5, VA & WV state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (18-Oct-2006). This small-patch community is restricted to high-elevation, acidic bedrock exposures in the Central Appalachians of eastern West Virginia and northwestern Virginia. There are fewer than 10 known occurrences, and the potential range and habitat of this community are both extremely limited. In addition, at least three of the occurrences are on national park land and are located at popular destinations for hikers, which has lead to significant trampling impacts and soil mat removal.

RELATED CONCEPTS

Global Similar Types:
- *Kalmia latifolia - Gaylussacia (baccata, brachycera)* Cumberland Shrubland (CEGL008470) of Kentucky and possibly Virginia and Tennessee.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: See Global Comments.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Classification of this type is based on analysis of 13 plot samples from Virginia and West Virginia. This community has some affinities to various Southern Appalachian heath bald communities in floristics, structure, and general edaphic conditions, but lacks many of the characteristic Southern Appalachian species such as *Rhododendron carolinianum, Rhododendron catawbiense, Rhododendron calendulaceum, Leucothoe recurva, Pieris floribunda*, and *Leiophyllum buxifolium*. Species of northern affinity not found in

Southern Appalachian heath balds (*Nemopanthus mucronatus, Vaccinium angustifolium, Lycopodium annotinum, Aralia hispida, Carex polymorpha, Oryzopsis asperifolia*) further differentiate this community, both from Southern Appalachian heath bald communities and from Kentucky examples of *Kalmia latifolia - Gaylussacia baccata*-dominated vegetation.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was observed in Shenandoah National Park in Rappahannock County, Virginia. It was also sampled along the Appalachian Trail at Marys Rock and the Pinnacle in Virginia.
Global Range: The type is known from scattered sites in the Northern Blue Ridge, Ridge and Valley, and Allegheny Mountains of eastern West Virginia and northwestern Virginia and Allegheny Plateau physiographic province in Maryland.
Nations: US
States/Provinces: VA:S1, WV
TNC Ecoregions: 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ba:CCC, M221Bc:CCC, M221Bd:CCP, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Shenandoah); USFS (George Washington, Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SCHB
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 plots; 2 accuracy assessment points): APPA.0387, APPA.0389, APPA.0390, APPA_AA_0392, APPA_AA_1220.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: CAP pers. comm. 1998, Eastern Ecology Working Group n.d., Fleming 1985, Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2004, Fleming et al. 2006*, Fleming et al. 2007a, Young et al. 2006, Young et al. 2009

[CEGL003958] *Vaccinium (angustifolium, myrtilloides, pallidum)* Central Appalachian Dwarf-shrubland

Translated Name: **(Lowbush Blueberry, Velvetleaf Huckleberry, Blue Ridge Blueberry) Central Appalachian Dwarf-shrubland**
Common Name: **Central Appalachian Blueberry Dwarf-shrubland**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	North-Central Appalachian Acidic Scrub & Grassland (G789)
Alliance	*Vaccinium angustifolium - Vaccinium pallidum* Rocky Heath Alliance (A4111)

ELEMENT CONCEPT

Global Summary: This association occurs on mid- to high-elevation acidic rock outcrops or summits and is characterized by abundant dwarf *Vaccinium* spp. in areas with frequent fire and/or droughty soils. This community is dominated by heaths or heath-like shrubs (typically blueberries *Vaccinium angustifolium, Vaccinium myrtilloides, Vaccinium stamineum, Vaccinium pallidum (= Vaccinium vacillans)*) and is commonly referred to as "heath barrens." Soils are shallow accumulations of organic material on bedrock habitats. Small trees may be present but are very sparse. The herbaceous layer is usually sparse with low diversity. In addition to *Vaccinium*, the shrub layer typically contains other low shrubs such as *Gaylussacia baccata, Kalmia angustifolia, Lyonia ligustrina*, and *Comptonia peregrina*, with *Kalmia latifolia* present in some areas. *Quercus ilicifolia* is frequently present, with variable cover, above the low heaths. Herbaceous plants scattered among the shrubs include *Deschampsia flexuosa, Schizachyrium scoparium, Carex pensylvanica, Carex argyrantha, Danthonia spicata, Piptatherum pungens (= Oryzopsis pungens), Lysimachia quadrifolia, Rubus hispidus, Melampyrum lineare, Solidago canadensis, Lycopodium dendroideum*, and *Lycopodium digitatum*. Mosses (including *Polytrichum* spp.) and lichens usually are present.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: These blueberry heath balds are found on northern or high-elevation acidic rock outcrops or summits. The sampled site is a somewhat steep, east-facing upper-slope rock outcrop with dry, rapidly drained soil. The unvegetated surface includes leaf litter, with small amounts of exposed bedrock and large/small rocks. No evidence of disturbance was reported.
Global Environment: These patchy communities are typically found on higher-elevation acidic rock outcrops or summits. Along with bedrock outcrops, ledges, summits of igneous or metamorphic rock, this association is sometimes found in depressions on valley floor frost pockets. Soils are shallow accumulations of organic material on bedrock habitats.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This shrubland is characterized by abundant dwarf *Vaccinium* spp. with *Gaylussacia baccata, Quercus ilicifolia*, and *Kalmia angustifolia*. Widely scattered trees, including *Betula lenta* and *Quercus prinus*, and tall shrubs such as *Prunus serotina* and *Rhus glabra* are possible along with the very dense heath shrubs. Herbs are sparse but may include *Carex pensylvanica* and *Schizachyrium scoparium*.
Global Vegetation: This dwarf-shrubland is dominated by locally dense *Vaccinium* (*Vaccinium angustifolium, Vaccinium stamineum*, and/or *Vaccinium pallidum (= Vaccinium vacillans)*. Scattered small individuals of *Pinus strobus, Pinus rigida, Prunus serotina*, and/or *Betula populifolia* may occur where soil has accumulated. The herbaceous layer is usually sparse with low diversity. In addition to *Vaccinium*, the shrub layer typically contains other shrubs such as *Gaylussacia baccata, Kalmia angustifolia, Lyonia ligustrina*, and *Comptonia peregrina*, with *Kalmia latifolia* present in some areas. *Quercus ilicifolia* is frequently present, with variable cover, above the low heaths. Herbaceous plants scattered among the shrubs include *Deschampsia flexuosa, Schizachyrium scoparium, Carex pensylvanica, Carex argyrantha, Danthonia spicata, Piptatherum pungens (= Oryzopsis pungens), Lysimachia quadrifolia, Rubus hispidus, Melampyrum lineare, Solidago canadensis, Lycopodium dendroideum*, and *Lycopodium digitatum*. Mosses (including *Polytrichum* spp.) and lichens usually are present.
Global Dynamics: Fire is an important natural disturbance agent, but some areas may be edaphically maintained.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium stamineum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia angustifolia*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Quercus ilicifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Comptonia peregrina*, *Gaylussacia baccata*, *Vaccinium angustifolium*, *Vaccinium pallidum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia angustifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Carex pensylvanica*, *Gaylussacia baccata*, *Schizachyrium scoparium*, *Vaccinium stamineum*
Global: *Comptonia peregrina*, *Deschampsia flexuosa*, *Gaylussacia baccata*, *Kalmia latifolia*, *Lysimachia quadrifolia*, *Melampyrum lineare*, *Quercus ilicifolia*, *Vaccinium angustifolium*, *Vaccinium pallidum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (4-Aug-2010). This association is distributed in the Central Appalachians and adjacent ecoregions, but does not appear to be abundant in any of the states in which it occurs.

RELATED CONCEPTS

Global Similar Types:
- *Gaylussacia baccata - Vaccinium pallidum - Vaccinium corymbosum* Shrubland (CEGL006622) occurs on sandy plains and often features taller vegetation.
- *Vaccinium angustifolium - Sorbus americana / Sibbaldiopsis tridentata* Dwarf-shrubland (CEGL005094)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The site in New York does not have any rock outcrops and has a very dense heath layer with widely scattered trees.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type shares many species and the general environmental setting with *Vaccinium angustifolium - Sorbus americana / Sibbaldiopsis tridentata* Dwarf-shrubland (CEGL005094), but it lacks species of more northern affinity such as *Picea* spp., *Abies* spp., and *Sorbus* spp., and is not characterized by *Sibbaldiopsis tridentata*. It results from frequent fires and droughty soils, with cold climate having less effect than in CEGL005094. Areas with similar floristics but occurring on sandplains, generally with a history of anthropogenic disturbance, are covered in *Gaylussacia baccata - Vaccinium pallidum - Vaccinium corymbosum* Shrubland (CEGL006622). In Maryland, this type is associated with "sandstone glades" over Potsville sandstone formations of the Allegheny Plateau. Stands are positioned on bedrock pavement on upper slopes, ridges, and crests at 820-855 m (2700-2800 feet). They are characterized by dense heaths of *Vaccinium pallidum* and/or *Gaylussacia baccata*. *Vaccinium angustifolium* and *Kalmia latifolia* are present in 50% of plots with mean cover (N=4 plots) ranging from 10-25% and 5-10%, respectively. Also reported are stunted *Quercus prinus (= Quercus montana)* and *Nyssa sylvatica* at low cover, in addition to an occasional *Sorbus americana*. Mean species richness among four plots is 25, homoteneity is 0.780, and Bray-Curtis similarity is 0.541.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Black Mountain - Harriman State Park in New York.
Global Range: This association is known from the mid-Atlantic states of Maryland, New Jersey, Pennsylvania and West Virginia, extending north to the Catskills.
Nations: US
States/Provinces: MD, NJ, NY, PA:S1, WV:S2?
TNC Ecoregions: 49:P, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCP, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Bd:CCC, 221Ea:CCC, 221Fa:CCC, M212Ea:CCP, M212Eb:CCP, M221Ac:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap, Upper Delaware); USFS (Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SCAB
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 observation point; 4 accuracy assessment points): APPA.1389, APPA_AA_1932, APPA_AA_2025, APPA_AA_2064, APPA_AA_3220.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): E. Largay and S.C. Gawler
References: Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Fike 1999*, Harrison 2004, Harrison 2011, Perles et al. 2007, Perles et al. 2008, WVNHP unpubl. data b, Walton et al. 1997

A3913 *Vaccinium angustifolium - Vaccinium pallidum* Sandy Heath Alliance

Alliance Summary Description: This northeastern U.S. heath barrens alliance of dry, sandy, nutrient-poor soils is dominated by low, usually heath shrubs such as *Gaylussacia baccata, Vaccinium angustifolium*, and *Vaccinium pallidum*, and other low shrubs such as *Arctostaphylos uva-ursi* and *Comptonia peregrina*. Characteristic herbs and forbs include *Carex lucorum, Carex pensylvanica, Ionactis linariifolius, Pteridium aquilinum, Schizachyrium scoparium*, and *Sericocarpus asteroides*.

[CEGL006622] *Gaylussacia baccata - Vaccinium pallidum - Vaccinium corymbosum* Shrubland

Translated Name: **Black Huckleberry - Blue Ridge Blueberry - Highbush Blueberry Shrubland**
Common Name: **Successional Heath Shrubland**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	North-Central Appalachian Acidic Scrub & Grassland (G789)
Alliance	*Vaccinium angustifolium - Vaccinium pallidum* Sandy Heath Alliance (A3913)

ELEMENT CONCEPT

Global Summary: This native successional ericaceous shrub community occurs in woodland and forest openings on acidic, coarse-textured soils that have been burned or cleared in the Northeast. Shrub height ranges from less than 0.5 m to 5 m in height. Species composition varies based on geography and moisture regime, but dominant shrubs typically include *Gaylussacia baccata, Vaccinium pallidum, Vaccinium corymbosum, Kalmia angustifolia*, and/or *Kalmia latifolia*. Associate shrubs may include some combination of the following species: *Photinia melanocarpa, Amelanchier canadensis, Leucothoe racemosa (= Eubotrys racemosa), Gaylussacia frondosa* (in southern examples), *Vaccinium myrtilloides, Vaccinium stamineum, Lyonia mariana, Ilex glabra, Quercus ilicifolia, Morella pensylvanica*, and *Clethra alnifolia*. *Smilax rotundifolia* and *Smilax glauca* may also be present. Scattered regeneration trees are typical with less than 10% cover; *Pinus rigida* is the most common tree associate. Herbs are uncommon due to the dense shrub cover and may include *Pteridium aquilinum, Carex pensylvanica, Gaultheria procumbens, Comptonia peregrina, Epigaea repens, Danthonia spicata*, and *Deschampsia flexuosa*. Mosses and lichens can be present in abundance in some examples. Non-native plants are uncommon in this community.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This native successional ericaceous shrub community was sampled once in southern Pennsylvania in the Central Appalachian project area on a moderate northwest-facing midslope with dry, well-drained silt loam soil under a transmission right-of-way. The unvegetated surface is dominated by leaf litter with a few small rocks. Evidence of disturbance includes the presence of powerlines and exotic plant species.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This community usually occurs on acidic soils that have been cleared or burned, such as forest openings or powerlines.

Global Environment: This native successional ericaceous shrub community occurs in woodland and forest openings on acidic, coarse-textured soils that have been burned or cleared in the Northeast. Shrub height ranges from less than 0.5 m to 5 m in height.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This successional shrubland is dominated by native heath shrubs including *Gaylussacia* spp., *Vaccinium* spp. (including *Vaccinium stamineum*), and *Kalmia latifolia*. *Smilax rotundifolia, Comptonia peregrina*, and *Photinia melanocarpa* are also common. *Dennstaedtia punctilobula* is the dominant herb.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The dominant shrubs typically include *Gaylussacia baccata*, *Nemopanthus mucronatus,* and *Alnus incana. Calamagrostis canadensis* is a common herb.

Global Vegetation: Species composition varies based on geography and moisture regime, but dominant shrubs typically include *Gaylussacia baccata, Vaccinium pallidum, Vaccinium corymbosum, Kalmia angustifolia*, and/or *Kalmia latifolia*. Associate shrubs may include some combination of the following species: *Photinia melanocarpa, Amelanchier canadensis, Leucothoe racemosa (= Eubotrys racemosa), Gaylussacia frondosa* (in southern examples), *Vaccinium myrtilloides, Vaccinium stamineum, Lyonia mariana, Ilex glabra, Quercus ilicifolia, Morella pensylvanica*, and *Clethra alnifolia*. *Smilax rotundifolia* and *Smilax glauca* may also be present. Scattered regeneration trees are typical with less than 10% cover, and tree species vary from north to south (i.e., *Pinus rigida* in New Jersey and *Picea mariana* in Maine). Herbs are uncommon due to the dense shrub cover and may include *Pteridium aquilinum, Carex pensylvanica, Gaultheria procumbens, Comptonia peregrina, Epigaea repens, Danthonia spicata*, and *Deschampsia flexuosa*. Mosses and lichens can be present in abundance in some examples. Non-native plants are uncommon in this community.

Global Dynamics: This successional community regenerates from fire, clearing, or cutting. The dense cover of shrubs can limit the establishment of herbs and small tree seedlings. However, this community may be relatively short-lived as it gradually succeeds to forest over time unless managed. These barrens provide habitat for the upland sandpiper, whimbrel, and short-eared owl.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia frondosa*, *Vaccinium stamineum*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus incana*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Nemopanthus mucronatus*
Herb (field)	Graminoid	*Calamagrostis canadensis*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia frondosa*, *Vaccinium stamineum*
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Gaylussacia frondosa*, *Vaccinium stamineum*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Gaylussacia baccata*
Global: *Gaylussacia frondosa*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Cirsium vulgare* (Medium/Low), *Rumex acetosella* (Medium/Low), *Verbascum thapsus* (Medium)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (23-Nov-2009). This is a successional community that arises from anthropogenic disturbance. New York ranks it as G4S4.

RELATED CONCEPTS

Global Similar Types:

- *Elaeagnus umbellata - Cornus racemosa - Rosa multiflora - Juniperus virginiana* Ruderal Shrubland (CEGL006451) has more non-native shrubs.
- *Gaylussacia baccata - Vaccinium angustifolium - Arctostaphylos uva-ursi / Schizachyrium littorale* Dwarf-shrubland (CEGL006066) comprised of dwarf-shrubs and influenced by onshore winds and salt spray in coastal settings.
- *Vaccinium (angustifolium, myrtilloides, pallidum) - Cladina rangiferina* Dwarf-shrubland (CEGL006426) is more northern and with *Picea mariana* as the common tree associate.
- *Vaccinium (angustifolium, myrtilloides, pallidum)* Central Appalachian Dwarf-shrubland (CEGL003958) is floristically similar but on rocky hilltops.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community can be distinguished from Northeastern Ruderal Shrubland (CEGL006451) by the dominance of native ericaceous shrubs.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: Without continual intervention by the electric company, the site would return to a native oak-heath forest type.
Global Classification Comments: Described from quick point data collected in New Jersey. Although this association is placed in a dwarf-shrubland alliance, this community is a taller shrubland.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled in Franklin County, Pennsylvania.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: No data are available.
Global Range: This shrubland has been documented from southern Maine to Pennsylvania and west to New York.
Nations: US
States/Provinces: MA, ME, NJ, NY, PA
TNC Ecoregions: 48:C, 59:C, 61:C, 62:C
USFS Ecoregions (1994/95): 221Ab:CCC, 222I:CC, 232Aa:CCC, 232Ab:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Northern Appalachians]); USFS (Finger Lakes); USFWS (Cape May, E.B. Forsythe, Monomoy, Nomans Land Island)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SXCN, SXHE
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 observation point; 1 accuracy assessment point): APPA.1316, APPA_AA_1094.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (4 accuracy assessment points): APPA_AA_1925, APPA_AA_2070, APPA_AA_2295, APPA_AA_2338.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): E. Largay and M. Russo
Global Description Author(s): E. Largay and S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, NatureServe 2009, Sneddon 2010

G657. SOUTHERN APPALACHIAN GRASS BALD

Group Summary Description: These densely vegetated herbaceous communities are found in the highest elevational zone of the Southern Appalachians, generally above 1524 m (5000 feet) but occasionally to 1220 m (4000 feet), and at slightly lower elevations at its northern limit in Virginia and West Virginia. The vegetation consists of dense herbaceous cover characteristically dominated by *Danthonia compressa* or *Carex* spp. Extensive areas have become dominated by *Rubus allegheniensis* and by mixtures of native grasses and exotic pasture grasses. Most examples of grassy balds have some invading shrubs and trees, often dense enough to threaten the herbaceous vegetation. The combination of high-elevation, non-wetland sites and dense herbaceous vegetation without appreciable rock outcrop conceptually distinguish this group from all others in the Southern Appalachians. However, the widespread areas of degraded spruce-fir with grass and/or shrub cover and the invasion of grassy balds by trees blur the distinction somewhat.

A2026 *Carex pensylvanica - Danthonia compressa - Hypericum mitchellianum* Grass Bald Alliance

Alliance Summary Description: This alliance includes montane grasslands dominated by *Danthonia compressa* and/or *Carex pensylvanica*. Some examples have significant cover of *Sibbaldiopsis tridentata* or *Rhododendron calendulaceum*. Species dominance is highly variable among and within occurrences. Associated species can include *Carex brunnescens, Carex debilis, Deschampsia flexuosa, Houstonia serpyllifolia, Oclemena acuminata (= Aster acuminatus), Prenanthes roanensis, Smilax herbacea, Solidago glomerata*, and *Stachys clingmanii*. Other associated species include *Ageratina altissima var. roanensis, Angelica triquinata, Bromus pubescens, Dennstaedtia punctilobula, Fragaria virginiana, Helenium autumnale*, and *Polytrichum commune*. The exotic *Rumex acetosella* may also be present. Typical shrubs are *Menziesia pilosa, Pieris floribunda, Rhododendron calendulaceum, Rhododendron catawbiense, Rubus canadensis, Vaccinium corymbosum*, and *Vaccinium simulatum*. Examples dominated by *Carex pensylvanica* are typically ungrazed grass balds with deep soil, and lack significant shrub cover. Grasslands in this alliance occur at the highest elevations of the southern Appalachian Mountains, often adjacent to montane shrublands or dwarfed forests dominated by *Fagus grandifolia* or *Quercus rubra*. These grasslands occur at high elevations (usually above 1200-1500 m [4000-5000 feet]) in the Southern Blue Ridge, often on south- to southwest-facing domes, ridgetops and gentle slopes. Strong winds, high rainfall, frequent fog, shallow, rocky soils, and extremes of temperature and moisture are characteristic of these environments.

[CEGL004094] *Carex pensylvanica* Grassland

Translated Name: **Pennsylvania Sedge Grassland**
Common Name: **Grassy Bald (Sedge Type)**

USNVC Classification

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Grass Bald (G657)
Alliance	*Carex pensylvanica - Danthonia compressa - Hypericum mitchellianum* Grass Bald Alliance (A2026)

Element Concept

Global Summary: This association represents montane grasslands occurring over 1220 m (4000 feet) elevation in the southern Appalachian Mountains dominated by *Carex pensylvanica*. Associated species include *Carex debilis, Polytrichum commune, Helenium autumnale, Danthonia compressa, Sibbaldiopsis tridentata, Fragaria virginiana, Ageratina altissima var. roanensis, Angelica triquinata, Oclemena acuminata (= Aster acuminatus), Bromus pubescens*, *Dennstaedtia punctilobula,* and *Rumex acetosella* (exotic). Woody species such as *Rhododendron catawbiense, Pieris floribunda, Rubus canadensis*, and *Robinia hispida*, may have sparse coverage in some occurrences.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This high-elevation grassy bald community generally occurs above 1,220 m (4,000 feet) elevation (but rarely down to 1,065 m [3,500 feet]). Sampled sites are gentle northwest- and west-facing ridgetops with mesic, well-drained loam and sandy loam soil. The unvegetated surface is dominated by a thick layer of leaf litter with some downed wood and rocks. Evidence of disturbance includes a catastrophic fire around the mid-1930s, trails, wind/ice damage, and possible impacts from ozone and nitrogen deposition.
Global Environment: Montane grasslands over 1220 m (4000 feet) elevation in the southern Appalachian Mountains.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This community is defined by its dense (up to 90% cover) herbaceous layer dominated by *Carex* spp., including *Carex debilis var. rudgei, Carex intumescens*, and particularly *Carex pensylvanica*. Additional common and/or abundant herbs include *Dennstaedtia punctilobula, Dryopteris campyloptera*, and *Luzula acuminata var. carolinae*. However, in addition, there may be a sparse (10%) emergent tree layer and/or fairly dense shrub layer that can include *Acer rubrum, Ilex montana, Magnolia fraseri, Picea rubens, Prunus pensylvanica*, and/or *Vaccinium simulatum*. This community also supports TN-state imperiled *Dicranodontium asperulum*.
Global Vegetation: This grassland is dominated by *Carex pensylvanica*. Associated species include *Carex debilis, Polytrichum commune, Helenium autumnale, Danthonia compressa, Sibbaldiopsis tridentata, Fragaria virginiana, Ageratina altissima var. roanensis, Angelica triquinata, Oclemena acuminata (= Aster acuminatus), Bromus pubescens, Dennstaedtia punctilobula*, and *Rumex acetosella* (exotic). Woody species, such as *Rhododendron catawbiense, Pieris floribunda, Rubus canadensis*, and *Robinia hispida*, may have sparse coverage in some occurrences.

Most Abundant Species

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex montana*
Herb (field)	Graminoid	*Carex debilis* var. *rudgei*, *Carex intumescens*, *Carex pensylvanica*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex pensylvanica*

Characteristic Species

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Carex pensylvanica*
Global: *Carex pensylvanica*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Dicranodontium asperulum* (G4G5, TN state-imperiled)
Global: Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Erythronium umbilicatum* ssp. *monostolum* (G5T3), *Gentiana austromontana* (G3), *Geum geniculatum* (G2), *Hypericum graveolens* (G3), *Hypericum mitchellianum* (G3), *Krigia montana* (G3), *Lilium grayi* (G3, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic); **Invasive/Exotic Plants**: *Rumex acetosella* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (15-Dec-1994). This community is known from the highest elevations of the southern Appalachian Mountains. It has a small range, few occurrences, and is rapidly disappearing due to vegetational succession. This community supports a diverse flora with many rare, unusual, and threatened species. It is threatened by high levels of recreational use and the introduction of exotic plant and animal species, and by successional trends of uncertain cause.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This community is a less common grassy bald type, with similar species as Grassy Bald (Southern Grass Type) (CEGL004242) but with *Carex pensylvanica* dominant. Small patches (below MMU) of *Carex* spp. may represent inclusions. (Not all *Carex* is *Carex pensylvanica*.)
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: A *Carex pensylvanica*-dominated grassy bald. Relatively high cover of forest trees and shrubs suggests successional advance toward forest is well underway.
Global Classification Comments: Three plots from Roan Mountain were classified as this association in the Appalachian Trail project (Fleming and Patterson 2009a), although two of the plots capture shrublands (heath thickets) with dense *Carex* below, or heath bald / grass bald transition areas. Species with a 100% constancy in the three plots include *Acer rubrum, Carex debilis var. rudgei, Carex pensylvanica, Dennstaedtia punctilobula, Ilex montana, Picea rubens, Prunus pensylvanica*, and *Vaccinium simulatum*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Documented along and near AT only from Unaka Mountain in Unicoi County, Tennessee.
Global Range: This community is known from the highest elevations of the southern Appalachian Mountains of North Carolina and Tennessee.
Nations: US
States/Provinces: NC:S1, TN
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CC?
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge]); USFS (Cherokee, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HBGF
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (3 plots; 7 accuracy assessment points): APPA.0588, APPA.0589, APPA.0590, APPA_AA_0163, APPA_AA_0260, APPA_AA_0557, APPA_AA_0798, APPA_AA_0863, APPA_AA_1022, APPA_AA_1031.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson
References: Allard 1990, Fleming and Patterson 2009a, Fleming pers. comm., Peet et al. unpubl. data, Pyne 1994, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

[CEGL004242] *Danthonia compressa - (Sibbaldiopsis tridentata)* Grassland

Translated Name: **Flattened Oatgrass - (Shrubby Fivefingers) Grassland**
Common Name: **Grassy Bald (Southern Grass Type)**

USNVC Classification

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Grass Bald (G657)
Alliance	*Carex pensylvanica - Danthonia compressa - Hypericum mitchellianum* Grass Bald Alliance (A2026)

Element Concept

Global Summary: This community consists of graminoid-dominated vegetation with scattered shrubs, occurring on moderate to high-elevation peaks and saddles in the Southern Blue Ridge. Characteristically, this vegetation is strongly dominated by *Danthonia compressa*, or in some areas codominated by the subshrub *Sibbaldiopsis tridentata (= Potentilla tridentata)*. Other characteristic herbaceous species are *Angelica triquinata, Carex pensylvanica, Carex debilis, Carex intumescens, Carex brunnescens, Deschampsia flexuosa, Erythronium umbilicatum ssp. monostolum, Gentiana austromontana, Gentianella quinquefolia, Houstonia serpyllifolia, Ionactis linariifolius (= Aster linariifolius), Lysimachia quadrifolia, Oclemena acuminata (= Aster acuminatus), Potentilla canadensis, Prenanthes roanensis, Smilax herbacea, Solidago bicolor, Solidago glomerata, Stachys clingmanii*, and *Trautvetteria caroliniensis var. caroliniensis*. The floristic composition is a mixture of widespread species, northern disjunct species, such as *Agrostis mertensii, Carex siccata (= Carex aenea), Minuartia groenlandica, Packera schweinitziana (= Senecio schweinitzianus)*, and *Sibbaldiopsis tridentata*, and Southern Appalachian endemics, such as *Erythronium umbilicatum ssp. monostolum, Geum geniculatum, Geum radiatum, Houstonia serpyllifolia, Lilium grayi, Prenanthes roanensis, Solidago glomerata*, and *Stachys clingmanii*). Typical shrubs (which may occur as scattered individuals or as patches) are *Rhododendron calendulaceum, Rhododendron catawbiense, Menziesia pilosa, Vaccinium corymbosum*, and *Rubus canadensis*. Species indicative of past grazing include *Phleum pratense, Agrostis gigantea, Hieracium scabrum, Rumex acetosella*, and *Prunella vulgaris*. This community occurs on high-elevation (usually above 1350 m [4500 feet]), often south- to southwest-facing domes, ridgetops, and gentle slopes. Strong winds, high rainfall, frequent fog, shallow rocky soils, and extremes of temperature and moisture are characteristic of these environments. It is known from the highest elevations of the southern Appalachian Mountains. It is typically surrounded by dwarfed forests dominated by *Fagus grandifolia* or *Quercus rubra*.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This high-elevation grassy bald community generally occurs above 1,220 m (4,000 feet) elevation (but rarely down to 1,065 m [3,500 feet]). Sampled sites range from moderate to steep upper slopes and ridgetops with dry to mesic, rapidly drained to moderately well-drained loam and sandy loam soil. The unvegetated surface may be dominated by leaf litter or may be a mix of leaf litter, exposed bedrock, large/small rocks, and bare soil. These sites were likely historically grazed by sheep or cattle. Evidence of disturbance includes past fire (natural and prescribed), erosion, trails, wind/ice damage, frost heave, and the presence of exotic plants.

Global Environment: This community occurs on high-elevation (usually above 1350 m [4500 feet]), often south- to southwest-facing domes, ridgetops, and gentle slopes. Strong winds, high rainfall, frequent fog, shallow rocky soils, and extremes of temperature and moisture are characteristic of these environments. In North Carolina and Tennessee, this grassland vegetation is typically surrounded by dwarfed forests dominated by *Fagus grandifolia* or *Quercus rubra*. On Whitetop Mountain, Virginia, the type occurs at elevations from 1525-1655 m (5000-5430 feet), adjacent to both well-developed *Picea rubens*-dominated forests and stunted northern hardwoods. Soils are extremely acidic (pH = 3.8), with low (5%) base saturation, high aluminum levels (1600 ppm), and relatively high (27%) organic matter content.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This is the most common naturally occurring grassy bald type in the corridor. It usually has a high percentage of *Danthonia compressa*, though this grass may not be evident at all seasons of the year. Other native species that may be present include *Sibbaldiopsis tridentata* (VA- and TN-state imperiled), *Angelica triquinata, Carex pensylvanica, Carex debilis var. rudgei, Dennstaedtia punctilobula, Deschampsia flexuosa, Gentiana austromontana, Oclemena acuminata, Gentianella quinquefolia, Houstonia serpyllifolia, Lysimachia quadrifolia, Packera schweinitziana, Potentilla canadensis, Prenanthes roanensis, Solidago bicolor, Solidago glomerata, Stachys clingmanii, Saxifraga michauxii*,

and *Solidago rugosa*. There may also be a sparse shrub layer that can include *Rubus canadensis* or *Vaccinium pallidum*. This community also supports TN-state critically imperiled *Alnus viridis ssp. crispa, Carex folliculata*, and *Minuartia groenlandica* and TN-state imperiled *Hypericum mitchellianum*.

Global Vegetation: This vegetation is graminoid-dominated with scattered shrubs. Most occurrences are strongly dominated by *Danthonia compressa*, but some sites are codominated by the subshrub *Sibbaldiopsis tridentata (= Potentilla tridentata)*. Other characteristic herbaceous species are *Angelica triquinata, Carex pensylvanica, Carex debilis var. rudgei, Carex intumescens, Carex brunnescens ssp. sphaerostachya, Deschampsia flexuosa, Erythronium umbilicatum ssp. monostolum, Gentiana austromontana, Gentianella quinquefolia, Houstonia serpyllifolia, Ionactis linariifolius (= Aster linariifolius), Lysimachia quadrifolia, Oclemena acuminata (= Aster acuminatus), Potentilla canadensis, Prenanthes roanensis, Smilax herbacea, Solidago bicolor, Solidago glomerata, Stachys clingmanii*, and *Trautvetteria caroliniensis var. caroliniensis*. The floristic composition is a mixture of widespread species, northern disjunct species such as *Sibbaldiopsis tridentata*; and Southern Appalachian endemics such as *Houstonia serpyllifolia, Lilium grayi*, and *Prenanthes roanensis*. Typical shrubs, which may occur as scattered individuals or patches are *Rhododendron calendulaceum, Rhododendron catawbiense, Menziesia pilosa, Vaccinium corymbosum*, and *Rubus canadensis*. Invasive, introduced species indicative of past grazing include *Phleum pratense, Agrostis gigantea, Hieracium caespitosum, Poa compressa, Rumex acetosella*, and *Prunella vulgaris*.

In the least disturbed, most natural areas, the most abundant or characteristic herbaceous associates are *Carex brunnescens ssp. sphaerostachya, Carex debilis var. rudgei, Lysimachia quadrifolia, Dennstaedtia punctilobula, Carex pensylvanica, Potentilla canadensis, Prenanthes roanensis, Solidago rugosa, Ageratina altissima var. roanensis*, and *Hypericum mitchellianum*. Despite the exposed topography, atmospheric conditions create a very moist microclimate, as evidenced by large populations of species often associated with wetlands, including *Helenium autumnale, Packera aurea, Houstonia serpyllifolia, Solidago patula*, and *Carex intumescens*.

Rare or northern disjunct plant species reported from this community include *Agrostis mertensii, Alnus viridis ssp. crispa, Botrychium multifidum, Calamagrostis canadensis, Carex siccata (= Carex aenea), Carex cristatella, Carex misera, Delphinium exaltatum, Gentiana austromontana, Geum geniculatum, Houstonia purpurea var. montana, Huperzia selago, Hypericum buckleii, Lilium grayi, Lilium philadelphicum, Lycopodium dendroideum, Lycopodium hickeyi, Minuartia groenlandica, Monarda media, Phlox subulata, Platanthera grandiflora, Poa palustris, Prenanthes roanensis, Rhododendron cumberlandense, Rhododendron vaseyi, Packera schweinitziana (= Senecio schweinitzianus), Spiranthes ochroleuca*, and *Trisetum spicatum* (Schafale and Weakley 1990). Exotic species that occur, probably as a result of grazing, include *Prunella vulgaris, Phleum pratense*, and *Poa compressa*.

Global Dynamics: The origin and ecological dynamics of this vegetation type are not clear. Several disturbance mechanisms, both natural and anthropogenic, have been hypothesized, including fire, grazing, trampling, clearing, climatic change, windthrow, or some combination of these influences. The importance of megaherbivores in long-term bald maintenance has recently been proposed (Wiegl and Knowles 1999). It appears that new occurrences of this community are not being created, and that many existing ones are being encroached by shrub and tree species. The presence of northern disjunct species requiring open habitat suggests that some of these areas have been open since the Pleistocene. This is the case at Whitetop Mountain, Virginia, although there is little question that the original openings were greatly expanded during a long history of grazing and the development of a 19th century resort. A. Weakley (pers. comm. 2001) suggests that the balds of Roan Mountain, Tennessee, are primarily natural, whereas those farther north are of anthropogenic origin.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Sibbaldiopsis tridentata*
Herb (field)	Graminoid	*Carex pensylvanica*, *Danthonia compressa*, *Deschampsia flexuosa*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Rhododendron calendulaceum*, *Rubus allegheniensis*
Short shrub/sapling	Dwarf-shrub	*Sibbaldiopsis tridentata*
Herb (field)	Flowering forb	*Potentilla canadensis*
Herb (field)	Graminoid	*Agrostis perennans*, *Carex brunnescens*, *Carex debilis*, *Carex pensylvanica*, *Danthonia compressa*, *Deschampsia flexuosa*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Carex debilis* var. *rudgei*, *Danthonia compressa*, *Deschampsia flexuosa*, *Prenanthes roanensis*, *Sibbaldiopsis tridentata*
Global: *Carex brunnescens* ssp. *sphaerostachya*, *Carex debilis* var. *rudgei*, *Carex normalis*, *Danthonia compressa*, *Danthonia spicata*, *Deschampsia flexuosa*, *Houstonia serpyllifolia*, *Hypericum mitchellianum*, *Lysimachia quadrifolia*, *Packera schweinitziana*, *Prenanthes roanensis*, *Sibbaldiopsis tridentata*, *Solidago roanensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Abies fraseri* (G2, globally imperiled & TN-state critically imperiled), *Alnus viridis* ssp. *crispa* (G5T5, TN state-critically imperiled), *Carex folliculata* (G5, TN state-critically imperiled), *Hypericum mitchellianum* (G3, TN state-imperiled), *Minuartia groenlandica* (G5, TN state-critically imperiled), *Prenanthes roanensis* (G3), *Sibbaldiopsis tridentata* (G5, TN state-critically imperiled); **Invasive/Exotic Plants**: *Hieracium caespitosum* (Medium/Insignificant, invasive/exotic), *Phleum pratense* (Medium, invasive/exotic), *Potentilla inclinata* (invasive/exotic), *Rumex acetosella* (Medium/Low, invasive/exotic)
Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Agrostis mertensii* (G5, rare or northern disjunct), *Allium allegheniense* (G3?), *Alnus viridis* ssp. *crispa* (G5T5, rare or northern disjunct), *Botrychium multifidum* (G5, rare or northern disjunct), *Calamagrostis canadensis* (G5, rare or northern disjunct), *Carex cristatella* (G5, rare or northern disjunct), *Carex misera* (G3, rare or northern disjunct), *Carex siccata* (G5, rare or northern disjunct), *Cuscuta rostrata* (G4, VA state-rare), *Delphinium exaltatum* (G3, rare or northern disjunct), *Erythronium umbilicatum* ssp. *monostolum* (G5T3), *Gentiana austromontana* (G3), *Geum geniculatum* (G2), *Geum radiatum* (G2, Southern Appalachian endemic), *Houstonia purpurea* var. *montana* (G5T2, Southern Blue Ridge endemic), *Huperzia selago* (G5, rare or northern disjunct), *Hypericum buckleii* (G3, Southern Blue Ridge endemic), *Hypericum graveolens* (G3), *Hypericum mitchellianum* (G3), *Lilium grayi* (G3, Southern Blue Ridge endemic), *Lilium philadelphicum* (G5, rare or northern disjunct), *Lycopodium dendroideum* (G5, rare or northern disjunct), *Lycopodium hickeyi* (G5, rare or northern disjunct), *Minuartia groenlandica* (G5, rare or northern disjunct), *Monarda media* (G4?, rare or northern disjunct), *Packera schweinitziana* (G5?, Rare or northern disjunct), *Phlox subulata* (G5, rare or northern disjunct), *Platanthera grandiflora* (G5, rare or northern disjunct), *Poa palustris* (G5, rare or northern disjunct), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rhododendron cumberlandense* (G4?, rare or northern disjunct), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Solidago glomerata* (G3), *Spiranthes ochroleuca* (G4, rare or northern disjunct), *Stachys clingmanii* (G2), *Trisetum spicatum* (G5, rare or northern disjunct), *Vaccinium hirsutum* (G3); **Invasive/Exotic Plants**: *Agrostis gigantea* (Medium/Low), *Agrostis stolonifera* (Medium/Low), *Hieracium caespitosum* (Medium/Insignificant), *Phleum pratense* (Medium), *Poa compressa* (High/Low), *Prunella vulgaris* (weedy native), *Rumex acetosella* (Medium/Low); **Other Plants**: *Huperzia appalachiana* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (14-Dec-1998). This community has small range, few occurrences, and is rapidly disappearing due to vegetational succession. This community is threatened by high levels of recreational use and the introduction of exotic plant and animal species, as well as by successional trends of uncertain cause.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Some examples may contain *Phleum pratense*, but these should not be confused with *Phleum*-dominated pastures or hayfields of anthropogenic origin at lower elevations [see Grazed Montane Grassland / Fire Meadow (CEGL004018)]. Some examples may have tall herbs, *Rubus* spp., or other shrubs at less than 25% cover, perhaps confounding the determination and/or signature.
Global Classification Comments: Notable examples include various peaks of the Roan Mountain complex, Long Hope Valley, Shining Rock Wilderness, and Great Smoky Mountains National Park. The origin of this community is not clear, and in fact, several mechanisms, both natural and anthropogenic, have been proposed including fire, grazing, trampling, clearing, climatic change, windthrow, or some combination of these influences. The presence of northern disjunct species requiring open habitat may suggest that some of these areas have been open since the Ice Age. A. Weakley (pers. comm.) suggests that the balds of Roan Mountain, Tennessee, are primarily natural, whereas those farther north are of anthropogenic origin. It appears that new occurrences of this community are not being created, and those that exist are being encroached by shrub and tree species. Lindsay (1976) reported that examples of this community in Great Smoky Mountains National Park will have disappeared by the end of the century if management is not undertaken to halt invasion by woody plants. However, these balds are among those most likely to be of anthropogenic origin. Six plots from Roan Mountain, Whitetop Mountain, and Gregory Bald were classified as this association in the Appalachian Trail project (Fleming and Patterson 2009a). Several plots have high cover by shrubs (*Amelanchier laevis, Rhododendron catawbiense, Rubus canadensis, Vaccinium corymbosum, Vaccinium erythrocarpum, Vaccinium pallidum*) indicating woody encroachment or plot placement in an ecotone. Species that have $\geq$67% constancy are, in order of descending constancy, *Danthonia compressa, Sibbaldiopsis tridentata, Dennstaedtia punctilobula, Carex debilis var. rudgei, Rubus canadensis, Rumex acetosella*, and *Saxifraga michauxii*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled at three locations along and near the AT, from Whitetop Mountain (Virginia) to Great Smoky Mountains National Park in Tennessee.
Global Range: This montane sparse dwarf-shrubland is found in the high mountain areas of the Southern Appalachians. While the majority of examples occur in North Carolina, this community is also known from Tennessee and Virginia.
Nations: US
States/Provinces: NC:S1, TN, VA:S1
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Db:CC?, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HBGF
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (4 plots; 1 observation point; 24 accuracy assessment points): APPA.0095, APPA.0363, APPA.0593, APPA.0594, APPA.1124, APPA_AA_0109, APPA_AA_0140, APPA_AA_0156, APPA_AA_0183, APPA_AA_0237, APPA_AA_0282, APPA_AA_0298, APPA_AA_0341, APPA_AA_0344, APPA_AA_0421, APPA_AA_0453, APPA_AA_0456, APPA_AA_0469, APPA_AA_0740, APPA_AA_0825, APPA_AA_0900, APPA_AA_0918, APPA_AA_0975, APPA_AA_1074, APPA_AA_1126, APPA_AA_1205, APPA_AA_1307, APPA_AA_1513, APPA_AA_1590.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson
References: Allard 1990, Allard et al. 1990, Billings and Mark 1957, Bratton 1975, Cain 1931, DeSelm and Murdock 1993, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Gersmehl 1969, Gersmehl 1971, Gersmehl 1973, Lindsay 1976, Lindsay 1977, Lindsay 1978, Lindsay and

Bratton 1979a, Lindsay and Bratton 1979b, Lindsay and Bratton 1980, Mark 1958, Mark 1959, NCNHP 1993, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Pyne 1994, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, Stratton and White 1982, TDNH unpubl. data, VDNH 2003, Weakley pers. comm., Wiegl and Knowles 1999

A0930 *Rubus allegheniensis - Rubus canadensis* Shrubland Alliance

Alliance Summary Description: This alliance encompasses *Rubus*-dominated areas at high elevations in the Southern Blue Ridge, as well as related stands dominated by *Prunus pensylvanica*. This includes grassy balds (open montane grasslands), areas where the balsam woolly adelgid has caused *Abies fraseri* death, or other disturbed areas such as landslide scars that create open conditions. Stands of this alliance are dominated by *Rubus allegheniensis, Rubus canadensis*, and *Rubus idaeus ssp. strigosus*. Examples in otherwise grassy balds may also contain trace amounts of other species from adjacent grasslands, such as *Athyrium filix-femina ssp. asplenioides, Agrostis perennans, Angelica triquinata, Carex debilis var. rudgei, Carex brunnescens, Carex intumescens (= var. fernaldii)*, and *Rumex acetosella* (exotic). Successional stands at high elevation resulting from severe disturbance of spruce-fir forests (i.e., balsam woolly adelgid-affected stands), as well as exposed sites with other frequent, natural disturbance (such as shrub invasion of grazed fire meadows), may contain dense *Athyrium filix-femina ssp. asplenioides* and *Solidago glomerata* (on more protected sites). Scattered living trees and shrubs of *Amelanchier laevis, Betula alleghaniensis, Picea rubens, Prunus pensylvanica*, and *Sorbus americana* may occur.

[CEGL003892] *Rubus allegheniensis - Rubus canadensis / Carex pensylvanica* Shrubland

Translated Name: **Allegheny Blackberry - Smooth Blackberry / Pennsylvania Sedge Shrubland**
Common Name: **Southern Appalachian Blackberry Bald**

USNVC Classification

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Grass Bald (G657)
Alliance	*Rubus allegheniensis* - *Rubus canadensis* Shrubland Alliance (A0930)

Element Concept

Global Summary: Areas within open montane grasslands dominated by *Rubus* spp. (*Rubus allegheniensis* and/or *Rubus canadensis*) at high elevations in the Southern Blue Ridge. These shrublands also contain trace amounts of other species from the surrounding grassland, such as *Athyrium filix-femina ssp. asplenioides, Agrostis perennans, Angelica triquinata, Carex debilis var. rudgei, Carex brunnescens, Carex intumescens (= var. fernaldii)*, and *Rumex acetosella* (exotic).

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: These blackberry thickets are found at high elevation (above 1,525 m [5,000 feet]), adjacent to or interspersed with natural grasslands. They arise from successional processes on natural grass balds following grazing or natural processes such as fire.
Global Environment: This deciduous shrubland typically occurs at elevations from 1500-1980 m (5000-6500 feet). The developmental and ecological dynamics of this vegetation are poorly understood. Occurrences are thought to result from successional processes on natural grass balds following grazing and other disturbances, or following the cessation of natural disturbance regimes (e.g., periodic fires). Habitats are in exposed, upper-slope to crest positions, where low winter temperatures, high winds, and ice storms are characteristic. Stands occur both on edges of the natural bald on Whitetop Mountain, and in artificial balds that resulted from intensive logging, fires, and grazing on Mount Rogers and Wilburn Ridge.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: These blackberry thickets are composed of *Rubus canadensis* and/or *Rubus allegheniensis*.
Global Vegetation: These shrublands are dominated by *Rubus allegheniensis* and *Rubus canadensis*, usually occurring within and on the edges of open montane grasslands at high elevations in the Southern Blue Ridge. Stands may contain large colonies of *Carex pensylvanica* under the dominant shrubs, as well as scattered individuals of other species from the surrounding grassland, such as *Athyrium filix-femina ssp. asplenioides, Agrostis perennans, Angelica triquinata, Carex debilis var. rudgei, Carex brunnescens ssp. sphaerostachya, Carex intumescens*, and

Rumex acetosella (exotic). Virginia examples of this community are heavily dominated by *Rubus canadensis* and contain a wide variety of minor associates.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Liana	*Rubus allegheniensis*, *Rubus canadensis*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Rubus allegheniensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Rubus allegheniensis*, *Rubus canadensis*
Global: *Rubus allegheniensis*, *Rubus canadensis*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Cuscuta rostrata* (G4, VA state-rare); **Invasive/Exotic Plants**: *Rumex acetosella* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Jan-2016). This community is known from the highest elevations of the southern Appalachian Mountains. It has a small range, few occurrences, and is rapidly disappearing due to vegetational succession. This community supports a diverse flora with many rare, unusual, and threatened species. It is threatened by high levels of recreational use, by the introduction of exotic plant and animal species, and by successional trends of uncertain cause. Sometimes this montane shrubland is regarded as a more advanced successional stage of *Carex pensylvanica* Grassland (CEGL004094) or *Danthonia compressa - (Sibbaldiopsis tridentata)* Grassland (CEGL004242). This modified vegetation is now a natural part of high-elevation landscapes in the Southern Blue Ridge and an important part of the functioning landscape, providing habitat for many Southern Appalachian species. For conservation planning purposes, examples of this community may be best considered lower quality occurrences of CEGL004094 or CEGL004242.

RELATED CONCEPTS

Global Similar Types:

- *Rubus canadensis - (Rubus idaeus ssp. strigosus) / Athyrium filix-femina - Solidago glomerata* Shrubland (CEGL003893) results from natural disturbance at higher elevations.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This community occurs only at the highest elevations of the Southern Appalachians in North Carolina, Tennessee, and Virginia. Occurrences in Virginia are known only from the upper slopes of Whitetop Mountain, Mount Rogers, and Wilburn Ridge in the Southern Blue Ridge.
Global Classification Comments: This vegetation type is thought to result from successional processes on natural grass balds following grazing and other disturbances, or following the cessation of natural disturbance regimes (e.g., periodic fires). This vegetation is now a natural part of high-elevation landscapes in the Southern Blue Ridge and an important part of the functioning landscape, but it is not a conservation target in and of itself.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community occurs only at the highest elevations of the Southern Appalachians in North Carolina, Tennessee, and Virginia. Occurrences in Virginia are known only from the upper slopes of Whitetop Mountain, Mount Rogers, and Wilburn Ridge in the Southern Blue Ridge.
Global Range: This community occurs only at the highest elevations of the Southern Appalachians in North Carolina, Tennessee, and Virginia. Occurrences in Virginia are known only from the upper slopes of Whitetop Mountain, Mount Rogers, and Wilburn Ridge in the Southern Blue Ridge.
Nations: US
States/Provinces: NC, TN, VA

TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains?); USFS (Cherokee, Jefferson, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SBAB
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: This community was observed by the UMESC mapping team during the summer of 2010 and during accuracy assessment.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (11 accuracy assessment points): APPA_AA_0084, APPA_AA_0170, APPA_AA_0213, APPA_AA_0291, APPA_AA_0489, APPA_AA_0906, APPA_AA_1020, APPA_AA_1121, APPA_AA_1148, APPA_AA_1261, APPA_AA_1398.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S. Simon, G. Kauffman, D. Danley
References: Allard 1990, Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Pyne 1994, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

[CEGL003893] *Rubus canadensis - (Rubus idaeus ssp. strigosus) / Athyrium filix-femina - Solidago glomerata* Shrubland

Translated Name: **Smooth Blackberry - (Grayleaf Red Raspberry) / Common Ladyfern - Clustered Goldenrod Shrubland**
Common Name: **High-Elevation Blackberry Thicket**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Grass Bald (G657)
Alliance	*Rubus allegheniensis - Rubus canadensis* Shrubland Alliance (A0930)

ELEMENT CONCEPT

Global Summary: This vegetation occurs at high elevations in the southern Appalachian Mountains of North Carolina, Tennessee, and Virginia. It is a successional type found on exposed sites with frequent or intense natural disturbances (such as shrub invasion of grazed fire meadows). Some examples result from severe disturbance of spruce-fir forests (including balsam woolly adelgid-affected stands and stands which were severely burned after logging). It occurs on exposed summits and high slopes, typically at elevations over 1830 m (6000 feet), but slightly lower in Virginia. This community includes high-elevation Appalachian *Rubus* thickets and differs from *Rubus* thickets on grassy balds by predominance of forbs rather than sedges and by frequent presence of *Rubus idaeus*. Vegetation is variously dominated by dense *Rubus canadensis* or by dense *Athyrium filix-femina ssp. asplenioides* and *Solidago glomerata* (on more-protected sites). In examples related to death of *Abies fraseri*, the standing dead *Abies fraseri* often tower above the shrubs and herbs, and there is usually much downed woody debris. There can be a large variation in the structural characteristics of these communities, and in some instances they may approach (or technically reach) a woodland condition with *Prunus pensylvanica* forming a scattered, open, low-canopy layer (<50% cover). In addition, *Sorbus americana, Ilex montana, Acer rubrum, Cornus alternifolia*, and *Vaccinium simulatum* are some other woody species that can occur as a part of this sparse canopy or tall-shrub layer. Other species present include *Agrostis perennans, Angelica triquinata, Oclemena acuminata (= Aster acuminatus), Carex brunnescens, Carex crinita, Carex intumescens, Carex debilis, Cinna latifolia, Clintonia borealis, Danthonia compressa, Diervilla sessilifolia, Oxalis montana*, and *Rugelia nudicaulis*. Scattered living *Picea rubens, Betula alleghaniensis*, and *Amelanchier laevis* may occur. The long-term future of this community is uncertain, but it appears to be fairly stable over periods of several decades. A variation of this community occurs in areas such as Shining Rock Wilderness and parts of the Great Smoky Mountains, where intense fires occurred after logging had taken place. These intense fires, due to the accumulated slash, burned down nearly to mineral soil. These areas do not have as much coarse woody debris from downed spruce or fir and often have a canopy approaching that of a woodland with sparse coverage of *Sorbus americana* and *Prunus pensylvanica*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: These blackberry thickets are found at high elevation (above 1,525 m [5,000 feet]) and adjacent to or interspersed with high-elevation forests. They arise from severe fire or extreme spruce-fir or beech die-off.

Global Environment: This successional vegetation occurs at high elevations in the southern Appalachian Mountains of North Carolina, Tennessee, and Virginia. It occurs on exposed sites with frequent or intense natural disturbances (such as shrub invasion of grazed fire meadows). Some examples result from severe disturbance of spruce-fir forests (including balsam woolly adelgid-affected stands and stands which were severely burned after logging). It occurs on exposed summits and high slopes, typically at elevations over 1830 m (6000 feet), slightly lower in Virginia.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: These blackberry thickets are composed of *Rubus canadensis* and/or *Rubus allegheniensis*. Examples can include an open, woodland canopy of *Prunus pensylvanica* covering up to 60% of the understory.

Global Vegetation: Stands of this vegetation are variously dominated by dense *Rubus canadensis* or by dense *Athyrium filix-femina ssp. asplenioides* and *Solidago glomerata* (on more protected sites). Other species present include *Agrostis perennans, Angelica triquinata, Oclemena acuminata (= Aster acuminatus), Carex brunnescens, Carex crinita, Carex intumescens, Carex debilis, Cinna latifolia, Clintonia borealis, Danthonia compressa, Diervilla sessilifolia, Oxalis montana, Prunus pensylvanica, Sorbus americana*, and *Rugelia nudicaulis*. Scattered living *Picea rubens, Betula alleghaniensis*, and *Amelanchier laevis* may occur. In examples related to death of *Abies fraseri*, the standing dead *Abies fraseri* often tower above the shrubs and herbs, and there is usually much downed woody debris. A variation of this community occurs in areas such as Shining Rock Wilderness and parts of the Great Smoky Mountains, where intense fires occurred after logging had taken place. These intense fires, due to the accumulated slash, burned down nearly to mineral soil. These areas do not have as much coarse woody debris from downed spruce or fir and often have a canopy approaching that of a woodland with sparse coverage of *Sorbus americana* and *Prunus pensylvanica*.

Global Dynamics: This is successional vegetation that results from frequent or intense natural disturbances (such as shrub invasion of grazed fire meadows). Some examples result from severe disturbance of spruce-fir forests (including balsam woolly adelgid-affected stands and stands which were severely burned after logging).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Liana	*Rubus allegheniensis*, *Rubus canadensis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies fraseri*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Rubus canadensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Rubus allegheniensis*, *Rubus canadensis*

Global: *Athyrium filix-femina* ssp. *asplenioides*, *Diervilla sessilifolia*, *Rubus canadensis*, *Solidago glomerata*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Abies fraseri* (G2, dead; Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Jan-2016). This community represents an altered vegetation type, modified by the effects of an alien pest species and/or the effects of past land use. Examples of this vegetation once represented what is now a globally rare and critically imperiled community that has an uncertain future. This modified vegetation is now a natural part of high-elevation landscapes in the Southern Blue Ridge and an important part of the functioning landscape, providing habitat for many Southern Appalachian species. For conservation planning purposes, examples of this community may be best considered low-quality occurrences of forests in *Picea rubens - Abies fraseri* Forest Alliance (A0136).

RELATED CONCEPTS

Global Similar Types:
- *Rubus allegheniensis - Rubus canadensis / Carex pensylvanica* Shrubland (CEGL003892) occurs within and adjacent to open natural montane grasslands.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Global Classification Comments: This community differs from *Rubus* thickets on grassy balds by predominance of forbs rather than sedges and by frequent presence of *Rubus idaeus*. This association does not include Grass Balds that have been invaded by *Rubus*; such situations are covered in *Rubus allegheniensis - Rubus canadensis / Carex pensylvanica* Shrubland (CEGL003892).

This is successional vegetation resulting from severe disturbance of spruce-fir forests. It appears to be fairly stable over periods of several decades. This vegetation is now a natural part of high-elevation landscapes in the Southern Blue Ridge and an important part of the functioning landscape, but it is not a conservation target in and of itself.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This vegetation occurs at high elevations in the Southern Appalachians of North Carolina and Tennessee.
Global Range: This vegetation occurs at high elevations in the Southern Appalachians of North Carolina, Tennessee, and Virginia.
Nations: US
States/Provinces: NC, TN, VA
TNC Ecoregions: 51:C, 59:C
USFS Ecoregions (1994/95): M221Bd:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SHBT
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: This community was observed by the UMESC mapping team during the summer of 2010 and during accuracy assessment.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (23 accuracy assessment points): APPA_AA_0172, APPA_AA_0186, APPA_AA_0236, APPA_AA_0245, APPA_AA_0347, APPA_AA_0370, APPA_AA_0399, APPA_AA_0459, APPA_AA_0561, APPA_AA_0889, APPA_AA_0911, APPA_AA_0947, APPA_AA_0978, APPA_AA_1018, APPA_AA_1075, APPA_AA_1076, APPA_AA_1219, APPA_AA_1289, APPA_AA_1469, APPA_AA_1472, APPA_AA_1576, APPA_AA_1588, APPA_AA_1624.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson, T. Govus and M. Pyne
References: CAP pers. comm. 1998, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

G658. SOUTHERN APPALACHIAN SHRUB BALD

Group Summary Description: These dense shrubland communities are found in the highest elevational zone of the Southern Appalachians, generally above 1524 m (5000 feet) but occasionally to 1220 m (4000 feet), and at slightly lower elevations at its northern limit in Virginia and West Virginia, and in the Cumberland Mountains along the Virginia-Kentucky border. The vegetation consists of dense shrubby areas most often dominated by *Rhododendron catawbiense*, but substantial examples are also dominated by *Rhododendron carolinianum, Kalmia latifolia*, or a mixture of shrubs. One large (and unusual) example dominated by *Alnus viridis ssp. crispa* is also included. Heath balds may contain sparse stunted trees barely larger than the shrub canopy. This combination of high-elevation, non-wetland sites and dense shrub vegetation without appreciable rock outcrop conceptually distinguishes this group from all others in the Southern Appalachians. However, the widespread areas of degraded spruce-fir with grass and/or shrub cover and the invasion of balds by trees blur the distinction somewhat.

A0929 *Alnus viridis ssp. crispa* Shrub Bald Alliance

Alliance Summary Description: Stands of this primarily deciduous shrubland alliance are dominated by *Alnus viridis ssp. crispa*, typically 1.5-2 m in height, rarely producing a closed canopy but typically occurring as uniformly spaced clumps about 1 m apart. *Rubus allegheniensis* is often a codominant. Other shrub species occur with low coverage and include *Rhododendron catawbiense, Vaccinium corymbosum*, and *Crataegus* spp. Openings in the shrub canopy are dominated by herbs, mainly *Carex pensylvanica* and *Carex debilis var. rudgei* and in moister areas, bryophyte cover can be up to 75%, with *Polytrichum commune* typical. This shrubland alliance occurs at the highest elevations of the southern Appalachian Mountains (above 1750 m [5800 feet]) on summit ridges of the Roan Mountain massif.

[CEGL003891] *Alnus viridis ssp. crispa / Carex pensylvanica* Shrubland

Translated Name: **Mountain Alder / Pennsylvania Sedge Shrubland**
Common Name: **Southern Appalachian Alder Bald**

USNVC Classification

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Shrub Bald (G658)
Alliance	*Alnus viridis ssp. crispa* Shrub Bald Alliance (A0929)

Element Concept

Global Summary: This mainly deciduous shrubland occurs at the highest elevations, greater than 1750 m (5800 feet) in the southern Appalachian Mountains on summit ridges of the Roan Mountain massif. It is dominated by *Alnus viridis ssp. crispa*, typically 1.5-2 m in height, rarely producing a closed canopy but typically occurring as uniformly spaced clumps about 1 m apart. *Rubus allegheniensis* is often a codominant with *Alnus viridis ssp. crispa*. Other shrub species occur with low coverage and include *Rhododendron catawbiense, Vaccinium corymbosum*, and *Crataegus* spp. Openings in the shrub canopy are dominated by herbs, mainly *Carex pensylvanica* and *Carex debilis var. rudgei* but also may include *Danthonia compressa, Deschampsia flexuosa, Viola blanda, Rumex acetosella* (exotic), and *Athyrium filix-femina ssp. asplenioides*. In moister areas, bryophyte cover can be up to 75%, with *Polytrichum commune* typical. This community can grade into or occur adjacent to high-elevation rock outcrop communities, montane grass-dominated communities, high-elevation herbaceous seeps, or forests dominated by stunted *Fagus grandifolia*. It may expand into montane grass-dominated communities and may eventually succeed to *Rhododendron catawbiense* Shrubland (CEGL003818).

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This high-elevation alder bald community generally occurring above 1,220 m (4,000 feet) elevation (but rarely down to 1,065 m [3,500 feet]).
Global Environment: This community occurs on ridges and exposed slopes at elevations of 1770-1800 m (5800-5900 feet). Slope gradients range from 8-15°. Extreme cold, high precipitation, frequent fog, and desiccating winds in combination with the shallow, nutrient-poor soils are the key environmental factors influencing this community. This community occurs as disconnected patches on summit ridges, interrupted by grass-dominated vegetation. It can grade into or occur adjacent to high-elevation rock outcrop communities, montane grass-dominated communities, high-elevation herbaceous seeps, or forests dominated by stunted *Fagus grandifolia*. It often invades montane grass-dominated communities and may eventually succeed to *Rhododendron catawbiense* Shrubland (CEGL003818).

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This shrubland is mostly composed of *Alnus viridis ssp. crispa* (cover >35%); sometimes with *Rubus canadensis* codominant. Other common species include *Rhododendron catawbiense, Vaccinium corymbosum, Vaccinium simulatum, Vaccinium pallidum*, and *Crataegus* spp.
Global Vegetation: These montane, mainly deciduous shrublands are dominated by *Alnus viridis* typically 1.5-2 m in height, rarely producing a closed canopy but typically occurring as uniformly spaced clumps about 1 m apart. *Rubus allegheniensis* is often a codominant with *Alnus viridis ssp. crispa*. Other shrub species occur with low coverage and include *Rhododendron catawbiense, Vaccinium corymbosum*, and *Crataegus* spp. Openings in the shrub canopy are dominated by herbs, mainly *Carex pensylvanica* and *Carex debilis var. rudgei* but also may

include *Athyrium filix-femina ssp. asplenioides, Danthonia compressa, Deschampsia flexuosa, Viola blanda, Rumex acetosella* (exotic). In moister areas, bryophyte cover can be up to 75%, with *Polytrichum commune* typical.
Global Dynamics: This community may be damaged by lightning-caused fire or defoliating insects (Brown 1941). It is unclear if *Alnus viridis ssp. crispa* is able to expand into adjacent grassy balds or not. This shrubland may experience invasion by *Rhododendron catawbiense, Abies fraseri*, and *Picea rubens* and may succeed to vegetation dominated by these species.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Liana	*Rubus canadensis*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus viridis* ssp. *crispa*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus viridis* ssp. *crispa*, *Rubus allegheniensis*
Herb (field)	Graminoid	*Carex debilis* var. *rudgei*, *Carex pensylvanica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Alnus viridis* ssp. *crispa*
Global: *Alnus viridis* ssp. *crispa*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Krigia montana* (G3), *Lilium grayi* (G3, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic); **Invasive/Exotic Plants**: *Rumex acetosella* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (27-Oct-2010). This community occurs only in the Roan Mountain massif, Avery and Mitchell counties, North Carolina, and Carter County, Tennessee, where it occupies a total acreage of less than 500 hectares. It is a narrowly endemic community, naturally rare, but apparently stable.

RELATED CONCEPTS

Global Similar Types:
- *Rhododendron catawbiense* Shrubland (CEGL003818) may have up to 25% of the total shrub cover made up of *Alnus viridis ssp. crispa*.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This type should be generously applied in this local area; there may be confusion with shrublands dominated by *Rhododendron catawbiense*.
Global Classification Comments: Other communities dominated by *Alnus viridis ssp. crispa* may occur in the western and northeastern United States as well as in Canada. This community occurs as disconnected patches on summit ridges, interrupted by grass-dominated vegetation such as *Danthonia compressa - (Sibbaldiopsis tridentata)* Grassland (CEGL004242) or *Carex pensylvanica* Grassland (CEGL004094). Additionally, this community can grade into or occur adjacent to high-elevation rock outcrop communities, high-elevation herbaceous seeps, or forests dominated by stunted *Fagus grandifolia*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This shrubland has a limited distribution and occurs at and near Carvers Gap on Roan Mountain.
Global Range: This community occurs only in the Roan Mountain massif of the Southern Blue Ridge of North Carolina and Tennessee.
Nations: US
States/Provinces: NC:S1, TN
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge]); USFS (Cherokee, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SBAA
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: This community is known to occur on the Roan Mountain massif, in Avery and Mitchell counties, North Carolina.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 13 accuracy assessment points): APPA.0595, APPA_AA_0069, APPA_AA_0279, APPA_AA_0359, APPA_AA_0391, APPA_AA_0513, APPA_AA_0533, APPA_AA_0729, APPA_AA_0810, APPA_AA_1196, APPA_AA_1229, APPA_AA_1350, APPA_AA_1591, APPA_AA_1600.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson
References: Allard 1990, Anderson et al. 1990, Brown 1941, Pyne 1994, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

A0744 *Rhododendron catawbiense - Rhododendron carolinianum - Kalmia latifolia* Shrub Bald Alliance

Alliance Summary Description: This alliance includes evergreen shrublands occurring in the southern Appalachian Mountains. These shrublands are dominated by evergreen ericaceous species, most often *Rhododendron catawbiense, Rhododendron carolinianum*, or *Kalmia latifolia*. Deciduous shrubs may be present and even locally dominant. Openings in the shrub stratum may contain sparse herbaceous cover, including *Deschampsia flexuosa, Galax urceolata, Gaultheria procumbens, Goodyera pubescens, Melampyrum lineare, Mitchella repens, Pteridium aquilinum, Selaginella tortipila*, and *Zigadenus leimanthoides*. Mosses and lichens are also typical in more open occurrences. This evergreen, sclerophyllous vegetation is of low stature (<0.5 m) and occurs at the highest elevations in the southern Appalachian Mountains on steep, exposed slopes, ridges, thin soils and rock outcrops. It is typically found at elevations over 1770 m (5800 feet) in northwestern North Carolina and eastern Tennessee.

[CEGL003814] *Kalmia latifolia - Rhododendron catawbiense - (Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum)* Shrubland

Translated Name: **Mountain Laurel - Catawba Rosebay - (Black Huckleberry, Mountain Fetterbush, Highbush Blueberry)**
Shrubland
Common Name: **Southern Appalachian Mountain Laurel Bald**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Shrub Bald (G658)
Alliance	*Rhododendron catawbiense* - *Rhododendron carolinianum* - *Kalmia latifolia* Shrub Bald Alliance

(A0744)

ELEMENT CONCEPT

Global Summary: This community occurs in the mountains of Georgia, North Carolina, Virginia, and Tennessee, on ridges and steep, rocky slopes at intermediate elevations (1220-1524 m [4000-5000 feet]). It also occurs in very small patches at elevations higher than 1035 m (3400 feet) in the Cumberland Mountains along the Virginia-Kentucky border. It is a mostly evergreen shrubland, although deciduous shrubs may be present and even locally dominant. Shrubs form a dense, sometimes impenetrable thicket, 1-4 m tall. The most typical shrub dominants are *Kalmia latifolia* and *Rhododendron catawbiense*, although *Gaylussacia baccata, Leiophyllum buxifolium, Pieris floribunda, Rhododendron carolinianum, Rhododendron maximum*, and *Vaccinium corymbosum* are dominant or have high coverage in some occurrences. Other shrubs include *Photinia melanocarpa (= Aronia melanocarpa), Clethra acuminata, Ilex montana, Vaccinium stamineum, Leucothoe recurva*, and *Viburnum nudum var. cassinoides*. Small openings in the shrub canopy are dominated by lichens, bare rock or herbs, with some occurrences having up to 60% exposed rock. Herb cover beneath the shrub canopy is absent or very sparse (<5%) and may include *Galax urceolata, Gaultheria procumbens, Goodyera pubescens, Melampyrum lineare, Mitchella repens*, and *Pteridium*

aquilinum. *Smilax rotundifolia* is a common vine. Small, scattered trees are possible (*Acer rubrum, Amelanchier laevis, Betula alleghaniensis, Ilex montana, Magnolia fraseri, Nyssa sylvatica, Oxydendrum arboreum, Picea rubens, Prunus pensylvanica, Quercus rubra*, and *Sorbus americana*) and may be more typical of shrublands resulting from intense fires on less exposed sites. Windfall, landslides, and small, localized, lightning-caused fires are important in the establishment and maintenance of these shrublands. This community can result from secondary succession after fire or logging or can occur as a topo-edaphic climax on steep or exposed sites.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This high-elevation mixed ericaceous shrub bald community generally occurs on southerly exposed ridges and steep slopes typically below 1,525 m (5,000 feet) elevation. The sampled sites include a steep, south- and southwest-facing upper slope and gentle to moderately sloping ridgetops. Soils range from moderately well-drained sandy loam to rapidly drained sandy loam or rock with little soil development. The unvegetated surface may be dominated by leaf litter with some downed wood or be a mix of leaf litter, exposed bedrock and large rocks. Evidence of disturbance includes wind/ice damage resulting from harsh weather conditions.

Global Environment: This community occurs in the mountains of Georgia, North Carolina, Virginia, and Tennessee on ridges and steep, rocky slopes at intermediate elevations (1220-1524 m [4000-5000 feet]). It also occurs in very small patches at elevations higher than 1035 m (3400 feet) in the Cumberland Mountains along the Virginia-Kentucky border.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: These dense (up to 100% cover) mixed ericaceous shrub thickets (1-4 m tall) are mostly evergreen, but may have local dominance by deciduous shrubs. Dominant shrubs are *Kalmia latifolia, Rhododendron catawbiense*, or *Leucothoe recurva*. *Gaylussacia baccata, Pieris floribunda*, and *Vaccinium corymbosum* may also be present. Herbs are sparse and may include *Polypodium appalachianum*.

Global Vegetation: This association typically manifests as a mostly evergreen shrubland, although deciduous shrubs may be present and even locally dominant. These shrubs form a dense, sometimes impenetrable thicket, 1-4 m tall. The most typical shrub dominants are *Kalmia latifolia* and *Rhododendron catawbiense*, although *Gaylussacia baccata, Leiophyllum buxifolium, Pieris floribunda, Rhododendron carolinianum, Rhododendron maximum*, and *Vaccinium corymbosum* are dominant or have high coverage in some occurrences. Other shrubs include *Photinia melanocarpa (= Aronia melanocarpa), Clethra acuminata, Ilex montana, Vaccinium simulatum, Vaccinium stamineum, Leucothoe recurva*, and *Viburnum nudum var. cassinoides*. Small openings in the shrub canopy are dominated by lichens, bare rock or herbs, with some occurrences having up to 60% exposed rock. Herb cover beneath the shrub canopy is absent or very sparse (<5%) and may include *Galax urceolata, Gaultheria procumbens, Goodyera pubescens, Melampyrum lineare, Mitchella repens*, and *Pteridium aquilinum*. *Smilax rotundifolia* is a common vine. Small, scattered trees are possible (*Acer rubrum, Amelanchier laevis, Betula alleghaniensis, Ilex montana, Magnolia fraseri, Nyssa sylvatica, Oxydendrum arboreum, Prunus pensylvanica, Picea rubens, Quercus rubra*, and *Sorbus americana*) and may be more typical of shrublands resulting from intense fires on less exposed sites.

Global Dynamics: Windfall, landslides, and small, localized, lightning-caused fires are important in the establishment and maintenance of these shrublands. This community can result from secondary succession after fire or logging or can occur as a topo-edaphic climax on steep or exposed sites.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia latifolia*, *Leucothoe recurva*, *Rhododendron catawbiense*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron catawbiense*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Kalmia latifolia*, *Leucothoe recurva*, *Rhododendron catawbiense*

Global: *Kalmia latifolia*, *Rhododendron catawbiense*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum buckleii* (G3, Southern Blue Ridge endemic), *Liatris helleri* (G2Q, NC/Southern Appalachian endemic), *Pseudevernia cladonia* (G2G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (15-Feb-1999). This is a locally common heath bald type in parts of the Southern Blue Ridge and Cumberland Mountains. Some occurrences represent a topo-edaphic climax, while other areas require fire to maintain the physiognomy. Fire-maintained occurrences are threatened by general fire prevention in the mountains.

RELATED CONCEPTS

Global Similar Types:

- *Menziesia pilosa - Vaccinium (erythrocarpum, simulatum, corymbosum) - Sorbus americana* Shrubland (CEGL004819)
- *Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium* Shrubland (CEGL007876)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This mixed ericaceous shrub bald is the most common bald type in the Southern Appalachian dataset.
Global Classification Comments: These shrublands possibly have a broader distribution and typically occur at lower elevations than other montane shrublands in *Rhododendron catawbiense - Rhododendron carolinianum - Kalmia latifolia* Shrub Bald Alliance (A0744). In the Southern Blue Ridge, this shrubland generally occurs at elevations over 1220 m (4000 feet) and grades into forests dominated by *Quercus coccinea, Pinus rigida, Pinus pungens*, and/or *Quercus rubra*. High-elevation occurrences may be compositionally similar to another heath bald community, *Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium* Shrubland (CEGL007876).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is scattered within the AT corridor at high elevations from Union County, Georgia, to Carter County, Tennessee. It was sampled in Chattahoochee National Forest in Georgia, and in North Carolina.
Global Range: This community is found in the Blue Ridge Mountains of Georgia, North Carolina, and Tennessee. Examples in the Cumberlands of Kentucky, and Southern Blue Ridge and Ridge and Valley of Virginia are rare and of limited extent.
Nations: US
States/Provinces: GA, KY, NC:S1, TN, VA:S1
TNC Ecoregions: 50:C, 51:C, 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Be:CPP, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Cumberland Gap, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SMBT
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 1 observation point; 23 accuracy assessment points): APPA.0539, APPA_AA_0575, APPA.0602, APPA.1083, APPA_AA_0037, APPA_AA_0364, APPA_AA_0388, APPA_AA_0463, APPA_AA_0542, APPA_AA_0617, APPA_AA_0638, APPA_AA_0712, APPA_AA_0739, APPA_AA_0836, APPA_AA_0840, APPA_AA_0854, APPA_AA_0963, APPA_AA_1005, APPA_AA_1203, APPA_AA_1221, APPA_AA_1296, APPA_AA_1312, APPA_AA_1507, APPA_AA_1523, APPA_AA_1616, APPA_AA_3362.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson, T. Govus and R. White
References: Allard 1990, Ambrose 1990a, CAP pers. comm. 1998, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl.

data, Pyne 1994, Risk 1993, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, White 2006

[CEGL004819] *Menziesia pilosa - Vaccinium (erythrocarpum, simulatum, corymbosum) - Sorbus americana* Shrubland

Translated Name: **Minniebush - (Southern Mountain Cranberry, Upland Highbush Blueberry, Highbush Blueberry) - American Mountain-ash Shrubland**
Common Name: **Southern Appalachian Deciduous Heath Bald**

USNVC Classification

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Shrub Bald (G658)
Alliance	*Rhododendron catawbiense - Rhododendron carolinianum - Kalmia latifolia* Shrub Bald Alliance (A0744)

Element Concept

Global Summary: This deciduous shrubland is known from several exposed, rock outcrop promontories between 1500 and 1675 m (5000-5500 feet) elevation in the Mount Rogers - Whitetop massif of the southern Virginia Blue Ridge. The exposed sites are subject to low winter temperatures, high winds, and ice storms, as well as high solar irradiation and moisture evaporation during the growing season. Slope profiles are strongly convex and surface cover of exposed bedrock and boulders is >25% in plot samples. Soils are extremely acidic (mean pH = 3.9) and low in base status. Vegetation is a deciduous shrubland codominated by *Menziesia pilosa*, stunted *Sorbus americana*, and either *Vaccinium simulatum* or *Vaccinium erythrocarpum*, or both. Associated shrubs and tree saplings include *Rubus canadensis, Crataegus punctata, Amelanchier laevis, Ribes rotundifolium, Ribes cynosbati, Prunus pensylvanica, Rhododendron calendulaceum*, and *Smilax tamnoides*. The most frequent herbs are *Danthonia compressa, Athyrium filix-femina ssp. asplenioides, Oclemena acuminata, Carex debilis var. rudgei, Heuchera villosa, Saxifraga michauxii, Maianthemum canadense, Carex pensylvanica*, and *Carex brunnescens ssp. sphaerostachya*.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This high-elevation deciduous heath bald community occurs on acidic soils on exposed, convex, rocky summits and ridges between 1,500 and 1,675 m (5,000-5,500 feet) elevation. The exposed sites are subject to low winter temperatures, high winds, and ice storms, as well as high solar irradiation and moisture evaporation during the growing season.
Global Environment: Habitats are exposed, rocky summits and promontories between 1500 and 1675 m (5000-5500 feet) elevation. The exposed sites are subject to low winter temperatures, high winds, and ice storms, as well as high solar irradiation and moisture evaporation during the growing season. Slope profiles are strongly convex and surface cover of exposed bedrock and boulders is >25% in plot samples. Soils are extremely acidic (mean pH = 3.9) and low in base status.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This deciduous shrubland is codominated by *Menziesia pilosa*, stunted *Sorbus americana*, and either *Vaccinium simulatum* or *Vaccinium erythrocarpum*, or both. *Rubus canadensis* is another common shrub. The herb layer is typically very dense; common species include *Athyrium filix-femina ssp. asplenioides, Carex brunnescens ssp. sphaerostachya, Carex debilis var. rudgei, Danthonia compressa, Heuchera villosa var. villosa, Maianthemum canadense, Oclemena acuminata, Rumex acetosella*, and *Saxifraga michauxii*.
Global Vegetation: Vegetation is a deciduous shrubland that typically contains 10 to 75% cover of 0.5- to 1.5-m tall *Menziesia pilosa*, 10 to 50% of *Sorbus americana* >1.5 m tall, and up to 25% cover of either *Vaccinium simulatum* or *Vaccinium erythrocarpum*, or both. This community is slightly more diverse than associated shrublands with nearly monospecific dominance by *Rhododendron catawbiense*, with a mean species richness of 23 taxa per 100 m2 in three plot-sampled stands. Associated shrubs and tree saplings include *Rubus canadensis, Crataegus punctata, Amelanchier laevis, Ribes rotundifolium, Ribes cynosbati, Prunus pensylvanica, Rhododendron calendulaceum*, and *Smilax tamnoides*. Opportunities for herbaceous species appear to be somewhat greater in this all-deciduous shrubland than in the densely evergreen, *Rhododendron catawbiense* shrublands. The most common

and abundant herbs in known stands, averaging >5% cover in plots, are *Danthonia compressa, Athyrium filix-femina ssp. asplenioides*, and *Oclemena acuminata*. Other species that occur with lower cover in 50% or more of the plot samples are *Carex debilis var. rudgei, Heuchera villosa, Saxifraga michauxii, Maianthemum canadense, Carex pensylvanica*, and *Carex brunnescens ssp. sphaerostachya*.

Global Dynamics: Occurrences of this shrubland may result from secondary succession after fires and logging, but may also occur as topo-edaphic climaxes on exposed, rocky sites. At present, there is little evidence of successional advance at any of the three Virginia sites, although there are stunted, widely scattered specimens of *Abies fraseri* and a few *Picea rubens* seedlings in the largest stand on Wilburn Ridge near Mount Rogers. It is not clear whether the shrublands here originated from the nearly complete destruction of spruce-fir forests on this ridge, or whether the massive bedrock promontories have always supported edaphic shrublands or woodlands with a shrub understory similar to this vegetation. At this site, the deciduous shrublands co-occur with more extensive stands of *Rhododendron catawbiense*-dominated shrublands, although the two occupy discrete parts of the outcrops and do not intermingle.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Menziesia pilosa*, *Sorbus americana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium erythrocarpum*, *Vaccinium simulatum*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Menziesia pilosa*, *Sorbus americana*
Herb (field)	Flowering forb	*Oclemena acuminata*
Herb (field)	Graminoid	*Danthonia compressa*
Herb (field)	Fern (Spore-bearing forb)	*Athyrium filix-femina* ssp. *asplenioides*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Menziesia pilosa*, *Sorbus americana*
Global: *Athyrium filix-femina* ssp. *asplenioides*, *Danthonia compressa*, *Menziesia pilosa*, *Oclemena acuminata*, *Sorbus americana*, *Vaccinium erythrocarpum*, *Vaccinium simulatum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Abies fraseri* (G2, globally imperiled & VA-state critically imperiled); **Invasive/Exotic Plants**: *Poa compressa* (High/Low, invasive/exotic), *Rumex acetosella* (Medium/Low, invasive/exotic)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (15-Oct-2014). This association is known from very few occurrences, and has a small to moderate area of potential occurrence. Existing occurrences appear stable and unthreatened. It occurs in the context of a globally rare, high-elevation ecosystem of the Southern Blue Ridge. The association may result from catastrophic disturbance of red spruce - Fraser fir forests. However, existing occurrences are persisting with a shrubland structure, with no invasion by tree-forming species. Although small spruce and fir saplings are scattered in the type, their growth is extremely slow, likely due to the massive rock outcrops and shallow soils of the habitats. This association is ranked lower than numbers of occurrences suggest, because of the likelihood of its occurrence at other high-elevation environments in the Appalachian Mountains, both south and north of Virginia.

RELATED CONCEPTS

Global Similar Types:

- *Kalmia latifolia - Rhododendron catawbiense - (Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum)* Shrubland (CEGL003814) occurs at lower elevation (1035-1525 m[3400-5000 feet]), and is mixed evergreen-deciduous.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Mixed deciduous shrublands on and around rocky summits in the Grayson Highlands area (Whitetop, Wilburn Ridge, Haw

Orchard Mountain), generally above 1,525 m (5,000 feet). Vegetation is primarily *Menziesia pilosa, Sorbus americana, Vaccinium* spp. with a number of herbs usually present at moderate cover underneath.
Global Classification Comments: This community type was initially classified in a 950-plot dataset analysis of Virginia montane plot data conducted for the George Washington and Jefferson national forests and NatureServe (Fleming and Coulling 2001). At that time, it was treated as a deciduous variant of *Rhododendron catawbiense* Shrubland (CEGL003818). The same group, with an additional plot sample, performed discretely in an analysis of 1050 plots of Southern Appalachian vegetation conducted for the Appalachian Trail vegetation mapping project in 2009 (Fleming and Patterson 2009a). This group (n= 4) shows close affiliation with CEGL003818 in cluster analysis, but this may be the result of spatial autocorrelation. In any case, treating these shrublands as one group produces a very awkward "type" that can vary from pure *Rhododendron catawbiense* to a mixed deciduous shrubland with no *Rhododendron catawbiense* at all. This association was placed within an evergreen formation, even though it is deciduous.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community occurs along and near the AT on three ridges of the Mount Rogers - Whitetop massif in southwestern Virginia.
Global Range: This community is known from three sites in the Mount Rogers - Whitetop (Balsam Mountains) massif of the southern Virginia Blue Ridge: Buzzard Rock near Whitetop, Wilburn Ridge near Mount Rogers, and Haw Orchard Mountain in Grayson Highlands State Park. It is likely in other high-elevation areas of the Appalachian Mountains.
Nations: US
States/Provinces: VA:S1
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge]); USFS (Jefferson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SBDH
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (3 plots; 17 accuracy assessment points): APPA.0368, APPA.0373, APPA.0374, APPA_AA_0073, APPA_AA_0121, APPA_AA_0154, APPA_AA_0171, APPA_AA_0467, APPA_AA_0594, APPA_AA_0609, APPA_AA_0624, APPA_AA_0628, APPA_AA_0680, APPA_AA_0691, APPA_AA_0747, APPA_AA_0844, APPA_AA_0873, APPA_AA_1225, APPA_AA_1564, APPA_AA_1577.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d., Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009a*, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006

[CEGL007876] *Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium* Shrubland

Translated Name: **Carolina Azalea - Catawba Rosebay - Sand-myrtle Shrubland**
Common Name: **Southern Appalachian Heath Bald**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Shrub Bald (G658)
Alliance	*Rhododendron catawbiense - Rhododendron carolinianum - Kalmia latifolia* Shrub Bald Alliance (A0744)

ELEMENT CONCEPT

Global Summary: This high-elevation shrubland occurs in the Great Smoky Mountains of eastern Tennessee, on steep ridges, rock outcroppings, and landslides at elevations over 1676 m (5500 feet), in the Spruce-Fir zone. It has 25-100% shrub cover and may occur as a dense shrubland, 2-4 m tall, or as a shorter, more open shrubland with areas of exposed rock, scattered mats of prostrate vegetation, and isolated clumps of herbaceous species. The most common shrubs are *Rhododendron carolinianum, Rhododendron catawbiense*, and *Leiophyllum buxifolium*, locally

dominant in patches and forming a mosaic. Shrubs are less than 1 m tall on the steepest, rockiest, most exposed sites, and taller on gentle, more protected sites with greater soil development. Other associated shrubs with minor coverage may include *Abies fraseri, Photinia pyrifolia (= Aronia arbutifolia), Photinia melanocarpa (= Aronia melanocarpa), Diervilla sessilifolia, Ilex montana, Menziesia pilosa, Pieris floribunda, Prunus pensylvanica, Vaccinium corymbosum, Vaccinium erythrocarpum*, and *Viburnum nudum var. cassinoides*. Under tall, dense shrubs there is little herb cover, but in more open shrublands, on steep cliffs with seepage, herbaceous species may grow in dense patches on ledges and crevices. Herbaceous species such as *Calamagrostis cainii, Carex misera, Geum radiatum, Saxifraga michauxii, Solidago glomerata*, and *Trichophorum caespitosum (= Scirpus cespitosus)* are associated with this community on the summits of Mount LeConte. Thick hummocks of lichens and mosses can occur on flatter sites, and scattered wind-sheared trees of *Picea rubens* or *Abies fraseri* are possible in some examples. High solar irradiation and desiccating winds, in combination with the shallow, nutrient-poor soils, are key environmental factors influencing this community. Locally, vegetation is influenced by seepage areas on steep cliffs and ledges. It is known from areas of exposed slate on the steep ridges of Mount LeConte (Ramseur 1958).

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: Sites are typically above 1,525 m (5,000 feet) elevation, in the spruce-fir zone. The sampled sites include very steep ridges to steep rocky summits with northern aspects.

Global Environment: This association occurs on steep ridges, rock outcroppings, and landslides at elevations over 1676 m (5500 feet), in the Spruce-Fir zone.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This open to dense shrub-dominated vegetation ranges from 0.5 to 4 m tall. Dominant shrubs include *Rhododendron carolinianum, Rhododendron catawbiense*, and *Leiophyllum buxifolium*; additional shrubs may include *Vaccinium corymbosum, Vaccinium simulatum*, and *Vaccinium pallidum*. *Saxifraga michauxii* is common in the very sparse herb layer.

Global Vegetation: This association has 25-100% shrub cover and may occur as a dense shrubland, 2-4 m tall, or as a shorter, more open shrubland with areas of exposed rock, scattered mats of prostrate vegetation, and isolated clumps of herbaceous species. The most common shrubs are *Rhododendron carolinianum, Rhododendron catawbiense*, and *Leiophyllum buxifolium*, locally dominant in patches and forming a mosaic. Shrubs are less than 1 m tall on the steepest, rockiest, most exposed sites, and taller on gentle, more protected sites with greater soil development. Other associated shrubs with minor coverage may include *Abies fraseri, Photinia pyrifolia (= Aronia arbutifolia), Photinia melanocarpa (= Aronia melanocarpa), Diervilla sessilifolia, Ilex montana, Menziesia pilosa, Pieris floribunda, Prunus pensylvanica, Vaccinium corymbosum, Vaccinium erythrocarpum*, and *Viburnum nudum var. cassinoides*. Under tall, dense shrubs there is little herb cover, but in more open shrublands, on steep cliffs with seepage, herbaceous species may grow in dense patches on ledges and crevices. Herbaceous species such as *Calamagrostis cainii, Carex misera, Geum radiatum, Saxifraga michauxii, Solidago glomerata*, and *Trichophorum caespitosum (= Scirpus cespitosus)* are associated with this community on the summits of Mount LeConte. Thick hummocks of lichens and mosses can occur on flatter sites, and scattered wind-sheared trees of *Picea rubens* or *Abies fraseri* are possible in some examples.

Global Dynamics: High solar irradiation and desiccating winds, in combination with the shallow, nutrient-poor soils, are key environmental factors influencing this community. Locally, vegetation is influenced by seepage areas on steep cliffs and ledges. It is known from areas of exposed slate on the steep ridges of Mount LeConte (Ramseur 1958).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron carolinianum*, *Rhododendron catawbiense*
Short shrub/sapling	Broad-leaved evergreen shrub	*Leiophyllum buxifolium*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Leiophyllum buxifolium*, *Rhododendron carolinianum*, *Rhododendron catawbiense*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Leiophyllum buxifolium*, *Micranthes petiolaris*, *Rhododendron carolinianum*, *Rhododendron catawbiense*
Global: *Leiophyllum buxifolium*, *Rhododendron carolinianum*, *Rhododendron catawbiense*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Carex misera* (G3, TN state-imperiled), *Menziesia pilosa* (G4G5, TN state-imperiled), *Rhododendron minus* (G4, TN state-imperiled)
Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Calamagrostis cainii* (G1), *Carex misera* (G3), *Geum radiatum* (G2, Southern Appalachian endemic), *Hypericum graveolens* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Solidago glomerata* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (16-Feb-1999). This community is limited in extent, occurring as scattered pockets in the southern Appalachian Mountains, possibly limited to the Great Smoky Mountains. This fragile community is threatened by heavy recreational use.

RELATED CONCEPTS

Global Similar Types:
- *Kalmia latifolia - Rhododendron catawbiense - (Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum)* Shrubland (CEGL003814)
- *Rhododendron carolinianum* Shrubland (CEGL003816)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Mixed ericaceous shrub bald with *Rhododendron carolinianum* and *Leiophyllum buxifolium*.
Global Classification Comments: The taxonomic distinctions between *Rhododendron minus* and *Rhododendron carolinianum* are currently uncertain. Some of what is treated here as *Rhododendron carolinianum* may prove to be *Rhododendron minus*. This association contains a portion of the former concept of *Rhododendron carolinianum* Shrubland (CEGL003816), which occurs at lower elevations in areas of quartzite and meta-arkose geology.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was documented along the AT only in the vicinity of Mount LeConte in the Great Smoky Mountains. It was sampled at Charlie's Bunion in Tennessee.
Global Range: This high-elevation shrubland occurs in the Great Smoky Mountains of eastern Tennessee.
Nations: US
States/Provinces: NC:S1, TN
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SBAH
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 2 observation points; 13 accuracy assessment points): APPA.0083, APPA.0084, APPA.0131, APPA_AA_0138, APPA_AA_0497, APPA_AA_0970, APPA_AA_0990, APPA_AA_1124, APPA_AA_1294, APPA_AA_1562, APPA_AA_1607, APPA_AA_1611, APPA_AA_1615, APPA_AA_1621, APPA_AA_1623, APPA_AA_3363.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson and T. Govus
References: Allard 1990, Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Pyne 1994, Ramseur 1958, Risk 1993, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Whittaker 1979a

[CEGL003818] *Rhododendron catawbiense* Shrubland

Translated Name: **Catawba Rosebay Shrubland**
Common Name: **Southern Appalachian Catawba Rosebay Heath Bald**

USNVC Classification

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Shrub Bald (G658)
Alliance	*Rhododendron catawbiense - Rhododendron carolinianum - Kalmia latifolia* Shrub Bald Alliance (A0744)

Element Concept

Global Summary: This evergreen shrubland occurs at the highest elevations, typically 1500-1980 m (5000-6500 feet), in the southern Appalachian Mountains on steep, exposed slopes, ridges, and rock outcrops. It occurs primarily in the northern portion of the Southern Appalachians, north of the Asheville Basin, in mountain ranges lacking *Pieris floribunda* and *Rhododendron carolinianum*. Greater than 75% of the shrub cover is composed of evergreen species, and the predominant shrub is *Rhododendron catawbiense*. Scattered trees contribute less than 1% cover, typically *Photinia melanocarpa (= Aronia melanocarpa), Abies fraseri*, and *Picea rubens*. Small openings in the shrub canopy are dominated by rock or herbs. Herb cover beneath the shrub canopy is absent or very sparse (<5%) and may include *Gaultheria procumbens, Galax urceolata, Epigaea repens, Medeola virginiana, Trillium undulatum, Melampyrum lineare, Dryopteris campyloptera, Houstonia serpyllifolia, Viola* spp., and *Carex debilis var. rudgei*. Mosses may be locally dominant at the base of *Rhododendron* clumps, often *Polytrichum commune* or bryophytes from adjacent *Picea - Abies* communities. This community can result from secondary succession after fire or logging or can occur as a topo-edaphic climax on steep, exposed sites. Occurrences may range in size from 0.5-200 hectares. This community can grade into or occur adjacent to high-elevation rock outcrop communities, montane grass-dominated communities, or forests dominated by *Picea rubens, Abies fraseri*, and northern hardwood species such as *Fagus grandifolia, Acer saccharum*, and *Betula alleghaniensis*.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This high-elevation, evergreen ericaceous shrub bald thicket occurs at >1370 m (4500 feet) on Wilburn Ridge of Whitetop Mountain in Virginia. The sampled stand is on a moderate, east-facing upper slope with well-drained silt loam soil. The unvegetated surface is dominated by leaf litter with some downed wood and large rocks. The site may have experienced some disturbance of unknown origin in the past.
Global Environment: This evergreen shrubland occurs at the highest elevations, typically 1500-1980 m (5000-6500 feet), in the southern Appalachian Mountains on steep, exposed slopes, ridges, and rock outcrops. It occurs primarily in the northern portion of the Southern Appalachians, north of the Asheville Basin, in mountain ranges lacking *Pieris floribunda* and *Rhododendron carolinianum*. This community can result from secondary succession after fire or logging or can occur as a topo-edaphic climax on steep, exposed sites. Occurrences may range in size from 0.5-200 hectares. This community can grade into or occur adjacent to high-elevation rock outcrop communities, montane grass-dominated communities, or forests dominated by *Picea rubens, Abies fraseri*, and northern hardwood species such as *Fagus grandifolia, Acer saccharum*, and *Betula alleghaniensis*.

Vegetation Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This evergreen shrubland is dominated by *Rhododendron catawbiense*; additional shrubs include *Vaccinium simulatum, Menziesia pilosa, Sorbus americana*, and *Vaccinium erythrocarpum*. Herbs are very sparse.
Global Vegetation: Greater than 75% of the shrub cover is composed of evergreen species, and the predominant shrub is *Rhododendron catawbiense*, which forms a continuous, dense shrub canopy from 1-4 m tall. On the most rugged, windswept sites, shrubs are stunted and gnarled. The occurrence and relative abundance of associated shrub species vary with elevation and adjacent vegetation. Scattered trees contribute less than 1% cover, typically *Photinia melanocarpa (= Aronia melanocarpa), Abies fraseri*, and *Picea rubens*. Small openings in the shrub canopy are dominated by rock or herbs. Herb cover beneath the shrub canopy is absent or very sparse (<5%) and may include *Gaultheria procumbens, Galax urceolata, Epigaea repens, Medeola virginiana, Trillium undulatum, Melampyrum lineare, Dryopteris campyloptera, Houstonia serpyllifolia, Viola* spp., and *Carex debilis var. rudgei*. Mosses may be locally dominant at the base of *Rhododendron* clumps, often *Polytrichum commune* or bryophytes from adjacent *Picea - Abies* communities. This community contains species endemic to the southern Appalachian Mountains, including *Abies fraseri, Fothergilla major, Galax urceolata, Geum radiatum, Houstonia purpurea var. montana,*

Houstonia serpyllifolia, Hudsonia montana, Hypericum buckleii, Liatris helleri, Lilium grayi, Menziesia pilosa, Pieris floribunda, Prenanthes roanensis, Rhododendron vaseyi, Rhododendron carolinianum, Photinia melanocarpa, and *Vaccinium erythrocarpum*. Species occurring disjunct from their typical northern distributions include *Alnus viridis ssp. crispa, Dryopteris campyloptera, Picea rubens*, and *Vaccinium corymbosum*.
Global Dynamics: Windfall, landslides, and small, localized and lightning-caused fires are important in the establishment and maintenance of this community. This community can result from secondary succession after fire or logging, in which case it is unstable and will eventually succeed to a forest community with a *Rhododendron* understory (e.g., *Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum)* Forest (CEGL007130)). When this community occurs on steep, exposed sites, where wind exposure, soil infertility, and drought maintain a scrubby shrub community, it is a topo-edaphic climax. According to Gant (1978) *Rhododendron catawbiense* heath balds represent stable communities that employ allelopathic interference to arrest succession and maintain themselves.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron catawbiense*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron catawbiense*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Menziesia pilosa*, *Rhododendron catawbiense*, *Sorbus americana*, *Vaccinium simulatum*
Global: *Menziesia pilosa*, *Rhododendron catawbiense*, *Sorbus americana*, *Vaccinium simulatum*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Abies fraseri* (G2, is a minor constituent of this community type and Southern Appalachian endemic), *Fothergilla major* (G3, Southern Appalachian endemic), *Geum radiatum* (G2, Southern Appalachian endemic), *Houstonia purpurea* var. *montana* (G5T2, Southern Blue Ridge endemic), *Hudsonia montana* (G1, NC/Southern Blue Ridge endemic), *Hypericum buckleii* (G3, Southern Blue Ridge endemic), *Liatris helleri* (G2Q, NC/Southern Blue Ridge endemic), *Lilium grayi* (G3, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic);
Other Plants: *Alnus viridis* ssp. *crispa* (G5T5, occurs disjunct from its typical northern distribution), *Dryopteris campyloptera* (G5, occurs disjunct from its typical northern distribution), *Galax urceolata* (G5, Southern Appalachian endemic), *Houstonia serpyllifolia* (G4?, Southern Blue Ridge endemic), *Photinia melanocarpa* (G5, Southern Appalachian endemic), *Picea rubens* (G5, occurs disjunct from its typical northern distribution), *Pieris floribunda* (G4, Southern Blue Ridge endemic), *Rhododendron carolinianum* (G4, Southern Blue Ridge endemic), *Vaccinium corymbosum* (G5, occurs disjunct from its typical northern distribution), *Vaccinium erythrocarpum* (G5, Southern Blue Ridge endemic), *Xerophyllum asphodeloides* (G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (31-Dec-1997). This community occurs at the highest elevations (1500-1980 m [5000-6500 feet]) of the southern Appalachian Mountains in Virginia, North Carolina, and Tennessee. Although there are hundreds of occurrences, the total acreage of this community is limited since it occurs as scattered islands of shrubland at the highest elevations. Since this community generally occurs in inaccessible, well-protected sites, it is not highly threatened. Occurrences in areas of high recreation use may be threatened by trampling, while natural succession may threaten other sites.

RELATED CONCEPTS

Global Similar Types:
- *Alnus viridis ssp. crispa / Carex pensylvanica* Shrubland (CEGL003891)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: In the vicinity of Carvers Gap on Roan Mountain, there may be confusion with Southern Appalachian Alder Bald

(CEGL003891), and a stand containing a mixture of *Alnus* and *Rhododendron* should be interpreted as CEGL003891 unless it is clearly dominated by *Rhododendron* (>65% cover). Some examples of this community observed by the USGS mapping team were codominated by *Vaccinium simulatum*.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Other Comments: Dense *Rhododendron catawbiense* shrublands growing on rocky promontories of the Grayson Highlands area.
Global Classification Comments: This community can grade into or occur adjacent to high-elevation rock outcrop communities, montane grass-dominated communities, or forests dominated by *Picea rubens, Abies fraseri*, and northern hardwood species such as *Fagus grandifolia, Acer saccharum*, and *Betula alleghaniensis*. A more open, low-growing, evergreen shrubland, *Leiophyllum buxifolium* Dwarf-shrubland (CEGL003951), is restricted to areas where *Leiophyllum buxifolium* dominates areas greater than 0.1 hectare. However, the species may be locally dominant as inclusions in this shrubland. Similar, but floristically different, ericaceous shrublands occur in the Mahoosuc Mountains of Maine (Fahey 1976). Exemplary occurrences are known from the Roan Mountain Massif, North Carolina and Tennessee, and Mount Rogers, Virginia.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This vegetation has been seen at Grayson Highlands State Park, Virginia, and could be present in other areas of the Rogers - Whitetop massif and other parts of the higher elevation (>1,370 m [4,500 feet]) Southern Blue Ridge as well. It was sampled on Wilburn Ridge and is known from Roan Mountain in Virginia.
Global Range: This community occurs primarily in the northern portion of the Southern Appalachians, north of the Asheville Basin, in North Carolina, Tennessee, and Virginia.
Nations: US
States/Provinces: GA?, NC:S2, TN, VA:S1
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge]); USFS (Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee, Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SBCH
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 12 accuracy assessment points): APPA.0372, APPA_AA_0090, APPA_AA_0133, APPA_AA_0726, APPA_AA_0872, APPA_AA_0974, APPA_AA_1054, APPA_AA_1072, APPA_AA_1086, APPA_AA_1346, APPA_AA_1462, APPA_AA_1573.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson
References: Allard 1990, Ambrose 1990a, Brown 1941, Fahey 1976, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Gant 1978, Pyne 1994, Ramseur 1958, Rawinski 1992, Risk 1993, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Weakley 1993, Whittaker 1979a

M123. Eastern North American Ruderal Grassland & Shrubland

G059. Eastern North American Ruderal Meadow & Shrubland

Group Summary Description: This group encompasses shrub or herb meadows or old fields in the northern and central regions of the eastern United States and adjacent Canada dominated by native and exotic forbs, grasses, ferns and shrubs that occur on sites that have been cleared and plowed (for farming or development), and then abandoned. Characteristics herbs and shrubs include three variants. Dry variants are less well-described. The mesic open old-field meadow variant has characteristic forbs that include *Asclepias syriaca, Cerastium arvense, Centaurea biebersteinii (= Centaurea maculosa), Daucus carota, Euthamia graminifolia, Fragaria virginiana, Oenothera biennis, Picris hieracioides, Potentilla simplex, Rudbeckia hirta, Solidago altissima, Solidago canadensis, Solidago nemoralis, Solidago rugosa, Solidago juncea, Symphyotrichum lateriflorum (= Aster lateriflorus)*, and *Symphyotrichum novae-angliae (= Aster novae-angliae)*. Common grasses include *Anthoxanthum odoratum, Bromus inermis, Dactylis glomerata, Elymus repens (= Agropyron repens), Phleum pratense, Poa compressa*, and *Poa pratensis*. Shrubs may be present, but collectively they have less than 25% cover. Characteristic shrubs include *Cornus amomum, Cornus racemosa (= Cornus foemina ssp. racemosa), Cornus sericea, Juniperus virginiana, Lonicera* spp., *Rubus* spp., *Rhus typhina, Rhus glabra*, and *Viburnum recognitum*. The mesic old-field shrubland variant includes *Amelanchier* spp., *Cornus racemosa, Cornus sericea, Crataegus* spp., *Prunus americana, Prunus virginiana, Rhus glabra, Rhus typhina, Rubus* spp., *Viburnum lentago*, and *Viburnum recognitum*. The exotic shrubs *Elaeagnus angustifolia, Lonicera* spp., *Rhamnus cathartica*, and *Rosa multiflora* may be invasive in some areas. The dry old-field grassland and shrubland is found on sandy or rock substrates and includes *Andropogon virginicus, Poa compressa, Solidago nemoralis, Schizachyrium scoparium*, and an assortment of dry weedy species such as *Centaurea biebersteinii*.

A1190 *Dactylis glomerata - Festuca* spp. - *Solidago canadensis* Ruderal Mesic Meadow Alliance

Alliance Summary Description: This broadly defined type includes mesic abandoned pastures and agricultural fields and is largely composed of non-native cool-season grasses and herbs (generally of European origin) in the early stages of succession. The fields are typically mowed every one to five years. Physiognomically, these grasslands are generally composed of mid-height (0.5 to 1 m tall) grasses and forbs, with occasional scattered shrubs (<25%). Species composition varies from site to site, depending on land-use history and perhaps soil type, but in general this vegetation is quite wide-ranging in northeastern and midwestern states and at higher elevations (610-1220 m [2000-4000 feet]) in the southeastern states. Dominant grasses vary from site to site but generally include the exotic grasses *Agrostis stolonifera, Agrostis hyemalis, Anthoxanthum odoratum, Bromus inermis, Bromus tectorum, Dactylis glomerata, Lolium arundinaceum (= Schedonorus arundinaceum), Lolium perenne, Phleum pratense* as well as weedy natives such as *Elymus repens, Poa pratensis*, and, less commonly, *Schizachyrium scoparium*. Forbs may be minor or dominant and include the exotic forbs *Achillea millefolium, Cerastium arvense* (and hybrids), *Daucus carota, Hieracium* spp., *Vicia cracca*, as well as weedy natives such as *Ambrosia artemisiifolia, Asclepias syriaca, Euthamia graminifolia, Oenothera biennis, Potentilla simplex, Solidago altissima, Solidago canadensis, Solidago juncea, Solidago nemoralis, Solidago rugosa, Trifolium* spp., *Symphyotrichum lanceolatum (= Aster simplex), Symphyotrichum lateriflorum (= Aster lateriflorus), Symphyotrichum novae-angliae (= Aster novae-angliae*), and many others. This vegetation is quite wide-ranging in northeastern and midwestern states and possibly occurs at higher elevations in the southeastern states and southern Canada.

[CEGL006107] *Dactylis glomerata - Phleum pratense - Festuca* spp. - *Solidago* spp. Ruderal Meadow

Translated Name: **Orchardgrass - Timothy - Fescue species - Goldenrod species Ruderal Meadow**
Common Name: **Northeastern Old-field Meadow**

USNVC Classification

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Eastern North American Ruderal Grassland & Shrubland (M123)
Group	Eastern North American Ruderal Meadow & Shrubland (G059)
Alliance	*Dactylis glomerata - Festuca* spp. - *Solidago canadensis* Ruderal Mesic Meadow Alliance (A1190)

ELEMENT CONCEPT

Global Summary: This broadly defined vegetation type includes pastures and post-agricultural fields and is largely composed of non-native cool-season grasses and herbs (generally of European origin) in the early stages of succession. The fields are typically mowed at least annually. Physiognomically, these grasslands are generally composed of mid-height (1-3 feet tall) grasses and forbs, with occasional scattered shrubs. Species composition varies from site to site, depending on land-use history and perhaps soil type, but in general this vegetation is quite wide-ranging in northeastern and midwestern states and at higher elevations (610-1220 m [2000-4000 feet]) in the southeastern states. Dominant grasses vary from site to site but generally feature the nominal species. Other graminoid associates may include *Agrostis stolonifera, Agrostis hyemalis, Elymus repens, Bromus inermis, Bromus tectorum, Lolium perenne, Poa pratensis, Poa compressa, Schizachyrium scoparium* (not in abundance), and *Anthoxanthum odoratum*. Forbs scattered among the grasses are varied but include *Hieracium* spp., *Oxalis stricta, Achillea millefolium, Asclepias syriaca, Solidago rugosa, Solidago nemoralis, Solidago juncea, Solidago canadensis, Solidago altissima, Euthamia graminifolia, Cerastium arvense, Oenothera biennis, Potentilla simplex, Symphyotrichum lateriflorum (= Aster lateriflorus), Symphyotrichum novae-angliae (= Aster novae-angliae), Symphyotrichum lanceolatum (= Aster simplex), Daucus carota, Ambrosia artemisiifolia, Vicia cracca, Trifolium* spp., and many others.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This herbaceous-dominated old field and pasture vegetation has been anthropogenically altered and/or maintained over time. It was observed at seven locations in the Central Appalachian project area. Sites range from flat summits to gentle or moderate mid and upper slopes. Soils are dry, rapidly to well-drained silt loam, sandy loam, and loam. The unvegetated surface is typically entirely covered by leaf litter. Evidence of disturbance includes past logging, clearing, mowing, grazing, and the prevalence of exotic plant species.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: This herbaceous-dominated old field and pasture vegetation has been anthropogenically altered and/or maintained over time. These are highly disturbed sites with many exotic plant species present.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association occurs on pastures and land that has been tilled. Generally, the fields are mowed at least annually.
Global Environment: This association occurs on pastures and land that has been tilled. Generally the fields are mowed at least annually.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The dense herbaceous layer is dominated by mixtures of native and introduced grasses and forbs, including *Dactylis glomerata, Phleum pratense, Euthamia graminifolia, Lolium pratense, Festuca* spp., *Solidago rugosa, Trifolium* spp., *Medicago* spp., *Setaria* spp., *Trifolium* spp., *Tridens flavus*, and other grass and/or forb species. *Rubus allegheniensis* is a common shrub. Scattered early-successional trees such as *Betula populifolia* may be present.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The herbaceous layer varies in composition and can include or be dominated by one or more of the following species: *Dactylis glomerata, Phleum pratense, Anthoxanthum odoratum, Festuca* spp., *Dichanthelium clandestinum, Poa pratensis, Euthamia graminifolia, Dennstaedtia punctilobula, Solidago* spp., and other grass and forb species. Scattered trees such as *Juniperus virginiana* and shrubs such as *Rubus allegheniensis* are possible.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: In addition to *Dactylis glomerata* and *Phleum pratense*, these grassy fields are characterized by graminoids, including *Agrostis stolonifera, Agrostis hyemalis, Elymus repens, Bromus inermis, Bromus tectorum, Lolium perenne, Poa pratensis, Poa compressa, Schizachyrium scoparium* (not in abundance), and *Anthoxanthum odoratum*. Forbs scattered among the grasses are varied but include *Achillea millefolium, Ambrosia artemisiifolia, Asclepias syriaca, Cerastium arvense, Daucus carota, Dennstaedtia punctilobula, Euthamia graminifolia, Hieracium* spp., *Oenothera biennis, Oxalis stricta, Potentilla simplex, Pteridium aquilinum, Solidago altissima, Solidago canadensis, Solidago juncea, Solidago nemoralis, Solidago rugosa, Symphyotrichum lanceolatum (= Aster simplex), Symphyotrichum lateriflorum (= Aster lateriflorus), Symphyotrichum novae-angliae (= Aster novae-angliae), Trifolium* spp., *Vicia cracca*, and many others.
Global Vegetation: In addition to *Dactylis glomerata* and *Phleum pratense*, these grassy fields are characterized by graminoids including *Agrostis stolonifera, Agrostis hyemalis, Elymus repens, Bromus inermis, Bromus tectorum, Lolium perenne, Poa pratensis, Poa compressa, Schizachyrium scoparium* (not in abundance), and *Anthoxanthum odoratum*. Forbs scattered among the grasses are varied but include *Hieracium* spp., *Oxalis stricta, Achillea*

millefolium, Asclepias syriaca, Solidago rugosa, Solidago nemoralis, Solidago juncea, Solidago canadensis, Solidago altissima, Euthamia graminifolia, Cerastium arvense, Oenothera biennis, Potentilla simplex, Symphyotrichum lateriflorum (= Aster lateriflorus), Symphyotrichum novae-angliae (= Aster novae-angliae), Symphyotrichum lanceolatum (= Aster simplex), Daucus carota, Ambrosia artemisiifolia, Vicia cracca, Trifolium spp., and many others.

Global Dynamics: These pastures and post-agricultural fields are largely composed of non-native cool-season grasses and herbs (generally of European origin) in the early stages of succession. The fields are typically mowed at least annually.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Solidago rugosa*
Herb (field)	Graminoid	*Dactylis glomerata*, *Lolium pratense*, *Phleum pratense*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Solidago canadensis*, *Solidago rugosa*
Herb (field)	Graminoid	*Poa pratensis*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Rumex acetosella*
Herb (field)	Graminoid	*Dactylis glomerata*, *Festuca rubra*, *Phleum pratense*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Rumex acetosella*
Herb (field)	Graminoid	*Dactylis glomerata*, *Festuca rubra*, *Phleum pratense*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Dactylis glomerata*, *Euthamia graminifolia*, *Lolium pratense*, *Phleum pratense*, *Rubus allegheniensis*, *Solidago rugosa*

Appalachian National Scenic Trail (Lower New England Project Area): *Euthamia graminifolia*, *Poa pratensis*, *Solidago canadensis*, *Solidago rugosa*

Appalachian National Scenic Trail (Northern Appalachian Project Area):

Global: *Achillea millefolium*, *Anthoxanthum odoratum*, *Dactylis glomerata*, *Euthamia graminifolia*, *Phleum pratense*, *Rumex acetosella*, *Solidago altissima*, *Solidago canadensis*, *Solidago rugosa*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Allium vineale* (Medium/Insignificant), *Anthoxanthum odoratum*, *Asparagus officinalis* (Medium/Insignificant), *Berberis thunbergii* (High/Medium), *Berberis vulgaris* (Medium/Low), *Cirsium arvense* (High/Medium), *Dactylis glomerata* (Medium/Insignificant), *Dianthus armeria* (Low/Insignificant), *Linaria vulgaris* (High/Low), *Lolium pratense* (High/Low), *Lonicera japonica* (High/Medium), *Medicago lupulina* (Medium/Insignificant), *Phleum pratense* (Medium), *Poa pratensis* (Medium), *Ranunculus bulbosus*, *Rosa multiflora* (Medium/Low), *Setaria pumila* (Low/Insignificant), *Taraxacum officinale*, *Verbascum thapsus* (Medium)

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Anthoxanthum odoratum*, *Dactylis glomerata* (Medium/Insignificant), *Daucus carota* (Low), *Glechoma hederacea* (Low), *Leucanthemum vulgare* (Medium/Low), *Lotus corniculatus* (Medium/Low), *Poa pratensis* (Medium), *Rosa multiflora* (Medium/Low), *Rumex acetosella* (Medium/Low); **Other Plants**: *Hieracium* x *floribundum* (GNA)

Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Dactylis glomerata* (Medium/Insignificant), *Festuca rubra* (Unknown), *Phleum pratense* (Medium), *Rumex acetosella* (Medium/Low)

Global: Invasive/Exotic Plants: *Achillea millefolium* (weedy native), *Anthoxanthum odoratum*, *Bromus tectorum* (High), *Dactylis glomerata* (Medium/Insignificant), *Daucus carota* (Low), *Elymus repens* (High/Medium), *Festuca*

rubra (Unknown), *Lolium perenne* (Medium), *Phleum pratense* (Medium), *Poa compressa* (High/Low), *Rumex acetosella* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (8-Dec-2005). This vegetation type includes pasture and post-agricultural fields and is largely composed of non-native grasses and herbs (generally of European origin).

RELATED CONCEPTS

Global Similar Types:

- *Lolium (arundinaceum, pratense)* Ruderal Grassland (CEGL004048)
- *Panicum virgatum - (Andropogon virginicus)* Ruderal Meadow (CEGL006616)
- *Phleum pratense - Bromus pubescens - Helenium autumnale* Ruderal Meadow (CEGL004018)
- *Schizachyrium scoparium - (Andropogon virginicus) - Solidago* spp. Ruderal Meadow (CEGL006333) has a greater component of native species and occurs on drier soils.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: When shrub cover exceeds 50%, classify as Northeastern Ruderal Shrubland (CEGL006451).
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: Powerline rights-of-way are kept artificially open, likely by herbicides in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: No plots or observation points were collected, but the UMESC mapping team reported it at low elevation in New Hampshire and then along the Kennebec River in Maine.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: *Schizachyrium scoparium - (Andropogon virginicus) - Solidago* spp. Ruderal Meadow (CEGL006333) is similar to this type but is dominated by warm-season grasses.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was observed within the Appalachian Trail corridor at Bluff City North and in the Paris area in Virginia, at Reno Mountain Road in Maryland, and in Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Unionville West in New Jersey and in Vermont but is wide-ranging in northeastern states.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: No plots or observation points were collected, but the UMESC mapping team reported it at low elevation in New Hampshire and then along the Kennebec River in Maine.
Global Range: This vegetation is quite wide-ranging in northeastern and midwestern states and possibly occurs at higher elevations in the southeastern states.
Nations: CA?, US
States/Provinces: CT, DE, KY, MA, MD, ME, NB?, NH, NJ, NS?, NY, PA, QC?, RI, TN, VA, VT, WV?
TNC Ecoregions: 48:C, 49:C, 50:P, 52:C, 58:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212D:CC, 212Fc:CCC, 221Aa:CCP, 221Ab:CCC, 221Ae:CCC, 221Ai:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Ea:CCC, 221Fa:CCC, 222Ib:CCC, 222Ic:CCC, 231Ae:CCC, 231Ak:CCC, 231An:CCC, 232Ab:CCC, 232Ac:CCC, 232Br:CCC, M212A:CP, M212Ba:CCC, M212Bb:CCC, M221Ac:CCC
Federal Lands: NPS (Allegheny Portage Railroad, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Appomattox Court House, Booker T. Washington, Boston Harbor Islands, Cape Cod, Colonial, Delaware Water Gap, Fire Island, Fort Necessity, Fredericksburg-Spotsylvania, Friendship Hill, Gateway, George Washington Birthplace, Gettysburg, Johnstown Flood, Marsh-Billings-Rockefeller, Minute Man, Morristown, Petersburg, Richmond, Saint-Gaudens, Saratoga, Upper Delaware, Valley Forge, Weir Farm); USFWS (Aroostook, Assabet River, Cape May, Carlton Pond, E.B. Forsythe, Erie, Great Meadows, Iroquois, Montezuma, Moosehorn, Nulhegan Basin, Oxbow, Parker River, Rachel Carson, Supawna Meadows)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HXNE
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: UMESC mapping team reported it at low elevation in New Hampshire and then along the Kennebec River in Maine. It was sampled during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (7 observation points; 38 accuracy assessment points): APPA.1148, APPA.1319, APPA.1320, APPA.1321, APPA.1322, APPA.1323, APPA.1324, APPA_AA_0028, APPA_AA_0045, APPA_AA_0058, APPA_AA_0089, APPA_AA_0094, APPA_AA_0165, APPA_AA_0247, APPA_AA_0286, APPA_AA_0305, APPA_AA_0307, APPA_AA_0314, APPA_AA_0367, APPA_AA_0520, APPA_AA_0573, APPA_AA_0635, APPA_AA_0654, APPA_AA_0663, APPA_AA_0711, APPA_AA_0741, APPA_AA_0850, APPA_AA_0880, APPA_AA_0977, APPA_AA_1004, APPA_AA_1188, APPA_AA_1308, APPA_AA_1321, APPA_AA_1360, APPA_AA_1364, APPA_AA_1413, APPA_AA_1438, APPA_AA_1441, APPA_AA_1468, APPA_AA_1473, APPA_AA_1506, APPA_AA_1552, APPA_AA_1554, APPA_AA_1580, APPA_AA_1581.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot, 3 observation points; 12 accuracy assessment points): APPA.1358, APPA.1484, APPA.1558, APPA.1745, APPA_AA_1643, APPA_AA_1962, APPA_AA_2015, APPA_AA_2108, APPA_AA_2163, APPA_AA_2167, APPA_AA_2369, APPA_AA_2943, APPA_AA_3016, APPA_AA_3245, APPA_AA_3252, APPA_AA_3317.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (6 accuracy assessment points): APPA_AA_1781, APPA_AA_1896, APPA_AA_2817, APPA_AA_2975, APPA_AA_3023, APPA_AA_3129.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: Clark 1986a, Conard 1935, Coxe 2009, Dowhan and Rozsa 1989, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Edinger et al. 2008a, Ehrenfeld 1977, Elliman 2003, Gawler and Bowman 2012, Gawler et al. 2005, Keever 1979, Klopfer et al. 2002, Largay and Sneddon 2010, Metzler et al. 2009, NRCS 2004a, NatureServe 2009, Patterson 2008a, Patterson 2008b, Patterson 2008c, Patterson 2008d, Patterson 2008e, Patterson 2008f, Perles et al. 2006a, Perles et al. 2006b, Perles et al. 2006c, Perles et al. 2006d, Perles et al. 2006e, Perles et al. 2007, Perles et al. 2008, Podniesinski et al. 2005b, Sneddon et al. 1995, Sneddon et al. 2008, Sneddon et al. 2010, Swain and Kearsley 2000, Swain and Kearsley 2001, TDNH unpubl. data, Taverna and Patterson 2008, Walz et al. 2008

[CEGL004018] *Phleum pratense - Bromus pubescens - Helenium autumnale* Ruderal Meadow

Translated Name: **Timothy - Hairy Woodland Brome - Common Sneezeweed Ruderal Meadow**
Common Name: **Grazed Montane Grassland / Fire Meadow**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Eastern North American Ruderal Grassland & Shrubland (M123)
Group	Eastern North American Ruderal Meadow & Shrubland (G059)
Alliance	*Dactylis glomerata* - *Festuca* spp. - *Solidago canadensis* Ruderal Mesic Meadow Alliance (A1190)

ELEMENT CONCEPT

Global Summary: This vegetation type is currently known from high-elevation pastures or grass balds in the Southern Appalachians but is possible throughout the United States and in southern Canada. It represents montane grasslands with many alien species, presumably planted or introduced by grazing animals. *Phleum pratense*, a native of Europe, is characteristic. Occurrences are variable and patchy, often with local dominance of tall forbs. Other characteristic species include *Hieracium caespitosum (= Hieracium pratense)* (alien), *Potentilla canadensis*, and

Ranunculus acris (alien). Stands of this type are maintained by periodic mowing or, in some instances, prescribed burning.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: These pastures occur at high elevation (above 915 m [3,000 feet]). They are anthropogenically disturbed/managed fields, created and maintained by yearly mowing or grazing. The single sampled stand is located on a moderate, northeast-facing upper slope with dry-mesic, moderately well-drained silt loam soil. The unvegetated surface is made up entirely of leaf litter (100% cover). Evidence of disturbance includes mowing, trails, and the presence of exotic species.
Global Environment: This vegetation type is currently known from high-elevation pastures or grass balds in the Southern Appalachians but is possible throughout the United States and in southern Canada.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: These herbaceous (greater than 50% herbaceous cover) pastures are dominated by *Phleum pratense* and *Bromus* spp. These are less diverse pastures of anthropogenic origin and lack native species characteristic of more natural Grassy Balds (CEGL004242).
Global Vegetation: Stands of this type are maintained by periodic mowing or, in some instances, prescribed burning. *Phleum pratense*, a native of Europe, is characteristic. Occurrences are variable and patchy, often with local dominance of tall forbs. Other characteristic species include *Hieracium caespitosum (= Hieracium pratense)* (alien), *Potentilla canadensis*, and *Ranunculus acris* (alien). The nominals *Bromus pubescens* and *Helenium autumnale* are indicative of grazing.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phleum pratense*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phleum pratense*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Phleum pratense*
Global: *Helenium autumnale*, *Phleum pratense*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Invasive/Exotic Plants: *Phleum pratense* (Medium)
Global: Invasive/Exotic Plants: *Phleum pratense* (Medium); **Other Plants**: *Bromus pubescens* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (8-Nov-2001). This vegetation type includes pasture and post-agricultural fields, and is largely composed of non-native grasses and herbs (generally of European origin).

RELATED CONCEPTS

Global Similar Types:
- *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Ruderal Meadow (CEGL006107)
- *Schizachyrium scoparium* - *(Andropogon virginicus)* - *Solidago* spp. Ruderal Meadow (CEGL006333)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This community was sampled in Tennessee. It is currently known from high-elevation pastures or grass balds in the Southern Appalachians.
Global Classification Comments: The nominals *Bromus pubescens* and *Helenium autumnale* are indicative of grazing.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled in Tennessee. It is currently known from high-elevation pastures or grass balds in the Southern Appalachians.
Global Range: This vegetation type is currently known from high-elevation pastures or grass balds in the Southern Appalachians but is possible throughout the United States and in southern Canada.
Nations: US
States/Provinces: NC, TN, VA
TNC Ecoregions: 51:C, 59:C
USFS Ecoregions (1994/95): M221Dc:CCP, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HXFM
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: 1 observation point; 27 accuracy assessment points): APPA.1139, APPA_AA_0018, APPA_AA_0207, APPA_AA_0284, APPA_AA_0289, APPA_AA_0292, APPA_AA_0318, APPA_AA_0564, APPA_AA_0577, APPA_AA_0656, APPA_AA_0661, APPA_AA_0672, APPA_AA_0758, APPA_AA_0776, APPA_AA_0894, APPA_AA_0908, APPA_AA_1002, APPA_AA_1038, APPA_AA_1059, APPA_AA_1105, APPA_AA_1145, APPA_AA_1207, APPA_AA_1250, APPA_AA_1371, APPA_AA_1375, APPA_AA_1404, APPA_AA_1408, APPA_AA_1539.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): K.D. Patterson and A.S. Weakley
References: Allard 1990, Pyne 1994, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

A3934 *Poa compressa - Solidago nemoralis - Centaurea biebersteinii* Ruderal Dry Meadow & Shrubland Alliance

Alliance Summary Description: This alliance includes three variants of dry ruderal grasslands: (1) Dry semi-natural grasslands found on sandy or rock substrates and includes weedy native grasses *Festuca* spp., *Poa compressa*, and *Schizachyrium scoparium*, and an assortment of dry invasive forbs such as *Centaurea biebersteinii (= Centaurea maculosa)* and *Solidago nemoralis*; (2) Vegetation dominated by the weedy native *Andropogon virginicus var. virginicus* that occurs on old fields, pastures, and rocky sites. Associated species vary with geography and habitat and include a mix of native and exotic species; and (3) Invasive grass dune vegetation, including stands of the non-native sedge *Carex kobomugi* that invades and overtakes coastal sand dunes dominated by *Ammophila breviligulata* and/or *Panicum amarum var. amarum*. It is reported along the central New Jersey coast and at First Landing/Seashore State Park in Virginia.

[CEGL006333] *Schizachyrium scoparium - (Andropogon virginicus) - Solidago* spp. Ruderal Meadow

Translated Name: **Little Bluestem - (Broomsedge Bluestem) - Goldenrod species Ruderal Meadow**
Common Name: **Little Bluestem Old-field Meadow**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Eastern North American Ruderal Grassland & Shrubland (M123)
Group	Eastern North American Ruderal Meadow & Shrubland (G059)
Alliance	*Poa compressa - Solidago nemoralis - Centaurea biebersteinii* Ruderal Dry Meadow & Shrubland Alliance (A3934)

ELEMENT CONCEPT

Global Summary: This broadly defined vegetation type includes old fields of well-drained soils, either sandy or shallow to bedrock. They are characterized by dominance of warm-season grasses. *Schizachyrium scoparium* is characteristic and nearly always present. Species composition is variable, depending on land-use history, but in general this vegetation is quite wide-ranging in northeastern and midwestern states. In addition to the nominal

species, other associates may include *Andropogon virginicus, Eragrostis spectabilis, Festuca rubra, Deschampsia flexuosa, Danthonia spicata, Nuttallanthus canadensis (= Linaria canadensis), Rubus flagellaris, Panicum virgatum, Dichanthelium depauperatum (= Panicum depauperatum), Potentilla simplex, Dichanthelium meridionale (= Panicum meridionale), Dichanthelium dichotomum (= Panicum dichotomum), Solidago rugosa*, and *Carex pensylvanica*. Scattered shrubs are often present, including *Comptonia peregrina, Morella pensylvanica, Gaylussacia baccata*, and scattered tree saplings, such as *Prunus serotina, Sassafras albidum*, and *Juniperus virginiana*. *Polytrichum juniperinum* and other *Polytrichum* spp. are common bryophytes.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This broadly defined old-field vegetation association occurs on well-drained soils, either sandy or shallow to bedrock.
Global Environment: This vegetation occurs on well-drained soils, either on sandy flats or on dry knolls with shallow soils. The vegetation arises spontaneously after soil disturbance.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Schizachyrium scoparium* is characteristic and nearly always present. Species composition is variable, depending on land-use history.
Global Vegetation: *Schizachyrium scoparium* is characteristic and nearly always present. Species composition is variable, depending on land-use history, but in general, this vegetation is quite wide-ranging in northeastern and midwestern states. In addition to the nominal species, other associates may include *Andropogon virginicus, Eragrostis spectabilis, Festuca rubra, Deschampsia flexuosa, Centaurea biebersteinii (= Centaurea maculosa), Danthonia spicata, Hypericum perforatum, Nuttallanthus canadensis (= Linaria canadensis), Rubus flagellaris, Panicum virgatum, Dichanthelium depauperatum (= Panicum depauperatum), Potentilla simplex, Dichanthelium meridionale (= Panicum meridionale), Dichanthelium dichotomum (= Panicum dichotomum), Solidago juncea, Solidago nemoralis, Solidago rugosa, Hieracium* spp., and *Carex pensylvanica*. Scattered shrubs are often present, including *Comptonia peregrina, Morella pensylvanica, Gaylussacia baccata*, and scattered tree saplings, such as *Prunus serotina, Sassafras albidum*, and *Juniperus virginiana*.

Most Abundant Species

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Schizachyrium scoparium*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Rubus flagellaris*
Herb (field)	Flowering forb	*Solidago juncea*, *Solidago nemoralis*, *Solidago rugosa*
Herb (field)	Graminoid	*Schizachyrium scoparium*

Characteristic Species

Appalachian National Scenic Trail (Lower New England Project Area): *Schizachyrium scoparium*
Global: *Andropogon virginicus*, *Dichanthelium* spp., *Schizachyrium scoparium*, *Solidago juncea*, *Solidago nemoralis*, *Solidago rugosa*

Other Noteworthy Species

Global: Other Plants: *Panicum virgatum* (G5)

Conservation Status Rank

Global Rank & Reasons: GNA (invasive) (19-Jan-2006). This vegetation type includes pasture and post-agricultural fields.

Related Concepts

Global Similar Types:
- *Dactylis glomerata - Phleum pratense - Festuca* spp. - *Solidago* spp. Ruderal Meadow (CEGL006107)
- *Lolium (arundinaceum, pratense)* Ruderal Grassland (CEGL004048)
- *Panicum virgatum - (Andropogon virginicus)* Ruderal Meadow (CEGL006616)
- *Phleum pratense - Bromus pubescens - Helenium autumnale* Ruderal Meadow (CEGL004018)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was not sampled in the field but is likely to occur within the corridor.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type is distinguished, in theory, from the very similar *Dactylis glomerata - Phleum pratense - Festuca* spp. - *Solidago* spp. Ruderal Meadow (CEGL006107) by the dominance of warm-season grasses as opposed to cool-season grasses (*Phleum, Festuca*) dominating CEGL006107. Additional data will be required to see how this distinction holds up and what geographic differences might accompany such a distinction.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: Not observed, but expected in the Lower New England AT corridor. It was mapped in a successional grass map class.
Global Range: This vegetation is quite wide-ranging in northeastern and midwestern states, and possibly occurs at higher elevations in the southeastern states.
Nations: US
States/Provinces: CT, MA, ME, MS, NH, NJ, NY, PA, RI, TN, VT
TNC Ecoregions: 43:C, 44:C, 48:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Ab:CCC, 221Bc:CCC, 221Bd:CCC, 222Eg:CCC, 222Ib:CCC, 231Bi:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Bd:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Boston Harbor Islands, Cape Cod, Delaware Water Gap, Gateway, Natchez Trace, Saratoga, Upper Delaware, Weir Farm); USFWS (E.B. Forsythe, Great Swamp, Iroquois)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HXNE
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 accuracy assessment point): APPA_AA_3224.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo., mod. E. Largay
Global Description Author(s): L.A. Sneddon and S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Edinger et al. 2008a, House 1917, Largay and Sneddon 2010, Metzler et al. 2009, NRCS 2001b, NRCS 2004a, NatureServe 2009, Niering et al. 1970, Nordman et al. 2011, Perles et al. 2007, Perles et al. 2008, Sneddon et al. 2010, Swain and Kearsley 2000, Swain and Kearsley 2001, Walz et al. 2008

A3935 *Rhamnus cathartica - Rosa multiflora - Elaeagnus umbellata* Ruderal Mesic Shrubland Alliance

Alliance Summary Description: This alliance is common in former agricultural areas in the northeastern and midwestern United States and temperate regions of eastern Canada. It comprises primarily shrubby old fields dominated by exotic shrubs, such as *Berberis thunbergii, Elaeagnus angustifolia, Euonymus alatus, Lonicera japonica, Lonicera morrowii, Ligustrum vulgare, Rhamnus cathartica*, and *Rosa multiflora*, as well as weedy natives, such as *Cornus racemosa, Rhus glabra, Rhus typhina*, and *Viburnum prunifolium* Less commonly, *Gaylussacia baccata, Vaccinium pallidum, Vaccinium stamineum*, and/or *Vaccinium angustifolium* may be dominant. Sapling or small trees are often present but form <10% cover; they include exotic trees such as *Robinia pseudoacacia*, and many weedy natives, such as *Acer rubrum, Betula populifolia, Cornus florida, Fraxinus americana, Juglans nigra, Juniperus virginiana, Populus deltoides, Prunus serotina*, and *Prunus virginiana*. The herbaceous layer is variable depending on the density of shrub cover. Common species include exotics such as *Achillea millefolium, Agrostis gigantea, Alliaria petiolata, Anthoxanthum odoratum, Bromus inermis, Centaurea* spp., *Daucus carota, Galium mollugo, Lolium arundinaceum (= Schedonorus arundinaceum), Trifolium repens*, as well as weedy natives such as *Euthamia graminifolia, Festuca rubra, Monarda fistulosa, Oxalis stricta, Poa pratensis, Solidago rugosa, Solidago gigantea*, and *Solidago nemoralis*, among many others. Vines can be absent or dominant, sometimes covering the tall and short shrubs. Common vines are exotic *Celastrus orbiculata* and *Lonicera japonica*, and weedy natives such as *Parthenocissus quinquefolia, Toxicodendron radicans, Vitis aestivalis*, and *Vitis labrusca*.

[CEGL006451] *Elaeagnus umbellata - Cornus racemosa - Rosa multiflora - Juniperus virginiana* Ruderal Shrubland

Translated Name: **Autumn-olive - Gray Dogwood - Multiflora Rose - Eastern Red-cedar Ruderal Shrubland**
Common Name: **Northeastern Ruderal Shrubland**

USNVC Classification

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Eastern North American Ruderal Grassland & Shrubland (M123)
Group	Eastern North American Ruderal Meadow & Shrubland (G059)
Alliance	*Rhamnus cathartica - Rosa multiflora - Elaeagnus umbellata* Ruderal Mesic Shrubland Alliance (A3935)

Element Concept

Global Summary: This association comprises shrubby old fields dominated by thickets of *Elaeagnus angustifolia, Cornus racemosa, Viburnum prunifolium, Lonicera japonica, Lonicera morrowii, Ligustrum vulgare, Euonymus alatus, Rosa multiflora, Rhus glabra*, and *Rhus typhina*, with patches of herbaceous vegetation among the shrubs. Shorter shrubs include *Berberis thunbergii* and *Rubus* spp., and in some fields *Gaylussacia baccata, Vaccinium pallidum, Vaccinium stamineum*, and/or *Vaccinium angustifolium*. Small trees are often present but form <25% cover; they include *Juniperus virginiana, Betula populifolia, Prunus virginiana, Cornus florida, Acer rubrum, Juglans nigra, Prunus serotina, Robinia pseudoacacia*, and *Fraxinus americana*. The herbaceous layer is variable depending on the density of shrub cover. Typical species are those associated with old fields, grasslands, and agricultural sites. Common species include *Solidago rugosa, Solidago gigantea, Solidago nemoralis, Monarda fistulosa, Anthoxanthum odoratum, Poa pratensis, Oxalis stricta, Viola sororia, Euthamia graminifolia, Festuca rubra, Schizachyrium scoparium, Pycnanthemum virginianum, Alliaria petiolata, Galium mollugo, Potentilla simplex, Achillea millefolium, Daucus carota, Trifolium repens, Bromus inermis, Agrostis gigantea*, and *Elymus repens (= Elytrigia repens)*, among many others. Vines can be absent or dominant, sometimes covering the tall and short shrubs. Common vines are *Vitis aestivalis, Vitis labrusca, Toxicodendron radicans, Celastrus orbiculata, Parthenocissus quinquefolia*, and *Lonicera japonica*.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This tall, typically closed-canopy shrubland thicket occurs on old fields, pastures, or modified lands. It was sampled at 10 locations in the Central Appalachian project area. Sites range from gentle to moderate lower to upper slopes of any aspect. Soils are dry to dry-mesic, mostly well-drained clay loam, silt loam, sandy loam, and loam. The unvegetated surface may be made up entirely of leaf litter or consist of a mix of large and small rocks, downed wood and/or bare soil. Evidence of disturbance includes past logging/clearing and the presence of exotic plant species.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: This successional shrubland occurs on old fields, pastures, or modified lands. These are highly disturbed sites with many exotic plant species present.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association occurs on former agricultural lands and old fields that are no longer intensively mowed, plowed or managed. These sites contain moderately well-drained to well-drained soils. The shrublands are flat to gently sloping, often bounded by stonewalls or fencerows.
Global Environment: This association occurs on former agricultural lands and old fields that are no longer intensively mowed, plowed or managed. These sites contain moderately well-drained to well-drained soils. The shrublands are flat to gently sloping, often bounded by stonewalls or fencerows.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This association is dominated by an admixture of non-native and native shrubs and vines such as *Elaeagnus umbellata, Rubus allegheniensis, Smilax rotundifolia, Rosa multiflora, Lonicera morrowii, Celastrus orbiculata, Vitis labrusca, Parthenocissus quinquefolia, Lonicera japonica, Ligustrum vulgare, Juniperus virginiana*, and other early-successional trees (<25% in cover). Old-field grasses and forbs such as *Daucus carota* and *Euthamia graminifolia* are common in more open-canopied variants where tall and short shrubs cover at least 25% of the field.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These successional shrubland thickets are dominated by an admixture of non-native and native shrubs such as *Elaeagnus umbellata, Rubus allegheniensis, Rosa multiflora, Lonicera morrowii, Celastrus orbiculata, Lonicera japonica, Ligustrum*

vulgare, Juniperus virginiana, Prunus pensylvanica, Prunus serotina, Rhus typhina, Amelanchier arborea, and other small trees (<25% in cover). Old-field grasses, forbs, and ferns are common in more open-canopied variants where tall and short shrubs cover at least 25% of the field. *Lonicera morrowii* and *Schizachyrium scoparium* are the dominant shrub and herb, respectively, in the sampled plot along this section of the trail.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The structure of this association varies from open fields with scattered tall and short shrubs covering 25% of the field, with herbaceous vegetation in the interstices, to dense "closed-canopy" tall shrublands with sparse ground layer vegetation. Common shrubs include *Elaeagnus angustifolia, Cornus racemosa, Viburnum prunifolium, Lonicera japonica, Lonicera morrowii, Ligustrum vulgare, Euonymus alatus, Rosa multiflora, Rhus glabra*, and *Rhus typhina*, with patches of herbaceous vegetation among the shrubs. Shorter shrubs include *Berberis thunbergii* and *Rubus* spp., and in some fields, *Gaylussacia baccata, Vaccinium pallidum, Vaccinium stamineum*, and/or *Vaccinium angustifolium*. Small trees are often present but form <25% cover; they include *Juniperus virginiana, Betula populifolia, Prunus virginiana, Cornus florida, Acer rubrum, Juglans nigra, Prunus serotina, Robinia pseudoacacia*, and *Fraxinus americana*. The herbaceous layer is variable depending on the density of shrub cover. Typical species are those associated with old fields, grasslands, and agricultural sites. Common species include *Solidago rugosa, Solidago gigantea, Solidago nemoralis, Monarda fistulosa, Anthoxanthum odoratum, Poa pratensis, Oxalis stricta, Viola sororia, Euthamia graminifolia, Festuca rubra, Schizachyrium scoparium, Pycnanthemum virginianum, Alliaria petiolata, Galium mollugo, Potentilla simplex, Achillea millefolium, Daucus carota, Trifolium repens, Bromus inermis, Agrostis gigantea*, and *Elymus repens (= Elytrigia repens)*, among many others. Vines can be absent or dominant, sometimes covering the tall and short shrubs. Common vines are *Vitis aestivalis, Vitis labrusca, Toxicodendron radicans, Celastrus orbiculata, Parthenocissus quinquefolia*, and *Lonicera japonica*.

Global Vegetation: The structure of this association varies from open fields with scattered tall and short shrubs covering 25% of the field, with herbaceous vegetation in the interstices, to dense "closed-canopy" tall shrublands with sparse ground layer vegetation. Common shrubs include *Elaeagnus angustifolia, Cornus racemosa, Viburnum prunifolium, Lonicera japonica, Lonicera morrowii, Ligustrum vulgare, Euonymus alatus, Rosa multiflora, Rhus glabra*, and *Rhus typhina*, with patches of herbaceous vegetation among the shrubs. Shorter shrubs include *Berberis thunbergii* and *Rubus* spp., and in some fields *Gaylussacia baccata, Vaccinium pallidum, Vaccinium stamineum*, and/or *Vaccinium angustifolium*. Small trees are often present but form <25% cover; they include *Juniperus virginiana, Betula populifolia, Prunus virginiana, Cornus florida, Acer rubrum, Juglans nigra, Prunus serotina, Robinia pseudoacacia*, and *Fraxinus americana*. The herbaceous layer is variable depending on the density of shrub cover. Typical species are those associated with old fields, grasslands, and agricultural sites. Common species include *Solidago rugosa, Solidago gigantea, Solidago nemoralis, Monarda fistulosa, Anthoxanthum odoratum, Poa pratensis, Oxalis stricta, Viola sororia, Euthamia graminifolia, Festuca rubra, Schizachyrium scoparium, Pycnanthemum virginianum, Alliaria petiolata, Galium mollugo, Potentilla simplex, Achillea millefolium, Daucus carota, Trifolium repens, Bromus inermis, Agrostis gigantea*, and *Elymus repens (= Elytrigia repens)*, among many others. Vines can be absent or dominant, sometimes covering the tall and short shrubs. Common vines are *Vitis aestivalis, Vitis labrusca, Toxicodendron radicans, Celastrus orbiculata, Parthenocissus quinquefolia*, and *Lonicera japonica*.

Global Dynamics: This association develops as woody species colonize open fields, typically from the outer edges of the field into the center or as scattered clumps throughout the field.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Elaeagnus umbellata*, *Lonicera morrowii*
Short shrub/sapling	Dwarf-shrub	*Rubus allegheniensis*
Herb (field)	Liana	*Vitis aestivalis*, *Vitis labrusca*
Herb (field)	Flowering forb	*Daucus carota*, *Euthamia graminifolia*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lonicera morrowii*
Herb (field)	Graminoid	*Schizachyrium scoparium*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Cornus racemosa*, *Elaeagnus umbellata*, *Rhus glabra*, *Rosa multiflora*
Tall shrub/sapling	Needle-leaved tree	*Juniperus virginiana*
Herb (field)	Liana	*Celastrus orbiculata*, *Vitis aestivalis*, *Vitis labrusca*
Herb (field)	Flowering forb	*Monarda fistulosa*, *Solidago altissima*, *Solidago rugosa*
Herb (field)	Graminoid	*Anthoxanthum odoratum*, *Schizachyrium scoparium*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Cornus racemosa*, *Elaeagnus umbellata*, *Rhus glabra*, *Rosa multiflora*
Tall shrub/sapling	Needle-leaved tree	*Juniperus virginiana*
Herb (field)	Liana	*Celastrus orbiculata*, *Vitis aestivalis*, *Vitis labrusca*
Herb (field)	Flowering forb	*Monarda fistulosa*, *Solidago altissima*, *Solidago rugosa*
Herb (field)	Graminoid	*Anthoxanthum odoratum*, *Schizachyrium scoparium*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Daucus carota*, *Elaeagnus umbellata*, *Euthamia graminifolia*, *Lonicera morrowii*, *Rubus allegheniensis*, *Vitis aestivalis*
Appalachian National Scenic Trail (Lower New England Project Area): *Elaeagnus umbellata*, *Lonicera morrowii*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Anthoxanthum odoratum*, *Celastrus orbiculata*, *Cornus racemosa*, *Elaeagnus umbellata*, *Juniperus virginiana*, *Monarda fistulosa*, *Rhus glabra*, *Rhus typhina*, *Rosa multiflora*, *Solidago altissima*, *Solidago rugosa*, *Vitis aestivalis*
Global: *Anthoxanthum odoratum*, *Celastrus orbiculata*, *Cornus racemosa*, *Elaeagnus umbellata*, *Juniperus virginiana*, *Monarda fistulosa*, *Rhus glabra*, *Rhus typhina*, *Rosa multiflora*, *Solidago altissima*, *Solidago rugosa*, *Vitis aestivalis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Ailanthus altissima* (Medium), *Calystegia sepium*, *Cirsium vulgare* (Medium/Low), *Dactylis glomerata* (Medium/Insignificant), *Daucus carota* (Low), *Elaeagnus umbellata* (High), *Lolium pratense* (High/Low), *Lonicera japonica* (High/Medium), *Lonicera morrowii* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum perfoliatum* (Medium), *Populus alba* (High/Low), *Rosa multiflora* (Medium/Low)
Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Agrostis gigantea* (Medium/Low), *Anthoxanthum odoratum*, *Bromus inermis* (High/Medium), *Centaurea biebersteinii* (High/Medium), *Elaeagnus umbellata* (High), *Galium mollugo*, *Lonicera morrowii* (High/Medium), *Phleum pratense* (Medium), *Pinus sylvestris* (Medium/Low), *Rosa multiflora* (Medium/Low), *Rumex acetosella* (Medium/Low)
Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Anthoxanthum odoratum*, *Celastrus orbiculata* (High/Medium), *Elaeagnus umbellata* (High), *Rosa multiflora* (Medium/Low)
Global: Invasive/Exotic Plants: *Anthoxanthum odoratum*, *Celastrus orbiculata* (High/Medium), *Elaeagnus umbellata* (High), *Rosa multiflora* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (23-Jun-2006).

Related Concepts

Global Similar Types:
- *Cornus (amomum, sericea) - Viburnum dentatum - Rosa multiflora* Ruderal Shrub Swamp (CEGL006576)
- *Gaylussacia baccata - Vaccinium pallidum - Vaccinium corymbosum* Shrubland (CEGL006622)

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community differs from Successional Heath Shrubland (CEGL006622) by the dominance of exotic shrubs and vines.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Some of the old-field sites in Vermont have been burned to keep them open and have since grown in with shrub vegetation.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: Limited to the Lower New England ecoregion (not project area), Successional Heath Shrubland (CEGL006622) was expanded to pickup the "native" successional shrublands in the Northern Appalachian project area. However, this is only in the Northern Appalachian project area since there was more than enough non-native invasion in the southern lobe of the Northern Appalachian Mountains ecoregion (Lower New England project area) to continue to use Northeastern Ruderal Shrubland (CEGL006451). I believe that we used Sanitorium Road - NH 25 as the official split between the two ecoregions in the Northern Appalachian project area.
Global Classification Comments: This is a broadly defined type intended for shrubby vegetation on abandoned cropland or pasture.

Element Distribution

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was observed within the AT corridor in Pennsylvania, Virginia (Front Royal), and West Virginia (Harpers Ferry).
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Housatonic Valley - Buck Hill in Connecticut but is wide-ranging in northeastern states.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is believed to occur in the Northern Appalachian project area, but no plots or observation points have been collected.
Global Range: This community is common in former agricultural areas in the northeastern U.S.
Nations: US
States/Provinces: CT, DE, MA, NJ, NY, PA, VA, WV
TNC Ecoregions: 48:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Ae:CCC, 221Bc:CCC, 221Bd:CCC, 221Db:CCC, 222Ib:CCC, 222Ic:CCC, 232Ab:CCC, 232Ac:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Boston Harbor Islands, Delaware Water Gap, Gateway, Saratoga, Upper Delaware, Valley Forge); USFWS (Cape May, E.B. Forsythe, Iroquois, Montezuma, Prime Hook, Supawna Meadows)

Element Sources

Appalachian National Scenic Trail Map-Class Code: SXCN
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (10 observation points; 20 accuracy assessment points): APPA.1195, APPA.1306, APPA.1307, APPA.1308, APPA.1309, APPA.1310, APPA.1311, APPA.1312, APPA.1314, APPA.1315, APPA_AA_0009, APPA_AA_0158, APPA_AA_0185, APPA_AA_0273, APPA_AA_0414, APPA_AA_0494, APPA_AA_0524, APPA_AA_0556, APPA_AA_0762, APPA_AA_0771, APPA_AA_0815, APPA_AA_0848, APPA_AA_0897, APPA_AA_0914, APPA_AA_0989, APPA_AA_1136, APPA_AA_1153, APPA_AA_1263, APPA_AA_1292, APPA_AA_1558.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (5 observation points; 7 accuracy assessment points): APPA.1424, APPA.1693, APPA.1699, APPA.1731, APPA.1734, APPA_AA_2241, APPA_AA_2303, APPA_AA_2329, APPA_AA_2639, APPA_AA_2788, APPA_AA_3031, APPA_AA_3312.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (4 accuracy assessment points): APPA_AA_1779, APPA_AA_1953, APPA_AA_2247, APPA_AA_2956.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Edinger et al. 2008a, Largay and Sneddon 2010, NRCS 2001b, NRCS 2004a, NatureServe 2009, Newbold et al. 1988, Overlease 1987, Perles et al. 2007, Perles et al. 2008, Podniesinski et al. 2005b, Walz et al. 2008

M505. Laurentian-Acadian Acidic Rocky Scrub & Grassland

G788. LAURENTIAN-ACADIAN ACIDIC SCRUB & GRASSLAND

Group Summary Description: This Laurentian and near-boreal outcrop group is found across central southern Canada and the upper Midwest of the United States. It is found on ridges or summits of resistant acidic bedrock at low to mid elevations with soils ranging from sands to loams. The vegetation is patchy, often a mosaic of woodlands and open glades and typically dominated by various conifers, including *Pinus banksiana* and *Picea mariana*, with occasional *Picea glauca* or *Populus tremuloides*. Hardwoods include *Quercus rubra, Quercus ellipsoidalis*, and *Populus tremuloides*. Structure can vary from treed to low heath shrubs to open lichen woodland. Common grass species include *Danthonia spicata, Oryzopsis asperifolia*, and *Poa compressa*. Dwarf-shrubs include *Comptonia peregrina, Juniperus* spp. and *Vaccinium* spp. *Pteridium aquilinum* may form an almost continuous canopy of fronds in some stands. Exposure and occasional fire are the major factors in keeping the vegetation relatively open.

A4110 *Vaccinium angustifolium - Vaccinium myrtilloides* Rocky Heath Alliance

Alliance Summary Description:

[CEGL005094] *Vaccinium angustifolium - Sorbus americana / Sibbaldiopsis tridentata* Dwarf-shrubland

Translated Name: **Lowbush Blueberry - American Mountain-ash / Shrubby Fivefingers Dwarf-shrubland**
Common Name: **Blueberry Granite Barrens**

USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Laurentian-Acadian Acidic Rocky Scrub & Grassland (M505)
Group	Laurentian-Acadian Acidic Scrub & Grassland (G788)
Alliance	*Vaccinium angustifolium - Vaccinium myrtilloides* Rocky Heath Alliance (A4110)

ELEMENT CONCEPT

Global Summary: This northern or high-elevation acidic rock heath barren occurs in the glaciated northeastern states on rocky ridges, outcrops and summits. It includes patches of shrub dominance as well as areas of bedrock-dominated sparse vegetation. The soils are shallow, well-drained, dry, acidic, coarse sands. Expanses of exposed bedrock are typical, with minimal soil development restricted to crevices or shelter areas. Elevations of known examples range from almost sea level on the Maine coast to about 825 m (2700 feet) inland. The physiognomy of this community is patchy and variable, ranging from woodland to shrubland to sparsely vegetated rock. A tree canopy is absent or poorly developed, usually consisting of scattered and stunted trees with less than 10% cover. Tall shrubs are scattered, mostly in somewhat protected areas. Dwarf-shrubs are the most extensive layer, with up to 75% cover. Herbs are sparse and confined to rock crevices and depressions. The bryoid layer varies from sparse to well-developed, with both lichens and mosses represented. Tree species include *Picea rubens, Abies balsamea, Quercus rubra, Pinus strobus, Betula papyrifera, Betula populifolia*, or *Acer rubrum*. Scattered tall shrubs include *Sorbus americana, Viburnum nudum var. cassinoides, Nemopanthus mucronatus, Photinia melanocarpa (= Aronia melanocarpa), Comptonia peregrina*, or *Amelanchier* spp. Prominent dwarf heath shrubs include *Vaccinium angustifolium, Vaccinium myrtilloides, Vaccinium pallidum, Gaylussacia baccata, Arctostaphylos uva-ursi*, and *Kalmia angustifolia*. The sparse herb layer includes graminoids such as *Deschampsia flexuosa, Danthonia spicata, Carex lucorum, Schizachyrium scoparium*, and *Piptatherum pungens (= Oryzopsis pungens)*, and the forbs *Sibbaldiopsis tridentata, Solidago simplex var. randii, Minuartia glabra, Maianthemum canadense, Gaultheria procumbens, Trientalis borealis*, and *Pteridium aquilinum*. Abundant mosses and lichens form a bryophyte layer characterized by *Polytrichum commune, Polytrichum juniperinum, Polytrichum piliferum, Dicranum polysetum*, and *Cladonia* and *Cladina* lichens. These heath balds are distinguished by the presence of boreal species such as *Sorbus americana* and *Sibbaldiopsis tridentata* combined with temperate species such as *Quercus rubra, Quercus prinus, Carex pensylvanica, Carex lucorum*, and *Betula populifolia*. They can be floristically similar to *(Pinus strobus, Quercus rubra) / Danthonia spicata* Acidic Bedrock Scrub Grassland (CEGL005101), but those have more (albeit scattered) trees and graminoids more abundant than dwarf-shrubs.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is only known from one location in Maine at 370 m (1,215 feet) elevation on a moderately sloping bedrock outcrop with a southerly aspect. Soils are thin and rapidly drained.

Global Environment: This northern or high-elevation acidic rock heath barren occurs in the glaciated northeastern states on rocky ridges, outcrops and summits. It includes patches of shrub dominance as well as areas of bedrock-dominated sparse vegetation. The soils are shallow, well-drained, dry, acidic, coarse sands. Expanses of exposed bedrock are typical, with minimal soil development restricted to crevices or shelter areas. Elevations of known examples range from almost sea level on the Maine coast to about 825 m (2700 feet) inland.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only known occurrence of this association is a rock heath barren dominated by an open shrub layer of *Vaccinium myrtilloides* with saplings of *Betula papyrifera, Picea rubens*, and *Pinus strobus* scattered throughout the site. The herbaceous layer is dominated by the grass *Deschampsia flexuosa* with lesser amounts of *Aralia hispida* and *Maianthemum canadense*. The rock surfaces are strongly dominated by *Cladina* spp.

Global Vegetation: The physiognomy of this community is patchy and variable, ranging from woodland to shrubland to sparsely vegetated rock. A tree canopy is absent or poorly developed, usually consisting of scattered and stunted trees with less than 10% cover. Tall shrubs are scattered, mostly in somewhat protected areas. Dwarf-shrubs are the most extensive layer, with up to 75% cover. Herbs are sparse and confined to rock crevices and depressions. The bryoid layer varies from sparse to well-developed, with both lichens and mosses represented. Tree species include *Picea rubens, Abies balsamea, Quercus rubra, Pinus strobus, Betula papyrifera, Betula populifolia*, or *Acer rubrum*. Scattered tall shrubs include *Sorbus americana, Viburnum nudum var. cassinoides, Nemopanthus mucronatus, Photinia melanocarpa (= Aronia melanocarpa), Comptonia peregrina*, or *Amelanchier* spp. Prominent dwarf heath shrubs include *Vaccinium angustifolium, Vaccinium myrtilloides, Vaccinium pallidum, Gaylussacia baccata, Arctostaphylos uva-ursi*, and *Kalmia angustifolia*. The sparse herb layer includes graminoids such as *Deschampsia flexuosa, Danthonia spicata, Carex lucorum, Schizachyrium scoparium*, and *Piptatherum pungens (= Oryzopsis pungens)*, and the forbs *Sibbaldiopsis tridentata, Solidago simplex var. randii, Minuartia glabra, Maianthemum canadense, Gaultheria procumbens, Trientalis borealis*, and *Pteridium aquilinum*. Abundant mosses and lichens form a bryophyte layer characterized by *Polytrichum commune, Polytrichum juniperinum, Polytrichum piliferum, Dicranum polysetum*, and *Cladonia* and *Cladina* lichens.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Vaccinium myrtilloides*
Herb (field)	Graminoid	*Deschampsia flexuosa*
Nonvascular	Lichen	*Cladina* spp.

Global

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Vaccinium myrtilloides*
Herb (field)	Graminoid	*Deschampsia flexuosa*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Cladina* spp., *Deschampsia flexuosa*, *Vaccinium myrtilloides*

Global: *Deschampsia flexuosa*, *Vaccinium myrtilloides*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (15-Dec-1994).

RELATED CONCEPTS

Global Similar Types:
- (*Picea mariana, Abies balsamea*) / *Kalmia angustifolia - Ledum groenlandicum* Dwarf-shrubland (CEGL006031)
- (*Pinus strobus, Quercus rubra*) / *Danthonia spicata* Acidic Bedrock Scrub Grassland (CEGL005101)
- *Vaccinium (angustifolium, myrtilloides, pallidum)* Central Appalachian Dwarf-shrubland (CEGL003958)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This association is only known from a rock outcrop above Big Wilson Stream in Maine.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: This community is phytogeographically intermediate between the more boreal *(Picea mariana, Abies balsamea) / Kalmia angustifolia - Ledum groenlandicum* Dwarf-shrubland (CEGL006031) and the more Central Appalachian *Vaccinium (angustifolium, myrtilloides, pallidum)* Central Appalachian Dwarf-shrubland (CEGL003958).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from a rock outcrop above Big Wilson Stream in Maine.
Global Range: This heath barren occurs in the glaciated northeastern states from Maine to Pennsylvania and in Ontario, Canada.
Nations: CA, US
States/Provinces: CT, MA, ME:S3, NH, NY, ON:S5, PA?, VT
TNC Ecoregions: 60:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212A:C?, 212B:C?, 212Ca:CCC, 212Cb:CCC, 212Da:CCP, 212Db:CCC, 212Dc:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCP, 212Fd:CCC, 212Ga:CCP, 221Ae:CCP, 221Ah:CCP, 221Ai:CCP, 221Al:CCC, M212A:C?, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CCC, M212Eb:CCP
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians]); USFS (White Mountain); USFWS (Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SBGB
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 plot): APPA.1650.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Gawler 2002, Gawler 2002*, Gawler and Cutko 2010, Hill 1923, Lee et al. 1998, Lubinski et al. 2003, Metzler and Barrett 2001, Metzler and Barrett 2006, NAP pers. comm. 1998, Rawinski 1984a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

2.B.2.NE. SOUTHEASTERN NORTH AMERICAN GRASSLAND & SHRUBLAND

M307. Southeastern Ruderal Grassland & Shrubland

G583. SOUTHEASTERN RUDERAL GRASSLAND & SHRUBLAND

Group Summary Description: This group comprises vegetation that occurs on disturbed sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads, etc.). Stands may be composed of native or exotic species, or combinations of these. These are combinations of taxa for which no natural analog exists. In the southeastern Piedmont, the herbs and grasses that dominate old fields undergo a rapid turnover in the first three years after abandonment. By the third year, *Andropogon virginicus* often is the dominant plant. Before it achieves dominance, *Ambrosia artemisiifolia, Conyza canadensis, Digitaria sanguinalis*, and *Symphyotrichum pilosum* may be more prominent. Other perennial grasses may include *Andropogon gyrans, Andropogon ternarius*, and *Dichanthelium dichotomum*. Shrubs and vines appear in these communities, and some genera may form stands, including the native genera *Baccharis, Cornus, Prunus, Rubus*, and *Sophora secundiflora* (in Texas), as well as the exotics *Ligustrum, Pueraria*, and *Wisteria*. This variation is accommodated at the alliance level within this group, as in the absence of disturbance, small trees rapidly overtake them and become dominant.

A3321 *Andropogon virginicus - Ambrosia artemisiifolia - Conyza canadensis* Eastern Ruderal Grassland Alliance

Alliance Summary Description: This alliance encompasses a variety of herbaceous vegetation that occurs in the eastern United States on sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads). Stands are composed of combinations of native and/or exotic species for which no natural analog exists. These species include *Ambrosia artemisiifolia, Andropogon virginicus var. virginicus, Conyza canadensis, Cynodon dactylon, Eremochloa ophiuroides, Eupatorium* spp., *Imperata cylindrica, Lolium arundinaceum, Lolium pratense, Paspalum notatum, Pennisetum glaucum, Solidago* spp., *Sorghum halepense, Stenotaphrum secundatum*, and *Urochloa ramosa*. Scattered shrubs may be present, including *Rhus copallinum*. In the southeastern Piedmont, the herbs and grasses that dominate old fields undergo a rapid turnover in the first three years after abandonment. By the third year, *Andropogon virginicus* often is the dominant plant. Before it achieves dominance, *Ambrosia artemisiifolia, Conyza canadensis, Digitaria sanguinalis*, and *Symphyotrichum pilosum* may be more prominent; other combinations of native and exotic species also may occur.

[CEGL004044] *Andropogon virginicus var. virginicus* Ruderal Grassland

Translated Name: **Broomsedge Bluestem Ruderal Grassland**
Common Name: **Broomsedge Old-field Grassland**

USNVC CLASSIFICATION

Division	Southeastern North American Grassland & Shrubland (2.B.2.Ne)
Macrogroup	Southeastern Ruderal Grassland & Shrubland (M307)
Group	Southeastern Ruderal Grassland & Shrubland (G583)
Alliance	*Andropogon virginicus - Ambrosia artemisiifolia - Conyza canadensis* Eastern Ruderal Grassland Alliance (A3321)

ELEMENT CONCEPT

Global Summary: This association includes herbaceous-dominated vegetation that has been anthropogenically altered and/or maintained, especially on old fields and pastures. Examples support predominately native species or a mixture of native and exotic species, one of the most dominant or characteristic species being *Andropogon virginicus var. virginicus*. *Lolium pratense (= Festuca pratensis)* can dominate fields early in the season. This is a very common and wide-ranging association that can be quite variable in terms of species composition. Additional components are other perennial grasses and herbaceous species, most with pioneer or weedy tendencies, the exact composition of which will vary with geography, management history, and habitat.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This vegetation typically occurs on old fields, pastures, and rocky sites. It will persist indefinitely under a regular mowing regime, e.g., in powerline corridors. It occurs at high elevations within the AT corridor. One site was observed in Giles County, Virginia, in the Central Appalachian project area.
Global Environment: This vegetation typically occurs on old fields, pastures, and rocky sites. It will persist indefinitely under a regular mowing regime, e.g., in powerline corridors.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: Old fields and pastures dominated by *Andropogon virginicus var. virginicus*. *Lolium pratense* can dominate fields early in the season.
Global Vegetation: Stands of this community are dominated by *Andropogon virginicus var. virginicus*, sometimes codominant with *Lolium pratense*. Associated species vary with geography and habitat and include typical pioneer species. Species with high cover values in plot samples attributed to this type include *Tridens flavus, Setaria parviflora (= Setaria geniculata), Eragrostis spectabilis*, and *Panicum anceps* (NatureServe Ecology unpubl. data). On the eastern Highland Rim of Tennessee (Arnold Air Force Base), associated species include *Diodia teres, Aristida dichotoma, Aristida oligantha, Packera anonyma (= Senecio anonymus), Paspalum laeve, Lespedeza virginica*, and *Plantago virginica*. *Rubus argutus* and *Smilax* spp. may be locally abundant but are not dominant. In clearcuts, *Schizachyrium scoparium, Danthonia spicata*, and *Dichanthelium* spp. are also common, as are occasional *Quercus* spp. and *Rubus argutus*. The plot at Shiloh National Military Park (western Tennessee) was a mowed field of mostly native species, dominated by *Andropogon virginicus var. virginicus*. *Paspalum setaceum* and *Tridens flavus* were codominant (with less cover). Other herbaceous plants with high cover values were *Setaria parviflora (= Setaria geniculata), Diodia teres, Schizachyrium scoparium*, and less common were *Packera anonyma, Sorghum halepense*, and *Cyperus retrorsus*. At less than 1% cover were *Polypremum procumbens, Oxalis stricta, Eragrostis spectabilis, Salvia lyrata, Solanum carolinense, Digitaria sanguinalis, Panicum anceps, Croton willdenowii (= Crotonopsis elliptica), Trifolium pratense, Kummerowia striata, Coreopsis pubescens, Plantago lanceolata*, and *Mecardonia acuminata*. At only a trace amount of cover were *Conyza canadensis, Acalypha virginica, Solidago* sp., *Erigeron annuus, Sida spinosa, Hypericum drummondii, Polygala verticillata, Eupatorium capillifolium, Passiflora incarnata*, and *Asclepias amplexicaulis*. In West Virginia, common associates include *Sorghastrum nutans, Dichanthelium clandestinum, Anthoxanthum odoratum, Phleum pratense, Dactylis glomerata, Daucus carota, Lotus corniculatus, Trifolium pratense, Leucanthemum vulgare, Solidago canadensis, Solidago rugosa*, and *Solidago nemoralis*.
Global Dynamics: This association may develop temporarily following clear-cutting, and will persist indefinitely under a regular mowing regime, e.g., in powerline corridors and maintained fields. If undisturbed, these grasslands will rapidly succeed to shrubs, and eventually to tree species.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Andropogon virginicus* var. *virginicus*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Andropogon virginicus* var. *virginicus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Andropogon virginicus* var. *virginicus*
Global: *Andropogon virginicus* var. *virginicus*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (8-Aug-2000). This is a ruderal community and represents vegetation resulting from succession following anthropogenic disturbance of an area. It is not a conservation priority for its own sake and does not receive a conservation rank.

RELATED CONCEPTS

Global Similar Types:
- *Rhus copallinum - Andropogon virginicus* Ruderal Grassland (CEGL004035)
- *Schizachyrium scoparium - Andropogon (gyrans, ternarius, virginicus)* Grassland (CEGL007707)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Phenology can affect apparent composition: in West Virginia, fields visited early in the season had high cover of *Lolium pratense*, while those sampled later in the season were dominated by *Andropogon virginicus*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: One example of this community was observed along the West Virginia / Virginia border in Giles County, Virginia. It may be more common to the south.
Global Range: This community ranges throughout most or all of the southeastern United States, extending north to Virginia and West Virginia.
Nations: US
States/Provinces: AL, AR, GA, IL, IN, KY, LA, MO?, MS, NC, OK, SC, TN, TX, VA, WV
TNC Ecoregions: 31:C, 32:C, 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 50:C, 51:P, 52:C, 53:C, 56:C, 57:C, 59:C
USFS Ecoregions (1994/95): 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 222Cg:CCC, 222Eg:CCC, 231Aa:CCC, 231Ba:CCC, 231Be:CCC, 231Bi:CCC, 231Cc:CCC, 231Fa:CCP, 231Fb:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232B:CC, 232Ce:CCC, 232F:CC, 255Da:CCC, 255Dc:CCC, M221Aa:CCC, M221Ab:CCC, M221Ba:CC?, M221Bb:CCC, M221Bd:CC?, M221Ca:CPP, M221Cb:CPP, M221Cc:CPP, M221Ce:CPP, M221Da:CCC, M221Db:CCC, M221Dc:CCP, M221Dd:CCP, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: DOD (Arnold, Fort Benning, Fort Gordon); NPS (Abe Lincoln Birthplace, Appalachian Trail [Central Appalachians], Big South Fork, Buffalo River, Chattahoochee River, Chickamauga-Chattanooga?, Cowpens, Fort Donelson, Kings Mountain, Little River Canyon, Mammoth Cave, Natchez Trace, Ninety Six, Shiloh, Stones River); USFS (Cherokee, George Washington, Jefferson, Oconee?, Ouachita (Coastal Plain)?, Ouachita (Mountains)?, Ouachita?, Ozark?, Talladega (Oakmulgee)?, Talladega (Talladega)?, Talladega?, Tuskegee?); USFWS (Anahuac, Big Boggy?, Brazoria)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HXNE
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: One example was noted by the UMESC mapping team in the field during the summer of 2011 and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 accuracy assessment point): APPA_AA_1301.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A.S. Weakley, C.W. Nordman and S.C. Gawler
References: Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming et al. 2006, Hoagland 2000, Homoya et al. 1988, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman 2004a, Nordman et al. 2011, Penfound 1953, Pyne et al. 2010, Schotz et al. 2008, Schotz pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, TNC 1998a, Tarr et al. 1980, Vanderhorst 2001a, Vanderhorst and Streets 2006, White 2004, White 2005, White and Govus 2003, White and Govus 2005, White and Madany 1978

[CEGL004048] *Lolium (arundinaceum, pratense)* Ruderal Grassland

Translated Name: **(Tall Fescue, Meadow Ryegrass) Ruderal Grassland**
Common Name: **Cultivated Grassland**

USNVC CLASSIFICATION

Division	Southeastern North American Grassland & Shrubland (2.B.2.Ne)
Macrogroup	Southeastern Ruderal Grassland & Shrubland (M307)
Group	Southeastern Ruderal Grassland & Shrubland (G583)
Alliance	*Andropogon virginicus - Ambrosia artemisiifolia - Conyza canadensis* Eastern Ruderal Grassland Alliance (A3321)

ELEMENT CONCEPT

Global Summary: This association includes grassland pastures and hayfields, more-or-less cultural, though sometimes no longer actively maintained. It is currently defined for the Central and Southern Appalachians, Ozarks, Ouachita Mountains, and parts of the Piedmont and Interior Low Plateau, but it is possible throughout much of the eastern United States and southern Canada. The dominant species in this type are the European "tall or meadow fescues" (*Lolium* or *Schedonorus* spp.) of uncertain and controversial generic placement. Several other exotic grasses, including *Agrostis gigantea, Dactylis glomerata, Holcus lanatus, Phleum pratense*, and *Poa pratensis*, are common associates. These communities are sometimes nearly monospecific but can also be very diverse and contain many native as well as exotic species of grasses, sedges, and forbs. Exotic forbs include the legumes *Lespedeza cuneata, Trifolium campestre, Trifolium hybridum, Trifolium pratense*, and *Trifolium repens*, as well as *Achillea millefolium var. occidentalis, Calystegia sepium, Daucus carota, Leucanthemum vulgare, Oxalis stricta*, and *Plantago lanceolata*. Common native herbs include *Apocynum cannabinum, Desmodium canescens, Dichanthelium clandestinum, Erigeron annuus, Fragaria virginiana, Potentilla simplex, Solanum carolinense, Solidago canadensis*, and *Verbesina occidentalis*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: Cultivated meadows occur at low to intermediate elevation (below 915 m [3,000 feet]). They are anthropogenically disturbed/managed fields, created and maintained by yearly mowing or grazing.

Global Environment: This association includes grassland pastures and hayfields, more-or-less cultural, though sometimes no longer actively maintained. It occurs in areas which have been cleared in the past, including abandoned farmlands, strip mines, and other areas disturbed by human activities.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This herbaceous association (greater than 50% herbaceous cover) is dominated by mixtures of introduced *Lolium (= Festuca)* spp. and other grasses and/or forb species.

Global Vegetation: This association represents early-successional herbaceous and herb-shrub vegetation dominated by or having a large component of exotic grasses and legumes. The dominant species in this association are the European "tall or meadow fescues" (*Lolium* or spp.). These communities are sometimes nearly monospecific but can also be very diverse and contain many native species of grasses, sedges, and forbs. Woody encroachment is restricted to low cover by *Toxicodendron radicans* and species of *Rubus*, both of which become more abundant in older stands. Scattered individuals of various shrubs may be present, including *Crataegus crus-galli, Fraxinus pennsylvanica, Fraxinus americana, Rosa multiflora, Robinia pseudoacacia, Cornus florida, Elaeagnus umbellata, Sambucus canadensis (= Sambucus nigra ssp. canadensis)*, and *Sassafras albidum*. In the Central Appalachians and northern Cumberlands, the dominant exotic grasses include *Agrostis gigantea, Dactylis glomerata, Holcus lanatus, Lolium pratense, Phleum pratense*, and *Poa pratensis*. Exotic forbs include the legumes *Lespedeza cuneata, Trifolium campestre, Trifolium hybridum, Trifolium pratense*, and *Trifolium repens*, as well as *Achillea millefolium var. occidentalis, Calystegia sepium, Daucus carota, Leucanthemum vulgare, Oxalis stricta*, and *Plantago lanceolata*. Common native herbs include *Apocynum cannabinum, Desmodium canescens, Dichanthelium clandestinum, Erigeron annuus, Fragaria virginiana, Potentilla simplex, Solanum carolinense, Solidago canadensis*, and *Verbesina occidentalis*. In the Black Belt region of Alabama and Mississippi, it is commonly found in mixture with *Paspalum dilatatum* (Bransby n.d.), and the exotic *Bromus tectorum* may be present in stands.

Global Dynamics: This association varies greatly depending upon past land use and recent history of the site. Some examples that have been recently farmed may be monocultures of *Lolium*, whereas other fields that were traditionally lightly grazed may have much higher diversity. If not grazed, periodically mowed or burned, vegetation will succeed towards woody physiognomy.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Lolium arundinaceum*, *Lolium pratense*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Agrostis gigantea*, *Lolium* spp., *Phleum pratense*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Lolium arundinaceum*, *Lolium pratense*
Global: *Achillea millefolium*, *Apocynum cannabinum*, *Calystegia sepium*, *Dactylis glomerata*, *Daucus carota*, *Desmodium canescens*, *Dichanthelium clandestinum*, *Erigeron annuus*, *Fragaria virginiana*, *Holcus lanatus*, *Lespedeza cuneata*, *Leucanthemum vulgare*, *Oxalis stricta*, *Plantago lanceolata*, *Poa pratensis*, *Potentilla simplex*, *Solanum carolinense*, *Solidago canadensis*, *Trifolium hybridum*, *Trifolium pratense*, *Trifolium repens*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Invasive/Exotic Plants: *Lolium arundinaceum* (High/Medium), *Lolium pratense* (High/Low)
Global: Vulnerable Plants: *Berberis canadensis* (G3); **Invasive/Exotic Plants**: *Achillea millefolium*, *Agrostis gigantea* (Medium/Low), *Bromus tectorum* (High), *Calystegia sepium*, *Dactylis glomerata* (Medium/Insignificant), *Daucus carota* (Low), *Holcus lanatus* (High/Medium), *Lespedeza cuneata* (Medium), *Leucanthemum vulgare* (Medium/Low), *Lolium* spp., *Phleum pratense* (Medium), *Plantago lanceolata* (High/Low), *Poa pratensis* (Medium), *Trifolium hybridum* (Medium/Low), *Trifolium pratense* (Low/Insignificant), *Trifolium repens* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (5-Jan-2000). This vegetation is dominated by an exotic species, is of anthropogenic origin, and is thus not a conservation priority.

RELATED CONCEPTS

Global Similar Types:
- *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Ruderal Meadow (CEGL006107)
- *Schizachyrium scoparium* - *(Andropogon virginicus)* - *Solidago* spp. Ruderal Meadow (CEGL006333)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This association is currently documented from the southern half of the Central Appalachians through the Southern Appalachians.
Global Classification Comments: *Lolium pratense* and *Lolium arundinaceum* are two closely related species which were traditionally treated as *Festuca pratensis (= Festuca elatior)* and *Festuca arundinacea*, and could alternately be treated as *Schedonorus pratensis* and *Schedonorus arundinaceus*. Conversion to Kartesz (1999) standard has necessitated the shift to the *Lolium* names from *Festuca*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This association is currently documented from the southern half of the Central Appalachians through the Southern Appalachians.
Global Range: This association is currently documented from the southern half of the Central Appalachians through the Gulf Coastal Plain and west to the Ozarks and Ouachitas. It is possible throughout much of the eastern United States.
Nations: US
States/Provinces: AL, AR, GA, KY, MD, MO, MS, NC, OK, SC, TN, VA, WV
TNC Ecoregions: 38:C, 39:C, 40:P, 43:C, 44:C, 50:C, 51:C, 52:C, 57:C, 59:C
USFS Ecoregions (1994/95): 221Hc:CCC, 221He:CCC, 222Eg:CCC, 231Ae:CCC, 231Ba:CCC, 231Bh:CCC, 231Bi:CCC, M221Cb:CCC, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC, M222Ab:CCC, M231A:CC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Abe Lincoln Birthplace, Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Buffalo River, Carl Sandburg Home, Chickamauga-Chattanooga,

Cowpens, Cumberland Gap, Fort Donelson, Great Smoky Mountains, Guilford Courthouse, Kings Mountain, Little River Canyon, Mammoth Cave, Natchez Trace, New River Gorge, Ninety Six, Obed River, Russell Cave, Shiloh, Stones River, Thomas Stone, Vicksburg); USFS (Cherokee, Ouachita, Ouachita (Coastal Plain)?, Ouachita (Mountains), Ozark)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HXCM
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: This ruderal old-field community was not sampled because it is dominated by an exotic species; it is of anthropogenic origin; and it is thus not a conservation priority. However, it is common throughout the Southern Blue Ridge project area and was observed by the UMESC mapping team during field reconnaissance in 2010 and during accuracy assessment.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (14 accuracy assessment points): APPA_AA_0066, APPA_AA_0563, APPA_AA_0572, APPA_AA_0598, APPA_AA_0636, APPA_AA_0817, APPA_AA_1116, APPA_AA_1137, APPA_AA_1273, APPA_AA_1341, APPA_AA_1475, APPA_AA_1549, APPA_AA_1550, APPA_AA_1584.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A.S. Weakley and S.C. Gawler
References: Bransby n.d., Heath et al. 1973, Hoagland 2000, Kartesz 1999, Lea et al. 2012, Lea et al. 2013, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman 2004a, Nordman 2004a*, Nordman et al. 2011, Pyne et al. 2010, Schmalzer and DeSelm 1982, Schotz et al. 2006, Schotz et al. 2008, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007, White 2003, White 2004, White 2005, White 2006, White and Govus 2003, White and Govus 2005, White and Pyne 2003

A4082 *Pueraria montana - Wisteria sinensis* Exotic Ruderal Vine-Shrubland Alliance

Alliance Summary Description: This alliance encompasses a variety of vine-dominated vegetation that occurs in the eastern United States on sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads). Stands may be composed of exotic vine species, particularly *Pueraria montana var. lobata* and *Wisteria sinensis*. These are combinations of taxa for which no natural analog exists in North America.

[CEGL003882] *Pueraria montana var. lobata* Ruderal Vine-Shrubland

Translated Name: **Kudzu Ruderal Vine-Shrubland**
Common Name: **Ruderal Kudzu Vineland**

USNVC CLASSIFICATION

Division	Southeastern North American Grassland & Shrubland (2.B.2.Ne)
Macrogroup	Southeastern Ruderal Grassland & Shrubland (M307)
Group	Southeastern Ruderal Grassland & Shrubland (G583)
Alliance	*Pueraria montana - Wisteria sinensis* Exotic Ruderal Vine-Shrubland Alliance (A4082)

ELEMENT CONCEPT

Global Summary: This vine-dominated vegetation is dominated by *Pueraria montana var. lobata*, a fast-growing vine native to Asia. The species was introduced into the United States in 1885, primarily as an ornamental and as a potential source for cattle forage. It was subsequently widely used for erosion control in the southeastern United States. This association occupies a variety of sites throughout most physiographic provinces in the Southeast, ranging in size from less than a hectare to 5-10 hectares or more. It chokes out existing vegetation. Edges of examples of this vegetation may consist of small to large trees in the process of being overwhelmed by kudzu. More than 2 million acres of forest land in Alabama, Georgia, Mississippi, Tennessee, North Carolina, and South Carolina are estimated to be infested with kudzu. This association is also known to occur north to central Kentucky, Virginia, and Maryland, and as far west as eastern Texas and Oklahoma.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This invasive community occurs on altered, plowed, farmed, and planted lands. It was observed in Amherst County, Virginia, in the Central Appalachian project area.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This non-native vegetation is expected to occur on disturbed sites, including parking and heavily used camping areas.
Global Environment: The association occupies a variety of sites throughout most physiographic provinces in the southeastern U.S., with examples ranging in size from less than one hectare to 5-10 hectares or more. It occurs on disturbed sites, including abandoned town sites and mine lands and on landslides. It chokes out existing vegetation. Edges of examples of this vegetation may consist of small to large trees in the process of being overwhelmed by kudzu. In West Virginia, *Pueraria montana var. lobata* may be limited in its ability to spread due to relatively cold climate.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This vegetation is dominated by *Pueraria montana var. lobata*.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This vine-shrubland vegetation is dominated almost exclusively by the invasive exotic *Pueraria montana*. Small to large trees in the process of being overwhelmed by kudzu may occur along stand edges.
Global Vegetation: This vine-dominated vegetation is dominated by *Pueraria montana var. lobata*, a fast-growing vine native to Asia.
Global Dynamics: This association chokes out existing vegetation.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Liana	*Pueraria montana* var. *lobata*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree canopy	Liana	*Pueraria montana* var. *lobata*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Liana	*Pueraria montana* var. *lobata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Pueraria montana* var. *lobata*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Pueraria montana* var. *lobata*
Global: *Pueraria montana* var. *lobata*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Pueraria montana* var. *lobata*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Invasive/Exotic Plants: *Pueraria montana* var. *lobata*
Global: Invasive/Exotic Plants: *Pueraria montana* var. *lobata*

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (24-May-2000). This vegetation is dominated by an exotic species, is of anthropogenic origin, and is thus not a conservation priority. *Pueraria montana var. lobata*, native to Asia, was introduced into the United States in 1885, primarily as an ornamental and as a potential source for cattle forage. More than 2 million acres of forest land in Alabama, Georgia, Mississippi, Tennessee, North Carolina, and South Carolina are estimated to be infested with kudzu.

RELATED CONCEPTS

Global Similar Types:
- *Wisteria sinensis* Ruderal Vine-Shrubland (CEGL008568)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This community was not sampled because it is dominated by an exotic species, is of anthropogenic origin, and is thus not a conservation priority. However, it is known to occur within the AT corridor in the Southern Blue Ridge and was observed at the Buck Mountain Road/US 19 parking area in Tennessee.
Global Classification Comments: *Pueraria montana var. lobata*, native to Asia, was introduced into the United States in 1885, primarily as an ornamental and as a potential source for cattle forage. More than 2 million acres of forest land in Alabama, Georgia, Mississippi, Tennessee, North Carolina, and South Carolina are estimated to be infested with kudzu.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: Observed at Long Mountain Wayside in Amherst County, Virginia. It may be more common to the south.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This vegetation was observed at the Buck Mountain Road/US 19 parking area in Tennessee and is expected to occur elsewhere in the corridor in disturbed settings.
Global Range: This vegetation is known to occur in the southeastern United States from central Kentucky, Virginia, and Maryland, south through Tennessee, North Carolina, South Carolina, Georgia, and Alabama to Florida and west through Mississippi and Louisiana to eastern Texas, Arkansas, and Oklahoma (Edwards 1982).
Nations: US
States/Provinces: AL, AR, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV
TNC Ecoregions: 38:C, 39:C, 40:C, 43:C, 44:C, 50:C, 51:C, 52:C, 53:C, 56:C, 57:C, 59:C, 61:C
USFS Ecoregions (1994/95): 221Db:CCC, 221Hc:CCC, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 231Ba:CCC, 231Bh:CCC, 231Ca:CCC, 231Cd:CCC, 232Bd:CCC, 232Bm:CCC, 234:C, M221Aa:CCC, M221Ab:CCC, M221Ca:CCP, M221Cb:CCC, M221Cc:CCP, M221Ce:CCP, M221Db:CCP, M221Dc:CCP, M221Dd:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: BIA (Eastern Band of Cherokee); DOD (Fort Benning); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], C&O Canal, Chickamauga-Chattanooga?, Cumberland Gap, Great Smoky Mountains?, Mammoth Cave?, Natchez Trace, New River Gorge, Vicksburg); TVA (Tellico); USFS (Bankhead, Cherokee, Daniel Boone, George Washington, Jefferson, Oconee?, Ouachita, Ouachita (Coastal Plain), Ouachita (Mountains), Ozark, Talladega, Talladega (Oakmulgee), Talladega (Talladega))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SXKV
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: This community is not a conservation priority. It is known to occur within the AT corridor in the Southern Blue Ridge and was observed at the Buck Mountain Road/US 19 parking area in Tennessee and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 accuracy assessment point): APPA_AA_0541.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 accuracy assessment points): APPA_AA_0486, APPA_AA_0909.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay
Global Description Author(s): A.S. Weakley and S.C. Gawler
References: CAP pers. comm. 1998, Coxe 2009, Edwards 1982, Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming et al. 2006, Hoagland 1998b, Hoagland 2000, Lea et al. 2013, Nordman et al. 2011, Pyne et al. 2010, Remo 1999, Schotz pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, Vanderhorst et al. 2007, White 2006

A3322 *Rubus* spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance

Alliance Summary Description: This alliance encompasses a variety of semi-natural native shrub-dominated vegetation that occurs in the eastern United States on sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads). Stands are primarily composed of native species. A variety of *Rubus* species (the taxa depending on biogeography) may be dominant in stands of one association, but other combinations of native species also occur, including *Baccharis halimifolia, Cornus drummondii, Prunus angustifolia*, other *Prunus* spp., and *Smilax* spp. These are combinations of taxa for which no natural analog exists.

[CEGL004732] *Rubus (argutus, trivialis) - Smilax (glauca, rotundifolia)* Ruderal Shrubland

Translated Name: **(Sawtooth Blackberry, Southern Dewberry) - (Cat Greenbrier, Roundleaf Greenbrier) Ruderal Shrubland**

Common Name: **Ruderal Blackberry - Greenbrier Shrub Thicket**

USNVC CLASSIFICATION

Division	Southeastern North American Grassland & Shrubland (2.B.2.Ne)
Macrogroup	Southeastern Ruderal Grassland & Shrubland (M307)
Group	Southeastern Ruderal Grassland & Shrubland (G583)
Alliance	*Rubus* spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance (A3322)

ELEMENT CONCEPT

Global Summary: Stands of this successional community develop following disturbance (complete forest canopy removal). These stands are dominated by blackberries/dewberries (*Rubus argutus, Rubus trivialis*) and by greenbrier species (*Smilax glauca, Smilax rotundifolia*). Many examples include a great variety of tree saplings and other woody species (*Quercus* spp., *Liquidambar styraciflua, Acer rubrum, Diospyros virginiana, Juniperus virginiana var. virginiana, Rhus copallinum*), herbs (*Solidago* spp., Asteraceae spp., *Helianthus* spp., *Hypericum* spp., *Potentilla simplex*), and grasses (*Andropogon* spp., *Dichanthelium* spp., *Panicum* spp., *Schizachyrium scoparium, Lolium* spp., and *Sorghastrum nutans*). Communities that are surrounded by relatively intact ecosystems will tend to have more native species. In the Southern Blue Ridge, at intermediate elevations, *Rubus allegheniensis* may be a component. Those surrounded by old fields or fragmented by development tend to have *Lonicera japonica* and/or *Rosa multiflora* as a codominant vine overtopping much of the blackberry and greenbrier.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: These successional shrublands are found primarily on naturally disturbed areas (possibly managed), created and maintained by blowdowns, tree die-offs, and occasional mowing (on 3- to 6-year cycles). They are found at low to moderate elevation.

Global Environment: This community can exist in both lowlands and uplands that have been cleared but have not been further disturbed by continued mowing or plowing for 3-5 years.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This shrubland has *Rubus* spp. dominant or codominant (at least 25-50% cover; on the lower end if in a more diverse mixture of successional shrub and vine species). *Rubus* spp. include primarily *Rubus argutus*, also possibly *Rubus allegheniensis*. *Rosa multiflora, Smilax* spp., and other successional and exotic shrub and vine species may also be present.

Global Vegetation: Stands of this association are dominated by blackberries/dewberries (*Rubus argutus, Rubus trivialis*) and by greenbrier species (*Smilax glauca, Smilax rotundifolia*). In parts of the range, other *Rubus* species may be components (e.g., *Rubus allegheniensis* in the northern and eastern parts of the range). They also contain a great variety of tree saplings and other woody species (e.g., *Quercus* spp., *Liquidambar styraciflua, Acer rubrum, Rhus copallinum*). Some herbs in central Tennessee examples may include *Solidago* spp., Asteraceae spp., *Helianthus* spp., *Hypericum* spp., *Potentilla simplex*; grasses may include *Andropogon* spp., *Dichanthelium* spp., *Panicum* spp., *Schizachyrium scoparium, Lolium* spp., and *Sorghastrum nutans*. Communities that are surrounded by relatively intact ecosystems will tend to have more native species. Those surrounded by old fields or fragmented by development tend to have *Lonicera japonica* and/or *Rosa multiflora* as a codominant vine overtopping much of the blackberry and greenbrier.

Global Dynamics: Stands of this successional community develop following disturbance (complete forest canopy removal) followed by a period of no disturbance of 3-5 years.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Liana	*Rubus allegheniensis*, *Rubus argutus*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Liana	*Rosa multiflora*, *Rubus allegheniensis*, *Rubus argutus*, *Rubus trivialis*, *Smilax glauca*, *Smilax rotundifolia*
Herb (field)	Liana	*Lonicera japonica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Rubus allegheniensis*, *Rubus argutus*
Global: *Rubus allegheniensis*, *Rubus argutus*, *Rubus trivialis*, *Smilax glauca*, *Smilax rotundifolia*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Symphyotrichum georgianum* (G3); **Invasive/Exotic Plants**: *Lonicera japonica* (High/Medium), *Rosa multiflora* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (1-Oct-2001). This type represents ruderal successional vegetation dominated by species native to North America.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This ruderal successional vegetation, dominated by species native to North America, was not sampled; however, it is known to occur within the AT corridor in the Southern Blue Ridge project area and was observed by the UMESC mapping team during the summer of 2010.
Global Classification Comments: In sandy parts of the southeastern U.S. Coastal Plain (e.g., Fort Benning, Georgia) the common blackberry is *Rubus cuneifolius*, and it does not form monocultural stands worthy of recognition as a vegetation type. At Arnold Air Force Base, Coffee and Franklin counties, Tennessee, this community is often found in powerline corridors and other areas that have experienced total canopy removal.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This ruderal successional vegetation is common along the AT in the Southern Appalachians.
Global Range: This ruderal successional vegetation could be found throughout the upper southern United States.
Nations: US
States/Provinces: AL?, GA, KY, MS, NC, SC, TN, VA
TNC Ecoregions: 43:C, 44:C, 50:C, 51:C, 52:C, 56:C
USFS Ecoregions (1994/95): 221Hc:CCC, 221He:CCC, 222Eb:CCC, 222Ed:CCC, 231Aa:CCC, 231Ae:CCC, 232Ce:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); DOD (Arnold); NPS (Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Chattahoochee River, Chickamauga-Chattanooga?, Cowpens, Cumberland Gap, Great Smoky Mountains, Kings Mountain, Mammoth Cave?, Natchez Trace, Ninety Six, Obed River, Stones River); USFS (Talladega (Oakmulgee)?, Talladega (Talladega)?, Talladega?, Tuskegee?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SXBG
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: This ruderal successional vegetation was observed by the UMESC mapping team during the summer of 2010 and during accuracy assessment.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (7 accuracy assessment points): APPA_AA_0338, APPA_AA_0443, APPA_AA_1037, APPA_AA_1070, APPA_AA_1442, APPA_AA_1531, APPA_AA_1555.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): M.J. Russo, R. White and M. Pyne
References: NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman 2004a, Peet et al. unpubl. data, Pyne et al. 2010, Schmalzer and DeSelm 1982, Schotz pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, TNC 1998a, White 2004, White 2006, White and Govus 2003, White and Govus 2005

2.C.2. Temperate to Polar Bog & Fen

2.C.2.NA. NORTH AMERICAN BOG & FEN

M877. North American Boreal & Sub-boreal Alkaline Fen

G185. EASTERN NORTH AMERICAN SUB-BOREAL ALKALINE FEN

Group Summary Description: [The content for this group summary is under review with Canadian ecologists; the current text overlaps with Eastern North American Boreal Alkaline Fen Group (G804)]. These fens, distributed across glaciated eastern and central sub-boreal (Laurentian-Acadian) regions of North America, develop in open basins where lateral groundwater flow through circumneutral to calcareous parent materials creates moderately to strongly alkaline conditions. They are found on level to gently sloping surfaces, or in closed wet depressions (sometimes as floating mats), and along wetland margins and lake and river shores. The shore fens are occasionally flooded, and so are included here because flooding tends to create moderately alkaline conditions. The vegetation may be graminoid-dominated, shrub-dominated, or a patchwork of the two, with broad-leaved non-ericaceous shrubs typically dominant. There is a discontinuous to absent layer of *Sphagnum* peatmoss (<80% cover), with brown mosses (*Drepanocladus, Calliergon, Tomentypnum, Campylium*) present to dominant. Broad-leaved non-ericaceous shrubs (*Myrica gale, Dasiphora fruticosa ssp. floribunda, Betula pumila, Betula glandulosa, Salix* spp., *Alnus incana, Rhamnus alnifolia*) exceed cover of ericaceous shrubs, although some shore fens may be dominated by *Chamaedaphne calyculata*. Thin-leaved graminoids include *Carex lasiocarpa, Carex livida, Carex interior, Carex limosa, Muhlenbergia glomerata, Trichophorum alpinum*, and *Eriophorum viridicarinatum*. A wide diversity of herbs is found, especially *Menyanthes trifoliata, Equisetum fluviatile, Sarracenia purpurea, Triantha glutinosa (= Tofieldia glutinosa)*, and *Triglochin maritima*. In the tree layer, *Picea mariana* is rare to absent, *Larix laricina* is variable, and other conifers and hardwoods may be present (e.g., *Acer rubrum, Thuja occidentalis*). Minerotrophic *Sphagnum* dominates the substrate among medium fens, but brown mosses become increasingly common under richer conditions. *Campylium stellatum* is an indicator brown moss bryophyte.

A3477 *Betula pumila - Chamaedaphne calyculata - Myrica gale* Shrub Fen Alliance

Alliance Summary Description: This moderately rich shrub fen is found across the eastern boreal region of Canada and the adjacent U.S., including in the northern Great Lakes region. The shrub cover is at least 25%, dominated by a combination of *Betula pumila, Myrica gale*, and ericaceous shrubs, including low to moderate cover of *Andromeda polifolia, Chamaedaphne calyculata, Ledum groenlandicum*, and *Vaccinium oxycoccos*. Other minerotrophic shrubs include *Lonicera villosa, Rhamnus alnifolia, Rubus arcticus ssp. acaulis (= Rubus acaulis), Rubus pubescens*, and *Salix pedicellaris*. Scattered, small (2-10 m) tree stems of *Larix laricina, Picea mariana*, and *Thuja occidentalis* are present at low cover. There is diverse forb, graminoid, and moss cover, at least in the richer examples of this type. The graminoids include *Carex chordorrhiza, Carex lasiocarpa, Carex leptalea*, and *Eriophorum viridicarinatum*. Forbs include *Comarum palustre (= Potentilla palustris), Drosera rotundifolia, Equisetum fluviatile, Maianthemum trifolium, Menyanthes trifoliata, Sarracenia purpurea*, and *Solidago uliginosa*. The moss layer contains *Aulacomnium palustre, Pleurozium schreberi, Sphagnum angustifolium*, and *Sphagnum capillifolium*. Less frequent are *Campylium stellatum, Sphagnum fuscum*, and *Tomentypnum nitens*. Stands are found on the margins of water tracks of large peatlands, or in the interior of small basins that are relatively isolated from runoff, or on shores of northern and boreal rivers, with occasional flooding.

[CEGL006302] *Myrica gale - Chamaedaphne calyculata / Carex (lasiocarpa, utriculata) - Utricularia* spp. Fen

Translated Name: **Sweetgale - Leatherleaf / (Woolly-fruit Sedge, Northwest Territory Sedge) - Bladderwort species Fen**

Common Name: **Medium Fen**

USNVC CLASSIFICATION

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Alkaline Fen (M877)
Group	Eastern North American Sub-boreal Alkaline Fen (G185)
Alliance	*Betula pumila - Chamaedaphne calyculata - Myrica gale* Shrub Fen Alliance (A3477)

ELEMENT CONCEPT

Global Summary: This fen vegetation is found in peatlands and peaty lakesides of the northeastern United States. It occurs in acidic waters receiving weakly minerotrophic input from surface water inflow or seepage from surrounding uplands. The substrate may be flooded at high water, and remains saturated through the growing season. pH is acidic to circumneutral, 4.8-6.8. Tall, rhizomatous sedges dominate the vegetation, with shrubs often shorter than the graminoids. Bryophyte cover is variable. Scattered shrubs of *Alnus incana* and *Spiraea alba* may protrude above the graminoid cover; shorter shrubs such as *Myrica gale, Andromeda polifolia var. glaucophylla (= Andromeda glaucophylla), Vaccinium macrocarpon*, and *Chamaedaphne calyculata* grow among the sedges. The dominant sedges are usually *Carex lasiocarpa* or *Carex utriculata*; associates include *Carex oligosperma, Carex exilis, Carex vesicaria, Carex limosa, Carex canescens, Carex lacustris, Carex stricta* (non-tussock form), *Carex oligosperma, Rhynchospora alba, Calamagrostis canadensis, Cladium mariscoides, Eriophorum angustifolium, Eriophorum virginicum*, and *Dulichium arundinaceum*. Forbs include *Lysimachia terrestris, Triadenum virginicum, Osmunda regalis, Comarum palustre (= Potentilla palustris), Drosera intermedia, Utricularia intermedia*, and *Pogonia ophioglossoides*. The bryophyte layer is dominated by species of *Sphagnum*, including *Sphagnum fallax, Sphagnum papillosum, Sphagnum cuspidatum, Sphagnum fimbriatum, Sphagnum centrale, Sphagnum lescurii*, and others. This fen vegetation is distinguished by the dominance of *Carex lasiocarpa* and the absence of any richness indicators such as *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This peatland association is known from elevations ranging from 150 to 750 m (490-2,460 feet) on flat to gently sloping basin floors, pond edges and occasionally on alluvial flats. Soils are intermittently flooded to saturated peat.

Global Environment: This fen vegetation is found in peatlands and peaty lakesides of the northeastern United States. It occurs in acidic waters receiving weakly minerotrophic input from surface water inflow or seepage from surrounding uplands. The substrate may be flooded at high water, and remains saturated through the growing season. pH is acidic to circumneutral, 4.8-6.8. Peat tends to be shallow.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association has variable physiognomic structure with combinations of ericaceous shrubs and sedges. Sedges tend to have the highest overall cover, ranging upward of 80% Dominant species include *Carex stricta, Carex utriculata*, and *Rhynchospora alba*. The dominant shrubs growing among the sedges include *Chamaedaphne calyculata, Myrica gale*, and *Vaccinium macrocarpon* which range from sparse to 40% cover. The bryophyte layer is dominated by species of *Sphagnum* and may have cover as high as 80%.

Global Vegetation: Tall, rhizomatous sedges dominate the vegetation, with shrubs often shorter than the graminoids. Bryophyte cover is variable. Scattered shrubs of *Alnus incana* and *Spiraea alba* may protrude above the graminoid cover; shorter shrubs such as *Myrica gale, Andromeda polifolia var. glaucophylla (= Andromeda glaucophylla), Vaccinium macrocarpon*, and *Chamaedaphne calyculata* grow among the sedges. The dominant sedges are usually *Carex lasiocarpa* or *Carex utriculata*; associates include *Carex oligosperma, Carex exilis, Carex vesicaria, Carex limosa, Carex canescens, Carex lacustris, Carex stricta* (non-tussock form), *Rhynchospora alba, Calamagrostis canadensis, Cladium mariscoides, Eriophorum angustifolium, Eriophorum virginicum*, and *Dulichium arundinaceum*. Forbs include *Lysimachia terrestris, Triadenum virginicum, Osmunda regalis, Comarum palustre (= Potentilla palustris), Drosera intermedia, Utricularia intermedia*, and *Pogonia ophioglossoides*. The bryophyte layer is dominated by species of *Sphagnum*, including *Sphagnum fallax, Sphagnum papillosum, Sphagnum cuspidatum, Sphagnum fimbriatum, Sphagnum centrale, Sphagnum lescurii*, and others.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*, *Myrica gale*
Short shrub/sapling	Dwarf-shrub	*Vaccinium macrocarpon*
Herb (field)	Graminoid	*Carex stricta*, *Carex utriculata*, *Rhynchospora alba*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Myrica gale*
Short shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*
Herb (field)	Graminoid	*Carex lasiocarpa*, *Carex utriculata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Carex utriculata*, *Chamaedaphne calyculata*, *Myrica gale*, *Rhynchospora alba*
Global: *Carex lasiocarpa*, *Carex utriculata*, *Chamaedaphne calyculata*, *Myrica gale*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (31-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Carex utriculata - Carex lacustris - (Carex vesicaria, Carex stricta)* Wet Meadow (CEGL002257)
- *Myrica gale - Chamaedaphne calyculata / Carex exilis* Acidic Peatland (CEGL006392)
- *Myrica gale - Dasiphora fruticosa ssp. floribunda / Carex lasiocarpa - Cladium mariscoides* Fen (CEGL006068)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: APPA.1638 was at one time classified as *Carex (oligosperma, exilis) - Chamaedaphne calyculata* Shrub Acidic Peatland (CEGL006524).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from the Little Swift River Pond area, Jones Pond and the Kennebec River.
Nations: CA, US
States/Provinces: CT, MA, ME, NH, NY, PA, QC, RI, VT
TNC Ecoregions: 48:C, 59:C, 60:C, 61:C, 63:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, 212Ec:CCC, 212Fa:CCP, 212Fb:CCP, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ac:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221B:CC, 221Fa:CCC, 222I:CC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ae:CCC, M212Af:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Fb:CPP, M221Ac:CCC, M221Ad:CCC, M221Da:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians], Cape Cod); USFWS (Pondicherry?, Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HMSM
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (4 plots; 9 accuracy assessment points): APPA.0718, APPA.0976, APPA.0980, APPA.1638, APPA_AA_1774, APPA_AA_2012, APPA_AA_2538, APPA_AA_2621, APPA_AA_2694, APPA_AA_2854, APPA_AA_3122, APPA_AA_3183, APPA_AA_3347.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler

References: Anderson and Davis 1997, CDPNQ unpubl. data, Cowardin et al. 1979, Damman and French 1987, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Enser 1999, Fike 1999, Furedi 2011d, Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, Metzler and Barrett 2001, Metzler and Barrett 2004, Metzler and Barrett 2006, Olivero 2001, Rawinski 1984a, Sneddon et al. 2010, Sperduto and Nichols 2004, Sperduto et al. 2000a, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zimmerman et al. 2012

[CEGL006512] *Myrica gale - Spiraea alba - Chamaedaphne calyculata* Fen

Translated Name: **Sweetgale - White Meadowsweet - Leatherleaf Fen**
Common Name: **Sweetgale Mixed Shrub Fen**

USNVC Classification

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Alkaline Fen (M877)
Group	Eastern North American Sub-boreal Alkaline Fen (G185)
Alliance	*Betula pumila - Chamaedaphne calyculata - Myrica gale* Shrub Fen Alliance (A3477)

Element Concept

Global Summary: This association is a mixed shrub fen in the Northern Appalachians region of the northeastern United States and adjacent Canada. It occurs in weakly to moderately minerotrophic settings, i.e., stream, lake or pond margins, adjacent to marshes, peatlands, or swamps, or on wet acidic colluvium at the base of slopes. The slowly moving, open water associated with this type creates somewhat minerotrophic conditions even though the pH is low (around 4.5 on average). The substrate is well-decomposed peat or muck overlying mineral soils; at most sites, standing water is present through most or all of the growing season. The shrub stratum is the dominant layer, usually with over 80% cover. The herb layer varies from sparse to well-developed. Bryophyte cover may be sparse overall, but bryophytes are locally extensive in the openings among the shrubs. Characteristic shrubs are *Myrica gale, Spiraea alba, Spiraea tomentosa*, and *Chamaedaphne calyculata*, in association with others, such as *Rhododendron canadense, Kalmia angustifolia, Alnus incana, Rosa palustris*, and saplings of *Acer rubrum, Larix laricina*, or, less commonly, *Picea mariana*. The herbaceous layer is relatively diverse, and may include *Calamagrostis canadensis, Carex stricta, Carex utriculata, Carex lasiocarpa, Carex canescens, Carex oligosperma, Oclemena nemoralis, Osmunda regalis, Typha latifolia, Triadenum virginicum, Triadenum fraseri, Dulichium arundinaceum, Juncus canadensis, Comarum palustre (= Potentilla palustris)*, and *Lysimachia terrestris*. The bryophyte layer is characterized by *Sphagnum fimbriatum, Sphagnum fallax, Sphagnum magellanicum, Sphagnum subsecundum, Sphagnum teres*, and others. The dense shrub cover of about 1 meter high, with *Myrica gale* and *Spiraea* spp. as important components, is diagnostic.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This mixed shrub fen occurs in standing shallow water. The sampled site is the saturated shoreline of Gore Pond. The water level of the pond was very low during the time of sampling, probably because of a breakage in a beaver dam. The unvegetated surface includes one large glacial erratic, with small amounts of downed wood and bare soil. Evidence of disturbance includes alterations to hydrology and recreational use impacts (trash).
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This peatland association is found locally throughout the Northern Appalachian project area in flat to gently sloping basin floors often along pond margins at elevations ranging from 200 to 850 m (655-2,790 feet). Soils are saturated to permanently flooded peat. Most sites are beaver-influenced.
Global Environment: This association is a mixed shrub fen in the Northern Appalachians region of the northeastern United States and adjacent Canada. It occurs in weakly to moderately minerotrophic settings, i.e., stream, lake or pond margins, adjacent to marshes, peatlands, or swamps, or on wet acidic colluvium at the base of slopes. The slowly moving, open water associated with this type creates somewhat minerotrophic conditions even though the pH is low (around 4.5 on average). The substrate is well-decomposed peat or muck overlying mineral soils; at most sites, standing water is present through most or all of the growing season.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This mixed, relatively tall (often >1 m) shrub fen is codominated by *Myrica gale, Spiraea tomentosa, Chamaedaphne calyculata*, and/or *Spiraea alba var. latifolia*. *Dulichium arundinaceum* and *Juncus* spp. are the dominant herbs.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association consists primarily of an open to very dense shrub stratum dominated by ericaceous shrubs with a sparse to dense sedge-dominated herbaceous layer. The dominant shrubs are *Chamaedaphne calyculata* and *Myrica gale*. *Spiraea alba* may dominate or codominate at some sites. Additional shrub associates occurring at lower cover may include *Alnus incana, Kalmia angustifolia, Kalmia polifolia, Ledum groenlandicum*, and *Rhododendron canadense*. Saplings of *Abies balsamea, Acer rubrum, Betula papyrifera, Larix laricina, Picea rubens, Pinus strobus*, and *Thuja occidentalis* are frequent at low cover. The herbaceous layer is overwhelmingly dominated by *Carex stricta*. Other common herbaceous associates include *Calamagrostis canadensis, Carex echinata, Chamaedaphne calyculata, Drosera rotundifolia, Gaultheria hispidula, Osmunda regalis, Rhynchospora alba, Sarracenia purpurea*, and *Triadenum virginicum*. Nonvascular cover by species of *Sphagnum* may range as high as 90%.
Global Vegetation: The shrub stratum is the dominant layer, usually with over 80% cover. The herb layer varies from sparse to well-developed. Bryophyte cover may be sparse overall, but bryophytes are locally extensive in the openings among the shrubs. Characteristic shrubs are *Myrica gale, Spiraea alba, Spiraea tomentosa*, and *Chamaedaphne calyculata*, in association with others, such as *Rhododendron canadense, Kalmia angustifolia, Alnus incana, Rosa palustris*, and saplings of *Acer rubrum, Larix laricina*, or, less commonly, *Picea mariana*. The herbaceous layer is relatively diverse, and may include *Calamagrostis canadensis, Carex stricta, Carex utriculata, Carex lasiocarpa, Carex canescens, Carex oligosperma, Oclemena nemoralis, Osmunda regalis, Typha latifolia, Triadenum virginicum, Triadenum fraseri, Dulichium arundinaceum, Juncus canadensis, Comarum palustre (= Potentilla palustris)*, and *Lysimachia terrestris*. The bryophyte layer is characterized by *Sphagnum fimbriatum, Sphagnum fallax, Sphagnum magellanicum, Sphagnum subsecundum, Sphagnum teres*, and others.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Spiraea alba* var. *latifolia*
Short shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*
Herb (field)	Graminoid	*Dulichium arundinaceum*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*, *Myrica gale*
Herb (field)	Graminoid	*Carex stricta*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Myrica gale*, *Spiraea alba* var. *latifolia*, *Spiraea tomentosa*
Short shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*
Herb (field)	Graminoid	*Dulichium arundinaceum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Chamaedaphne calyculata*, *Spiraea alba* var. *latifolia*, *Spiraea tomentosa*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Carex stricta*, *Chamaedaphne calyculata*, *Myrica gale*
Global: *Chamaedaphne calyculata*, *Myrica gale*, *Spiraea tomentosa*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Calamagrostis pickeringii* (G5, NH state-imperiled)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (2-Jul-1999).

RELATED CONCEPTS

Global Similar Types:
- *Chamaedaphne calyculata - Myrica gale / Carex lasiocarpa* Fen (CEGL005228)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The plot and local description are representative of the boggy, shrub and graminoid pondshore on the west side of Gore Pond in Massachusetts.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: This association is more common in New Hampshire and Maine.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Gore Pond in Massachusetts.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from Bog Pond, Gentian Pond and Lonesome Lake in New Hampshire, and Church Pond, Jones Pond, Little Swift River Pond area and Little Wilson Stream in Maine.
Global Range: This weakly to moderately minerotrophic mixed shrub swamp occurs in New England.
Nations: CA, US
States/Provinces: CT, MA, ME, NH, NY, QC:S4, RI, VT:S3
TNC Ecoregions: 61:C, 63:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, 212E:CC, 221Ag:CCC, 221Al:CCC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ae:CCC, M212Af:CCC, M212Bd:CCC, M212C:CC
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFWS (Aroostook, Assabet River?, Carlton Pond, Great Meadows?, Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SSLF
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 2 accuracy assessment points): APPA.0036, APPA_AA_2207, APPA_AA_2470.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (9 plots; 2 observation points; 20 accuracy assessment points): APPA.0186, APPA.0463, APPA.0466, APPA.0472, APPA.0475, APPA.0717, APPA.0737, APPA.0975, APPA.0979, APPA.1622, APPA.1662, APPA_AA_1732, APPA_AA_1753, APPA_AA_1982, APPA_AA_2035, APPA_AA_2043, APPA_AA_2239, APPA_AA_2286, APPA_AA_2310, APPA_AA_2461, APPA_AA_2534, APPA_AA_2812, APPA_AA_2833, APPA_AA_2876, APPA_AA_3019, APPA_AA_3059, APPA_AA_3200, APPA_AA_3211, APPA_AA_3213, APPA_AA_3247, APPA_AA_3260.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Cowardin et al. 1979, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Enser 1999, Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, Metzler and Barrett 2006, Northern Appalachian Ecology Working Group 2000, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

G805. NORTH-CENTRAL INTERIOR & APPALACHIAN ALKALINE FEN

Group Summary Description: This group encompasses shrub and herbaceous fen vegetation in the northeastern temperate region, including Allegheny Plateau and much of New York and New England, as well as the tallgrass prairie and southern Great Lakes regions of the north-central Midwest. Associations may be shrub-dominated, a mixture of shrubs and herbs, or herb-dominated. Characteristic species include the shrubs *Dasiphora fruticosa ssp. floribunda, Cornus amomum, Cornus racemosa, Cornus sericea*, prairie grasses such as *Andropogon gerardii* and *Spartina pectinata*, sedges, including *Carex flava, Carex sterilis, Carex prairea, Carex stricta*, and other graminoids such as *Trichophorum alpinum*, and forbs such as *Lobelia kalmii, Packera aurea, Symplocarpus foetidus, Rhynchospora* spp., and *Triantha glutinosa (= Tofieldia glutinosa)*. Less commonly, *Cladium mariscoides* may be a dominant. Vegetation develops on shallow to deep peat over a gently sloping or level substrate, where the groundwater, typically minerotrophic and slightly alkaline, provides nutrients. In glaciated areas, they are characteristically in pitted outwash or in kettle lakes associated with kettle-kame-moraine topography.

A3703 *Dasiphora fruticosa ssp. floribunda - Carex sterilis - Carex flava* Alkaline Shrub Fen Alliance

Alliance Summary Description: This alliance includes calcareous sedge fens of the northeastern United States and possibly adjacent eastern Canada. This alliance brings together a suite of spring-fed herbaceous vegetation occurring on shallow peat and irrigated by base-rich surface discharge or groundwater. The vegetation has a consistent set of characteristic species but a locally variable set of associates, many of which are uncommon within the region. Occurrences are generally small, local and restricted to a rather particular set of conditions. The prominent architectural elements of this alliance include a well-developed herbaceous layer dominated by short cespitose sedges, a ground layer of bulky "brown" mosses, and clumped or scattered shrubs (generally restricted to micro-hummocks). Typically there is no clear dominant species allowing for a highly variable compositional and structural aspect from occurrence to occurrence. The cespitose, short shrub *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)* is perhaps the most characteristic species of the alliance although it is rarely present in the Northern Appalachian examples. *Rhamnus alnifolia* is another characteristic and much more spreading short shrub, which may be quite extensive in some examples. Additionally, tall branching shrubs such as *Cornus sericea, Salix discolor, Salix bebbiana, Salix candida, Salix lucida, Salix serissima*, and others are very typical and often form a fringe around the lower slope of the fen. *Juniperus virginiana* occurs as scattered individuals in some stands. Common herbs include *Andropogon gerardii, Carex lasiocarpa, Carex sterilis, Carex prairea, Cladium mariscoides, Eleocharis quinqueflora, Lobelia kalmii, Rhynchospora capillacea, Schoenoplectus americanus (= Scirpus americanus)*, and *Triglochin maritima*, which are all abundant in parts of the alliance.

[CEGL006326] *Dasiphora fruticosa ssp. floribunda / Carex (sterilis, hystericina, flava)* Fen

Translated Name: **Shrubby-cinquefoil / (Dioecious Sedge, Bottlebrush Sedge, Yellow Sedge) Fen**
Common Name: **Lower New England Sloping Fen**

USNVC Classification

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Alkaline Fen (M877)
Group	North-Central Interior & Appalachian Alkaline Fen (G805)
Alliance	*Dasiphora fruticosa ssp. floribunda - Carex sterilis - Carex flava* Alkaline Shrub Fen Alliance (A3703)

Element Concept

Global Summary: Spring-fed herbaceous vegetation occurring on shallow peat and irrigated by base rich surface discharge or groundwater. Occurrences are generally small, local and restricted to a rather particular set of conditions. They are often on gentle slopes and in headwater positions. The community comprises a well-developed, very diverse herbaceous layer dominated by short cespitose sedges (*Carex hystericina, Carex leptalea, Carex interior, Carex flava, Carex sterilis*) and grasses such as *Muhlenbergia glomerata, Glyceria striata* and *Bromus kalmii* are common. Other characteristic herbs include *Packera aurea (= Senecio aureus), Parnassia glauca, Solidago patula, Solidago uliginosa, Geum rivale, Equisetum* spp., *Spiranthes romanzoffiana, Symplocarpus foetidus, Drosera rotundifolia, Iris versicolor, Lobelia kalmii, Lycopus uniflorus, Thelypteris palustris*, and *Thalictrum pubescens*. Many additional associated wetland species also occur. The bryophyte layer is well-developed and composed of bulky "brown" mosses (*Campylium stellatum, Limprichtia revolvens (= Drepanocladus revolvens), Calliergonella cuspidata, Aulacomnium palustre, Climacium* spp., *Tomentypnum nitens, Philonotis fontana, Bryum pseudotriquetrum, Scorpidium scorpioides*). Shrubs are variable in cover and generally include *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Rhamnus alnifolia*, and *Salix* spp.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This calcareous sloping fen is often found in headwater positions fed by enriched groundwater seepage. Peat depth is relatively shallow (<50 cm).Sites are gently sloping saturated to seasonally flooded basins. Soils are somewhat to very poorly drained peat. The unvegetated surface is dominated by leaf litter, with very small amounts of downed wood, bare soil and standing water. One site is a former pasture that is now a gas pipeline corridor maintained by mowing. Evidence of disturbance includes an ATV track and the presence of exotic plants.
Global Environment: Spring-fed herbaceous vegetation occurring on shallow peat over mineral soil and irrigated by base rich surface discharge or groundwater. They are often on gentle slopes and in headwater positions. Occurrences are generally small, local and restricted.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The vegetation is strongly dominated by short *Carex* spp. and brown mosses. Species composition is very diverse, including numerous enrichment indicators such as *Parnassia glauca, Packera aurea, Lobelia kalmii*, and *Geum rivale*; other characteristic herbs include *Equisetum* spp., *Eupatorium maculatum, Galium tinctorium*, and *Scirpus microcarpus*. *Frangula alnus* and *Salix sericea* are characteristic shrubs.
Global Vegetation: The community comprises a well-developed, very diverse herbaceous layer dominated by short cespitose sedges (*Carex hystericina, Carex leptalea, Carex interior, Carex flava, Carex sterilis*). Other characteristic herbs include *Muhlenbergia glomerata, Glyceria striata, Bromus kalmii, Packera aurea (= Senecio aureus), Parnassia glauca, Solidago patula, Solidago uliginosa, Geum rivale, Equisetum* spp., *Spiranthes romanzoffiana, Symplocarpus foetidus, Drosera rotundifolia, Iris versicolor, Lobelia kalmii, Lycopus uniflorus, Thelypteris palustris*, and *Thalictrum pubescens*. Many additional associated wetland species also occur. The bryophyte layer is well-developed and composed of bulky "brown" mosses (*Campylium stellatum, Limprichtia revolvens (= Drepanocladus revolvens), Calliergonella cuspidata, Aulacomnium palustre, Climacium* spp., *Tomentypnum nitens, Philonotis fontana, Bryum pseudotriquetrum, Scorpidium scorpioides*). Shrubs are variable in cover and generally include *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Rhamnus alnifolia*, and *Salix* spp.
Global Dynamics: This community is found in headwater positions fed by enriched groundwater seepage.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex echinata* ssp. *echinata*, *Carex interior*, *Scirpus microcarpus*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex echinata* ssp. *echinata*, *Carex hystericina*, *Carex interior*, *Carex leptalea*, *Scirpus microcarpus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Carex echinata* ssp. *echinata*, *Carex interior*, *Equisetum arvense*, *Galium tinctorium*, *Salix sericea*, *Scirpus microcarpus*
Global: *Carex flava*, *Carex hystericina*, *Carex interior*, *Carex leptalea*, *Carex sterilis*, *Muhlenbergia glomerata*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Daucus carota* (Low), *Frangula alnus* (High/Medium), *Leucanthemum vulgare* (Medium/Low), *Linaria vulgaris* (High/Low), *Lythrum salicaria* (High), *Pastinaca sativa* (Low/Insignificant), *Poa compressa* (High/Low)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (11-Jan-1998). This "fen" vegetation type is restricted in distribution to calcareous or limestone areas in the southern Green Mountains, Connecticut River valley, and the Northwest Highlands region of Massachusetts, Connecticut and New York. There are less than 50 known occurrences of this vegetation, and the occurrences are generally very small in size, often only an acre or two. Some, however, are considerably larger and these are often associated with areas of grazing or pasture. In areas where grazing has been discontinued the fens are often rapidly filling with shrubs, particularly *Cornus sericea*. In other areas, disruptions in local hydrology, caused by nearby development, has had a negative effect on the condition of some occurrences. These have become increasingly shrubbier and contain many weedy species both native and exotic.

RELATED CONCEPTS

Global Similar Types:
- *Carex (interior, hystericina, flava) - Trichophorum alpinum / Campylium stellatum* Fen (CEGL006331)
- *Cornus racemosa / Carex (sterilis, aquatilis, lacustris)* Fen (CEGL006123)
- *Dasiphora fruticosa ssp. floribunda / Carex interior - Carex flava - Sarracenia purpurea* Fen (CEGL005140)
- *Dasiphora fruticosa ssp. floribunda / Carex sterilis - Andropogon gerardii - Arnoglossum plantagineum* Fen (CEGL005139)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: One disturbed fen in Massachusetts occurs along a gas pipeline corridor in a former pasture, now mown occasionally by the gas company. The adjacent uplands were also in agriculture until the last 10 years or so. The site has rich soils and a diversity of flora, both native and non-native.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community ranges throughout Lower New England from Connecticut and New York north to Vermont. It was sampled at Hop Brook-Gas Pipeline Natural Heritage Site in Massachusetts and at Sargent Brook in Vermont.
Global Range: This association is found in Massachusetts, Connecticut, Vermont, New York, and New Hampshire and restricted to seepage areas of calcareous bedrock.
Nations: US
States/Provinces: CT, MA, NH:S2, NY, VT
TNC Ecoregions: 60:C, 61:C
USFS Ecoregions (1994/95): 212Ec:CCC, 212Fb:CCC, 221Ae:CCC, 221Bb:CCC, M212Bb:CCC, M212Cb:CCC, M212Cc:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 1 accuracy assessment point): APPA.0053, APPA.0964, APPA_AA_2756.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Metzler and Barrett 2001, Metzler and Barrett 2004, Metzler and Barrett 2006, Motzkin 1994, Rawinski 1984a, Sperduto 2000a, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson and Sorenson 2000

[CEGL006357] *Juniperus virginiana / Dasiphora fruticosa ssp. floribunda / Carex flava - Carex tetanica* Fen

Translated Name: **Eastern Red-cedar / Shrubby-cinquefoil / Yellow Sedge - Rigid Sedge Fen**
Common Name: **Pasture Fen**

USNVC CLASSIFICATION

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Alkaline Fen (M877)
Group	North-Central Interior & Appalachian Alkaline Fen (G805)
Alliance	*Dasiphora fruticosa ssp. floribunda* - *Carex sterilis* - *Carex flava* Alkaline Shrub Fen Alliance (A3703)

ELEMENT CONCEPT

Global Summary: This association is a saturated wetland of turfy mineral soil occurring over calcareous bedrock, a fen supporting a number of calciphitic species. It occurs in New York, New Jersey and Pennsylvania. It varies in appearance from an open shrubland to open herbaceous vegetation. The tall-shrub layer, when present, is 2-5 m in height with 20% cover or less. Typical tall shrubs include *Cornus amomum, Juniperus virginiana*, and *Toxicodendron vernix*. Typical short shrubs include *Dasiphora fruticosa ssp. floribunda, Spiraea tomentosa, Spiraea alba var. latifolia*, and *Lyonia ligustrina*. Other characteristic, often calciphilic, shrubs include *Salix candida* and *Salix discolor*. Invasive shrubs may be locally abundant in some fens, especially *Rosa multiflora* and *Elaeagnus umbellata*. The herbaceous layer is greater than 75% cover (often near 100%). Dominant herb species include *Packera aurea (= Senecio aureus), Parnassia glauca, Thelypteris palustris, Pycnanthemum tenuifolium, Onoclea sensibilis, Juncus subcaudatus, Solidago rugosa, Carex stricta, Dryopteris cristata*, and *Juncus dudleyi*. Other associates include *Juncus nodosus, Equisetum fluviatile, Sisyrinchium angustifolium, Solidago uliginosa,*

Eupatorium maculatum, Liatris spicata, Spiranthes lucida, Rudbeckia fulgida, Pedicularis canadensis, and *Pedicularis lanceolata*. A number of calciphilic herb species are often present at low cover values, including *Lobelia kalmii, Epilobium strictum, Carex tetanica, Carex flava, Juncus brachycephalus, Bromus kalmii, Cypripedium parviflorum, Geum rivale*, and *Castilleja coccinea*. *Lythrum salicaria* can be an abundant weed species in some fens. This vegetation has been generally affected by grazing in the past, which in some cases continues to the present, and as such this vegetation is known locally as a pasture fen.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This rich fen has turfy mineral soil occurring over calcareous bedrock. The sampled site is a groundwater-fed weedy rich fen on a slight slope. The soil is poorly drained silt loam, and the unvegetated surface is made up of leaf litter, small rocks, bare soil, and standing water. Evidence of disturbance includes the presence of exotic plants.

Global Environment: These wetlands occur as small patches where calcareous groundwater discharges to the surface. They typically occur along the toeslope of ridges, in association with limestone and calcareous siltstone. Soils vary from silt loams to shallow mucky peat.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This fen has a canopy of scattered *Juniperus virginiana* and often *Cornus amomum, Toxicodendron vernix*, and the dwarf-shrub *Dasiphora fruticosa ssp. floribunda*. *Packera aurea, Carex flava, Parnassia glauca, Equisetum arvense*, and *Carex tetanica* are characteristic herbs. *Rhamnus cathartica, Morella pensylvanica, Rosa multiflora*, and *Elaeagnus umbellata* are common shrubs. Evidence of grazing may be evident; exotic species such as *Lythrum salicaria* may be present in quantity.

Global Vegetation: This association varies in appearance from an open shrubland to open herbaceous vegetation. The tall-shrub layer, when present, is 2-5 m in height with 20% cover or less. Typical tall shrubs include *Cornus amomum, Juniperus virginiana*, and *Toxicodendron vernix*. Typical short shrubs include *Dasiphora fruticosa ssp. floribunda, Spiraea tomentosa, Spiraea alba var. latifolia*, and *Lyonia ligustrina*. Other characteristic, often calciphilic, shrubs include *Salix candida* and *Salix discolor*. Invasive shrubs may be locally abundant in some fens, especially *Rosa multiflora* and *Elaeagnus umbellata*. The herbaceous layer is greater than 75% cover (often near 100%). Dominant herb species include *Packera aurea (= Senecio aureus), Parnassia glauca, Thelypteris palustris, Pycnanthemum tenuifolium, Onoclea sensibilis, Juncus subcaudatus, Solidago rugosa, Carex stricta, Dryopteris cristata*, and *Juncus dudleyi*. Other associates include *Juncus nodosus, Equisetum fluviatile, Sisyrinchium angustifolium, Solidago uliginosa, Eupatorium maculatum, Liatris spicata, Spiranthes lucida, Rudbeckia fulgida, Pedicularis canadensis*, and *Pedicularis lanceolata*. A number of calciphilic herb species are often present at low cover values, including *Lobelia kalmii, Epilobium strictum, Carex tetanica, Carex flava, Juncus brachycephalus, Bromus kalmii, Cypripedium parviflorum, Geum rivale*, and *Castilleja coccinea*. *Lythrum salicaria* can be an abundant weed species in some fens.

Global Dynamics: This vegetation has been generally affected by grazing in the past, which in some cases continues to the present, and as such this vegetation is known locally as a pasture fen.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Rhamnus cathartica*
Tall shrub/sapling	Needle-leaved tree	*Juniperus virginiana*
Short shrub/sapling	Broad-leaved evergreen shrub	*Dasiphora fruticosa* ssp. *floribunda*
Herb (field)	Flowering forb	*Packera aurea*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Needle-leaved tree	*Juniperus virginiana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Toxicodendron vernix*
Short shrub/sapling	Broad-leaved evergreen shrub	*Dasiphora fruticosa* ssp. *floribunda*
Herb (field)	Flowering forb	*Packera aurea*, *Parnassia glauca*
Herb (field)	Graminoid	*Carex stricta*, *Juncus subcaudatus*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris palustris*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Carex flava*, *Dasiphora fruticosa* ssp. *floribunda*, *Juniperus virginiana*, *Packera aurea*, *Rhamnus cathartica*
Global: *Carex tetanica*, *Castilleja coccinea*, *Cornus amomum*, *Dasiphora fruticosa* ssp. *floribunda*, *Juniperus virginiana*, *Lobelia kalmii*, *Packera aurea*, *Spiraea tomentosa*, *Toxicodendron vernix*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium), *Galium mollugo*, *Rhamnus cathartica* (High/Medium), *Rosa multiflora* (Medium/Low)
Global: Vulnerable Plants: *Trollius laxus* ssp. *laxus* (G5T3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1G2 (23-Jan-1998). This association is restricted to saturated wetlands of turfy mineral soil occurring over calcareous bedrock in New Jersey, Pennsylvania, and possibly New York. There are 10-20 estimated occurrences in New Jersey and possibly the same number from Pennsylvania. These fens are 0.1-1.5 acres in size, with a total of 20-40 acres known from New Jersey. The total potential acreage of this type is well below 200 acres rangewide.

RELATED CONCEPTS

Global Similar Types:
- *Morella pensylvanica - Dasiphora fruticosa ssp. floribunda / Carex sterilis - Carex flava* Fen (CEGL006103) has active marl deposition and lower herbaceous cover.
- *Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Seepage Meadow (CEGL006448) has fewer calciphilic species.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This vegetation has been generally affected by grazing in the past, which in some cases continues to the present, and as such this vegetation is known locally as a pasture fen. Many exotics may be present.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Edinger et al.'s (2002) Rich Shrub Fen has been crosswalked to this association (as well as four others), in which case the range would extend to New York.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Hammersley Ridge in New York.
Global Range: This association occurs in New Jersey, Pennsylvania, and New York.
Nations: US
States/Provinces: NJ:S1S2, NY, PA
TNC Ecoregions: 60:C, 61:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Ba:CCC, 221Bd:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WPAF
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot): APPA.0683.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler
References: Breden et al. 2001, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Perles et al. 2007, Radis 1986

M876. North American Boreal & Sub-boreal Bog & Acidic Fen

G748. EASTERN NORTH AMERICAN BOREAL BOG & ACIDIC FEN

Group Summary Description: These acidic peatlands are found in eastern boreal regions of central and eastern Canada and southward into adjacent sub-boreal regions of northeast and north-central United States. Climates are cold enough to allow the rate of peat accumulation to exceed its decomposition. They contain a continuous (>80% cover) layer of *Sphagnum* mosses (sometimes submerged in bog pools), to depths exceeding 40 cm, with ericaceous dwarf-shrubs and thin-leaved graminoids >25% cover. Scrub trees <2 m may be common, but trees >5 m are <10% cover. Acidic peatlands range from strictly ombrotrophic bog (isolated from groundwater, precipitation fed) to weakly minerotrophic poor fen. They occur in extensive areas of low flats, or develop in open or closed, relatively shallow basins with nutrient-poor and acidic conditions. Many occur in association with larger lakes or streams. Some occur as kettlehole fens (usually called kettlehole "bogs") associated with eskers or other glacial deposits. Poor fens often develop adjacent to open water and may form a floating mat over water. The surface morphology of a bog may be more-or-less level, domed, or eccentric, but typically is above the water table. As peat accumulates, ridges may form, which can be relatively dry compared to the flat areas. Secondary bog pools (schlenke) may be present in the raised portions of the peatlands. *Sphagnum* mosses play a key role in these systems because they trap base cations, causing the organic soils to acidify, and they retain moisture, thus slowing the decomposition rate and promoting peat accumulation. Species diversity is low. Dwarf-shrubs include *Chamaedaphne calyculata, Ledum groenlandicum, Kalmia polifolia, Andromeda polifolia, Vaccinium oxycoccos, Vaccinium macrocarpon*, occasionally *Gaultheria hispidula* or *Betula pumila*. Rarely, tall ericaceous shrubs such as *Vaccinium corymbosum* are dominant. Common sedges include *Carex oligosperma, Carex chordorrhiza, Carex magellanica ssp. irrigua (= Carex paupercula), Carex limosa*, and *Carex lasiocarpa*. Other herbs include *Eriophorum vaginatum, Eriophorum virginicum, Drosera rotundifolia, Menyanthes trifoliata, Sarracenia purpurea*, and *Scheuchzeria palustris*. When present, stunted *Picea mariana* and *Larix laricina* are the dominant trees. Dominant mosses include *Sphagnum fuscum* and *Sphagnum magellanicum*, and less commonly *Sphagnum angustifolium*. *Pleurozium schreberi* can be common on raised mats.

In the Atlantic region, from Labrador to Downeast Maine, acidic peatlands take a somewhat different characteristics. In basins, they develop raised plateaus with undulating sedge and dwarf-shrub vegetation. *Trichophorum caespitosum* may form sedge lawns on the raised plateau. The system may also occur as "blanket bogs" over a sloping rocky substrate in extreme maritime settings; here, dwarf-shrubs and *Sphagnum* are the dominant cover. Species characteristic of this maritime setting include *Empetrum nigrum* and *Rubus chamaemorus*. Typical bog heaths such as *Kalmia angustifolia, Kalmia polifolia, Gaylussacia baccata, Ledum groenlandicum*, and *Gaylussacia dumosa* are also present. Morphological characteristics and certain coastal species distinguish these from more inland acidic peatlands.

A3836 *Picea mariana / Sphagnum* spp. Eastern Boreal Treed Bog Alliance

Alliance Summary Description: This bog forest alliance is found in the Great Lakes and northeastern parts of the United States and the Ontario and Quebec boreal region in Canada (excluding Atlantic boreal region). Tree canopy cover is variable but generally exceeds 10%. Stunted *Picea mariana* trees (<10 m tall) dominate the canopy, which may also include scattered *Larix laricina*. The dwarf-shrub layer is dominated by ericaceous species, such as *Andromeda polifolia var. glaucophylla (= Andromeda glaucophylla), Chamaedaphne calyculata, Kalmia polifolia*, and *Ledum groenlandicum*. *Kalmia angustifolia* is common in the eastern part of the range (Quebec). Herbaceous species include *Carex trisperma* and *Eriophorum vaginatum*. *Sphagnum* mosses (usually *Sphagnum fuscum, Sphagnum angustifolium*, and *Sphagnum magellanicum*) cover the ground layer, with scattered feathermosses *Pleurozium schreberi, Dicranum undulatum*, and *Polytrichum strictum*. This alliance is best developed on the crests and upper slopes of raised bogs within bog complexes, but is also found in basin bogs and occasionally on shores (but isolated from groundwater contact). Here, sphagnum mosses can prevent most tree reproduction except that of *Picea mariana* and *Larix laricina*, which can reproduce by layering. The substrate consists of deep, fibric peat.

[CEGL002485] *Picea mariana / Ledum groenlandicum / Carex trisperma / Sphagnum* spp. Open Bog Woodland

Translated Name: **Black Spruce / Bog Labrador-tea / Three-seeded Sedge / Peatmoss species Open Bog Woodland**

Common Name: **Black Spruce Open Bog Woodland**

USNVC CLASSIFICATION

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Bog & Acidic Fen (M876)
Group	Eastern North American Boreal Bog & Acidic Fen (G748)
Alliance	*Picea mariana / Sphagnum* spp. Eastern Boreal Treed Bog Alliance (A3836)

ELEMENT CONCEPT

Global Summary: This black spruce-dominated raised bog community type is found in the sub-boreal to boreal regions of the Great Lakes, elsewhere in the boreal region of central Canada, and across to Maine. Stands are typically on the crests of raised bog landforms in large peatland complexes, as well as in basin bogs. Sites are poorly drained, with wet organic substrates. Tree cover forms at least 25% canopy (and may be very dense), varying in height from 3 m to over 10 m. *Picea mariana* is often the sole species in the canopy. *Larix laricina* may occasionally occur. The dwarf-shrub layer is dominated by *Ledum groenlandicum* and other ericaceous shrubs, such as *Chamaedaphne calyculata, Vaccinium myrtilloides, Vaccinium oxycoccos, Kalmia polifolia, Kalmia angustifolia, Gaultheria hispidula*, and *Andromeda polifolia*. *Picea mariana* may also be found in scrub form in this layer. Ground cover consists of a species-poor herb layer, with *Carex trisperma, Eriophorum vaginatum*, and *Maianthemum trifolium* most prevalent. Moss cover is a *Sphagnum* carpet with patches of feathermoss (especially *Pleurozium schreberi*) and conifer litter beneath the trees. Dominant sphagnum species include *Sphagnum magellanicum, Sphagnum fuscum, Sphagnum recurvum*, and *Sphagnum angustifolium*, and less commonly, *Sphagnum capillifolium (= Sphagnum nemoreum)* and *Sphagnum girgensohnii*. Minerotrophic indicators, such as *Betula pumila, Carex stricta*, and *Carex aquatilis*, are absent.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This forest association is only known from one location in New Hampshire occurring in a mountain basin at 700 m (2,300 feet) elevation. No other supplemental environmental data were collected from this site.

Global Environment: Stands are typically on the crests of raised bog landforms in large peatland complexes, as well as in basin bogs. Sites are poorly drained, with wet organic substrates (Sims et al. 1989, MNNHP 1993, McCarthy et al. 1994, Harris et al. 1996).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only occurrence of this association is a closed-canopy evergreen forest dominated by *Picea mariana* with no other canopy associates. The understory is shrub-dominated with low cover of *Kalmia angustifolia, Myrica gale, Nemopanthus mucronatus*, and *Vaccinium oxycoccos*. Herbaceous species also occur at low cover and include *Cornus canadensis, Eriophorum vaginatum, Linnaea borealis, Lysimachia terrestris*, and *Maianthemum trifolium*.

Global Vegetation: Trees cover at least 25% of the canopy (and may be very dense), varying in height from 3 m to over 10 m. *Picea mariana* is often the sole species in the canopy. *Larix laricina* may occasionally occur. The dwarf-shrub layer is dominated by *Ledum groenlandicum* and other ericaceous shrubs, such as *Chamaedaphne calyculata, Vaccinium myrtilloides, Vaccinium oxycoccos, Kalmia polifolia, Gaultheria hispidula*, and *Andromeda polifolia*. *Picea mariana* may also be found in scrub form in this layer. Ground cover consists of a species-poor herb layer, with *Carex trisperma, Eriophorum vaginatum*, and *Maianthemum trifolium* most prevalent. Moss cover is a *Sphagnum* carpet with patches of feathermoss (especially *Pleurozium schreberi*) and conifer litter beneath the trees. Dominant *Sphagnum* species include *Sphagnum magellanicum, Sphagnum fuscum*, and *Sphagnum angustifolium*, and less commonly, *Sphagnum capillifolium (= Sphagnum nemoreum*) and *Sphagnum girgensohnii*. Minerotrophic indicators, such as *Betula pumila, Carex stricta*, and *Carex aquatilis*, are absent (Sims et al. 1989, MNNHP 1993, McCarthy et al. 1994, Harris et al. 1996).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea mariana*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia angustifolia*, *Myrica gale*
Herb (field)	Flowering forb	*Maianthemum trifolium*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea mariana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Myrica gale*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia angustifolia*
Herb (field)	Flowering forb	*Maianthemum trifolium*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Ledum groenlandicum*, *Picea mariana*
Global: *Ledum groenlandicum*, *Picea mariana*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (3-Oct-1996).

RELATED CONCEPTS

Global Similar Types:

- *Picea mariana - (Larix laricina) / Ledum groenlandicum / Sphagnum* spp. Swamp Forest (CEGL005271) Treed bogs in smaller basins that are closed canopy may key to this type, a black spruce poor swamp type more typically found in basins. It may be that, apart from peatland setting (i.e., open peatland complex vs. closed basin), these two types are vegetationally indistinguishable.
- *Picea mariana / Chamaedaphne calyculata / Sphagnum* spp. Open Bog Woodland (CEGL005218)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: This type is conceptually a raised bog in a large peatland complex, with a more open-treed canopy. It includes both raised and intermediate bogs as described by the MNNHP (1993); however, Minnesota's intermediate bog may also overlap in part with *Picea mariana - (Larix laricina) / Ledum groenlandicum / Sphagnum* spp. Swamp Forest (CEGL005271), a black spruce poor swamp type). Based on work at Voyageurs National Park, Minnesota, and work in Ontario, closed stands of black spruce bog may key here or to CEGL005271, a black spruce poor swamp type more typically found in basins. It may be that, apart from peatland setting (i.e., open peatland complex vs. closed basin), these two types are vegetationally indistinguishable. This type is not expected in Wisconsin (E. Epstein pers. comm. 1999). This type extends to the Northern Appalachians in the larger peatland complexes.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Page Pond in New Hampshire.
Global Range: This black spruce-dominated bog community type is found in the sub-boreal to boreal regions of the Great Lakes and elsewhere in the boreal region of central Canada, ranging from inland areas of Maine to northern Minnesota and northward into central Canada, including Manitoba, Ontario and Quebec.
Nations: CA, US
States/Provinces: MB:S5, ME, MI, MN, NB, NH, NY, ON, QC, VT, WI
TNC Ecoregions: 35:C, 46:C, 47:C, 48:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CPP, 212Da:CCC, 212Hb:CPP, 212Hh:CPP, 212Hi:CPP, 212Hj:CPP, 212Hp:CPP, 212Hq:CPP, 212Hr:CPP, 212Hs:CPP, 212Hw:CPP, 212Hy:CPP, 212Ja:CCP, 212Jb:CCP, 212Jc:CCC, 212Je:CCC, 212Jf:CCP, 212Jj:CCP, 212Jl:CCP, 212Jm:CCP, 212Jn:CCP, 212Ka:CCP, 212Kb:CCC, 212La:CCC, 212Lb:CCC, 212Lc:CCP, 212Ma:CCP, 212Mb:CCC, 212Na:CCC, 212Nb:CCP, 212Nc:CCC, 212Nd:CCP, 222Ke:CCC, 222Na:CCC, M212A:PP
Federal Lands: NPS (Appalachian Trail [Northern Appalachians], Isle Royale, Voyageurs); USFS (Chequamegon, Chequamegon-Nicolet, Chippewa, Hiawatha, Huron, Huron-Manistee, Manistee, Nicolet, Ottawa, Superior); USFWS (Carlton Pond?, Moosehorn?, Nulhegan Basin)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: FBSB
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: This association is only known from Page Pond in New Hampshire.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 plot; 9 accuracy assessment points): APPA.0308, APPA_AA_1945, APPA_AA_2407, APPA_AA_2559, APPA_AA_2717, APPA_AA_2949, APPA_AA_2995, APPA_AA_3061, APPA_AA_3104, APPA_AA_3305.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): D. Faber-Langendoen
References: CDPNQ unpubl. data, Chapman et al. 1989, Davis and Anderson 1991, Edinger et al. 2002, Faber-Langendoen 2001, Gawler 2002, Gawler and Cutko 2010, Glaser 1992b, Greenall 1996, Harris et al. 1996, Hop et al. 1999, Kost et al. 2007, Lee et al. 1998, MNNHP 1993, McCarthy et al. 1994, Midwestern Ecology Working Group n.d.*, Minnesota DNR 2003, Minnesota DNR 2005a, Sims et al. 1989, TNC 1999b, Thompson and Sorenson 2000, WNHI 2011, WNHI unpubl. Data

G745. EASTERN NORTH AMERICAN SUB-BOREAL BOG & ACIDIC FEN

Group Summary Description: These *Sphagnum* and shrub peatlands occur in basins and open peatlands in the Laurentian-Acadian region down to near the glacial boundary in the northeastern and north-central U.S. Unlike the true raised bogs of boreal regions, the vegetation is rarely or not raised above the groundwater level. The nutrient-poor substrate and the reduced throughflow of water create oligotrophic conditions fostering the development of *Sphagnum* peat and the growth of peatland vegetation. Major physiognomic types include two primary types. First, the ericaceous dwarf-shrub bog, often dominated by *Chamaedaphne calyculata* (sometimes with distinctive southern and coastal elements such as *Gaylussacia dumosa, Ilex glabra*, and *Morella pensylvanica*). Second, tall-shrub thicket peatlands are dominated by deciduous ericaceous shrubs, especially *Vaccinium corymbosum* (*Ilex verticillata* can dominate on shallower peat and near the bog border). Graminoids such as *Carex oligosperma, Carex magellanica ssp. irrigua (= Carex paupercula), Eriophorum angustifolium, Eriophorum virginicum*, and *Eriophorum vaginatum* are most common, and together these graminoids have greater cover than medium to rich fen graminoid indicators (*Carex lasiocarpa, Carex livida, Carex interior, Carex limosa, Muhlenbergia glomerata, Trichophorum alpinum, Eriophorum viridicarinatum*). Transitional poor to medium sites may include *Myrica gale* and *Dulichium arundinaceum*. Some peatlands may have a sparse tree layer (<10% cover), and stunted (<2 m) trees may be common, usually *Picea mariana, Larix laricina*, and *Acer rubrum*. These peatlands are found in colder regions, mostly in areas where glacial stagnation left coarse deposits and glacial depressions (many are "kettleholes"). The basins are generally closed, i.e., without inlets or outlets of surface water, and typically small in area. In deeper basins, the vascular vegetation grows on a *Sphagnum* mat over water, with no mineral soil development. Species diversity is typically low. Although these peatlands are often called bogs, in most cases they are technically "poor fens," as the vegetation remains in contact with the weakly minerotrophic (nutrient-poor) groundwater.

A3450 *Chamaedaphne calyculata / Carex lasiocarpa* Sub-boreal Acidic Shrub Bog & Fen Alliance

Alliance Summary Description: This acidic peatland alliance is found in the sub-boreal regions of the midwestern and northeastern United States, as well as extreme southern Ontario in Canada. Commonly called bogs and poor fens, stands occur in areas that are at best weakly influenced by groundwater. The ground layer is dominated by ericaceous dwarf-shrubs (>25%) and sphagnum. The moss layer has a continuous mat of sphagnum mosses, usually dominated by *Sphagnum magellanicum, Sphagnum fuscum*, or *Sphagnum angustifolium*. In the north, scattered and stunted (<5 m tall) *Picea mariana* and *Larix laricina* may be present, but tree cover over 5 m is less than 10%. The ericaceous shrub layer is dominated by *Chamaedaphne calyculata*, with *Kalmia polifolia* and *Andromeda polifolia var. glaucophylla (= Andromeda glaucophylla)* typical associates. Characteristic herbaceous species are *Drosera rotundifolia* and *Sarracenia purpurea*. Other characteristic species include *Calamovilfa brevipilis, Carex striata var. striata, Eriophorum virginicum, Lysimachia asperulifolia, Rhynchospora alba, Utricularia subulata*, and *Vaccinium macrocarpon*.

[CEGL006008] *Chamaedaphne calyculata - (Gaylussacia dumosa) - Decodon verticillatus / Woodwardia virginica* Acidic Peatland

Translated Name: **Leatherleaf - (Dwarf Huckleberry) - Swamp-loosestrife / Virginia Chainfern Acidic Peatland**

Common Name: **Southern New England Bog**

USNVC Classification

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Bog & Acidic Fen (M876)
Group	Eastern North American Sub-boreal Bog & Acidic Fen (G745)
Alliance	*Chamaedaphne calyculata / Carex lasiocarpa* Sub-boreal Acidic Shrub Bog & Fen Alliance (A3450)

Element Concept

Global Summary: This dwarf-shrub quaking or floating bog occurs in the southern portion of the glaciated Northeast, extending west to the Western Allegheny Plateau. It occupies oligotrophic, peat-accumulating basins. *Chamaedaphne calyculata* is strongly dominant, with associate species including *Kalmia angustifolia, Kalmia polifolia, Vaccinium oxycoccos, Vaccinium macrocarpon, Gaylussacia dumosa* (on the coast), and *Gaylussacia baccata*. Associate shrubs generally occur with low cover, although they may be locally common. Scattered tall shrubs, such as *Vaccinium corymbosum, Rhododendron viscosum, Larix laricina, Picea mariana*, and *Acer rubrum*, may occur but always with low cover. Herbaceous cover is quite low but can include *Carex trisperma, Pogonia ophioglossoides, Calopogon tuberosus (= Calopogon pulchellus), Eriophorum virginicum, Drosera rotundifolia, Drosera intermedia, Sarracenia purpurea*, and *Woodwardia virginica* scattered throughout and with *Carex canescens, Carex limosa, Glyceria canadensis, Triadenum virginicum, Utricularia cornuta, Rhynchospora alba*, and sometimes *Scheuchzeria palustris* occurring in wetter fen windows. Edges of floating mats tend to receive more nutrient enrichment and support such species as *Peltandra virginica, Decodon verticillatus*, and *Dulichium arundinaceum*. The bryophyte layer is well-developed, dominated by *Sphagnum capillifolium, Sphagnum magellanicum, Sphagnum rubellum*, and *Sphagnum fuscum* with *Sphagnum bartlettianum, Sphagnum cuspidatum, Sphagnum fallax*, and *Sphagnum recurvum* also occurring in some examples.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This dwarf-shrub quaking or floating sphagnum bog occurs in the southern portion of the glaciated Northeast. One sampled site is a permanently flooded depression between two small ridges; another borders a bog lake. Soils are very poorly drained. The unvegetated surface includes standing water, small amounts of leaf litter, downed wood and/or bare soil. No evidence of disturbance was reported.

Global Environment: This dwarf-shrub quaking or floating bog occupies oligotrophic, peat-accumulating basins.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This dwarf-shrubland is strongly dominated by *Chamaedaphne calyculata* and *Sphagnum* spp. Other shrubs, such as *Myrica gale, Kalmia angustifolia, Vaccinium corymbosum*, or *Gaylussacia baccata*, may be present and locally common, including *Decodon verticillatus* along fringes of a peat mat. Herbs are generally very sparse and comprised of oligotrophic indicator species such as *Carex trisperma, Eriophorum* spp., *Drosera* spp., and *Sarracenia purpurea*.

Global Vegetation: *Chamaedaphne calyculata* is strongly dominant, with associate species including *Kalmia angustifolia, Kalmia polifolia, Vaccinium oxycoccos, Vaccinium macrocarpon, Gaylussacia dumosa* (near the coast), and *Gaylussacia baccata*. Associate shrubs generally occur with low cover, although they may be locally common. Scattered tall shrubs, such as *Vaccinium corymbosum, Rhododendron viscosum, Lyonia ligustrina, Larix laricina, Picea mariana*, and *Acer rubrum*, may occur but always with low cover. Herbaceous cover is quite low but can include *Carex trisperma, Pogonia ophioglossoides, Calopogon tuberosus (= Calopogon pulchellus), Eriophorum virginicum, Decodon verticillatus, Drosera rotundifolia, Drosera intermedia, Sarracenia purpurea*, and *Woodwardia virginica* scattered throughout and with *Carex canescens, Carex limosa, Carex folliculata, Carex atlantica, Glyceria canadensis, Triadenum virginicum, Utricularia cornuta, Rhynchospora alba*, and sometimes *Scheuchzeria palustris* occurring in wetter fen windows. Edges of floating mats tend to receive more nutrient enrichment and support such species as *Peltandra virginica, Decodon verticillatus*, and *Dulichium arundinaceum*. The bryophyte layer is well-developed, dominated by *Sphagnum capillifolium, Sphagnum magellanicum, Sphagnum*

rubellum, and *Sphagnum fuscum* with *Sphagnum bartlettianum, Sphagnum cuspidatum, Sphagnum fallax*, and *Sphagnum recurvum* also occurring in some examples.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*
Nonvascular	Moss	*Sphagnum* spp.

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*
Herb (field)	Flowering forb	*Drosera rotundifolia*
Nonvascular	Moss	*Sphagnum* spp.

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Chamaedaphne calyculata*, *Gaylussacia baccata*, *Kalmia angustifolia*, *Sphagnum* spp., *Vaccinium corymbosum*
Global: *Chamaedaphne calyculata*, *Drosera rotundifolia*, *Eriophorum virginicum*, *Gaylussacia* spp., *Rhynchospora alba*, *Sarracenia purpurea*, *Sphagnum* spp., *Vaccinium macrocarpon*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Chamaedaphne calyculata / Carex striata* Acidic Peatland (CEGL006208)
- *Chamaedaphne calyculata / Eriophorum virginicum / Sphagnum rubellum* Acidic Peatland (CEGL006513)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The New Jersey site has patchy dominance of several shrub species as well as a more open area dominated by sphagnum. The New York site is a wet leatherleaf dwarf-shrub bog bordering a bog lake. This area has some sphagnum coverage, but the presence of *Nuphar* indicates channels with very deep water.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community occurs in the southern portion of the glaciated Northeast. It was sampled in New Jersey and at Harriman State Park in New York.
Global Range: This dwarf-shrubland occurs in the southern portion of the glaciated Northeast, extending west to the Western Allegheny Plateau, from Maine to Ohio and Ontario, Canada.
Nations: CA, US
States/Provinces: CT, MA, ME, NH:S3, NJ:S1, NY, OH, ON:S3, PA:S2S3, QC:S2?, RI
TNC Ecoregions: 49:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212E:CC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Aa:CCP, 221Ab:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Bc:CCC, 221Bd:CCC, 221Fa:CCC, 222I:CC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CCP, M212Eb:CCP
Federal Lands: NPS (Appalachian Trail [Lower New England], Cape Cod, Delaware Water Gap?, Minute Man, Upper Delaware); USFWS (Assabet River)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SSNB
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots): APPA.0067, APPA.0569.

Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid, L.A. Sneddon, S.C. Gawler
References: Anderson 1982, Breden 1989, Breden et al. 2001, CDPNQ unpubl. data, Damman and French 1987, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Enser 1999, Enser and Lundgren 2006, Fike 1999, Furedi 2011b, Gawler 2002, Gawler and Cutko 2010, Gawler et al. 2005, Lynn and Karlin 1985, Metzler and Barrett 2001, Metzler and Barrett 2006, ONHD unpubl. data, Perles et al. 2007, Perles et al. 2008, Radis 1986, Sneddon et al. 2010, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2000, Swain and Kearsley 2001, Zimmerman et al. 2012

[CEGL006513] *Chamaedaphne calyculata / Eriophorum virginicum / Sphagnum rubellum* Acidic Peatland

Translated Name: **Leatherleaf / Tawny Cottongrass / Red Peatmoss Acidic Peatland**
Common Name: **Leatherleaf Boggy Fen**

USNVC Classification

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Bog & Acidic Fen (M876)
Group	Eastern North American Sub-boreal Bog & Acidic Fen (G745)
Alliance	*Chamaedaphne calyculata / Carex lasiocarpa* Sub-boreal Acidic Shrub Bog & Fen Alliance (A3450)

Element Concept

Global Summary: These nutrient-poor fens are found across the glaciated northeastern United States and likely adjacent Canada. Physiognomy is that of a dwarf-shrubland of variable cover over a bryophyte carpet. They occur as floating or quaking mats in peat-accumulating basins, either closed basins or, if in open basins, with very restricted water movement. Kettleholes in glacial deposits are a classic setting. Conditions are acidic, with pH averaging about 4.0, and nutrient availability is very limited. Often referred to as "bogs," these are technically fens since the vegetation is in contact with groundwater. Trees and tall shrubs, if present, are sparse, and the vegetation is dominated by bryophytes and the dwarf-shrub layer, the latter typically with 40-80% cover. Herb cover is variable but is less than the dwarf-shrub cover. The bryophyte layer is essentially continuous. *Chamaedaphne calyculata* dominates the dwarf-shrub layer; *Andromeda polifolia var. glaucophylla (= Andromeda glaucophylla)* is usually present, a good indicator, and may occasionally approach codominance. *Myrica gale, Kalmia polifolia, Ledum groenlandicum*, and *Kalmia angustifolia* are frequent, although not at high cover. Scattered tall shrubs (usually near the upland margin) and stunted trees may include *Gaylussacia baccata, Lyonia ligustrina, Picea mariana*, and *Larix laricina*. Prominent sedges are *Eriophorum vaginatum var. spissum* (on hummocks), *Eriophorum virginicum*, and *Rhynchospora alba* (on *Sphagnum* mats), and, under the wettest conditions, *Eriophorum angustifolium*. *Carex oligosperma, Carex utriculata*, or *Carex pauciflora* may also be present. *Vaccinium oxycoccos* grows as a trailing shrub on the *Sphagnum* mats, where *Sphagnum rubellum (= Sphagnum capillifolium var. tenellum)* and/or *Sphagnum magellanicum* usually dominate. Other common *Sphagnum* spp. include *Sphagnum fallax* and *Sphagnum angustifolium*. Diagnostic characteristics include the dominance of *Chamaedaphne calyculata* and presence of *Vaccinium oxycoccos* in a setting that is not a raised bog, with lower abundance of graminoids than shrubs, and without species of somewhat southerly affinity such as *Decodon verticillatus* and *Peltandra virginica*.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This acidic (poor) fen was sampled in Vermont in the Lower New England project area. The sites are flat with very poorly drained peat substrate. The unvegetated surface includes leaf litter and standing water. No evidence of disturbance was reported.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is known from only two locations in Maine on permanently flooded or semipermanently flooded pond margins. Elevations are 400 and 720 m (1,310-2,360 feet) and positions can be flat or gently sloping. Soils are very poorly drained muck and standing water is common.
Global Environment: These nutrient-poor dwarf-shrub fens are found across the glaciated northeastern United States and likely adjacent Canada. They occur as floating or quaking mats in peat-accumulating basins, either closed basins or, if in open basins, with very restricted water movement. Kettleholes in glacial deposits are a classic setting. Conditions are acidic, with pH averaging about 4.0, and nutrient availability is very limited. Often referred to as "bogs," these are technically fens since the vegetation is in contact with groundwater.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Chamaedaphne calyculata* dominates the dwarf-shrub layer (>25% cover). *Andromeda polifolia* is usually present, and *Myrica gale, Kalmia angustifolia*, and *Ledum groenlandicum* are frequent. *Carex* spp., *Equisetum arvense, Lysimachia terrestris*, and *Triadenum virginicum* are characteristic herbs. *Sphagnum* spp. mats are typical.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This fen community is codominated by the dwarf-shrubs *Chamaedaphne calyculata* and *Myrica gale*. Other common shrubs include *Ledum groenlandicum, Kalmia angustifolia*, and *Rhododendron canadense*. Herbaceous composition is variable and some sites may have an open to dense layer of sedges, including *Carex stricta* and *Carex utriculata*, with the forb *Iris versicolor* typically present at low cover. *Sphagnum* mosses often form dense mats throughout sites.
Global Vegetation: Trees and tall shrubs, if present, are sparse, and the vegetation is dominated by the dwarf-shrub layer, typically with 40-80% cover. Herb cover is variable, but is less than the dwarf-shrub cover. The bryophyte layer is essentially continuous. *Chamaedaphne calyculata* dominates the dwarf-shrub layer; *Andromeda polifolia var. glaucophylla (= Andromeda glaucophylla)* is usually present, a good indicator, and may occasionally approach codominance. *Myrica gale, Kalmia polifolia, Ledum groenlandicum*, and *Kalmia angustifolia* are frequent, although not at high cover. Scattered tall shrubs (usually near the upland margin) and stunted trees may include *Gaylussacia baccata, Lyonia ligustrina, Picea mariana*, and *Larix laricina*. Prominent sedges are *Eriophorum vaginatum var. spissum* (on hummocks), *Eriophorum virginicum*, and *Rhynchospora alba* (on *Sphagnum* mats), and, under the wettest conditions, *Eriophorum angustifolium*. *Carex oligosperma, Carex utriculata*, or *Carex pauciflora* may also be present. *Vaccinium oxycoccos* grows as a trailing shrub on the *Sphagnum* mats, where *Sphagnum rubellum (= Sphagnum capillifolium var. tenellum)* and/or *Sphagnum magellanicum* usually dominate. Other common *Sphagnum* include *Sphagnum fallax* and *Sphagnum angustifolium*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Chamaedaphne calyculata*, *Myrica gale*
Herb (field)	Fern (Spore-bearing forb)	*Equisetum arvense*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Chamaedaphne calyculata*, *Myrica gale*
Herb (field)	Graminoid	*Carex stricta*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Myrica gale*
Short shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*
Herb (field)	Graminoid	*Carex stricta*
Herb (field)	Fern (Spore-bearing forb)	*Equisetum arvense*
Nonvascular	Moss	*Sphagnum rubellum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Chamaedaphne calyculata*, *Equisetum arvense*, *Lysimachia terrestris*, *Myrica gale*, *Triadenum virginicum*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Chamaedaphne calyculata*, *Iris versicolor*, *Myrica gale*
Global: *Chamaedaphne calyculata*, *Equisetum arvense*, *Iris versicolor*, *Lysimachia terrestris*, *Myrica gale*, *Sphagnum rubellum*, *Triadenum virginicum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Jul-1999).

Related Concepts

Global Similar Types:
- *Carex (oligosperma, exilis) - Chamaedaphne calyculata* Shrub Acidic Peatland (CEGL006524)
- *Chamaedaphne calyculata - (Gaylussacia dumosa) - Decodon verticillatus / Woodwardia virginica* Acidic Peatland (CEGL006008)
- *Chamaedaphne calyculata / Carex oligosperma - Eriophorum virginicum* Acidic Peatland (CEGL005092)
- *Chamaedaphne calyculata / Carex oligosperma / Sphagnum* spp. Poor Fen (CEGL005277)
- *Rhododendron canadense - Chamaedaphne calyculata* Acidic Peatland (CEGL006514)
- *Sphagnum (cuspidatum, torreyanum) - Vaccinium macrocarpon* Fen (CEGL006394)

Classification

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: This northeastern type appears very similar to the Midwest's *Chamaedaphne calyculata / Carex oligosperma - Eriophorum virginicum* Acidic Peatland (CEGL005092), but additional data from the Canadian range of these boggy fens is needed, followed by a rangewide review to determine if the two should be combined. In the Northeast, this type is related to the dwarf-shrub bog types *Rhododendron canadense - Chamaedaphne calyculata* Acidic Peatland (CEGL006514) and *Kalmia angustifolia - Chamaedaphne calyculata - (Picea mariana) / Cladina* spp. Acidic Peatland (CEGL006225), both of which can feature *Chamaedaphne calyculata* but are in more ombrotrophic (raised bog) settings; it is also related to the more minerotrophic *Carex (oligosperma, exilis) - Chamaedaphne calyculata* Shrub Acidic Peatland (CEGL006524), which differs in having graminoids more abundant than dwarf-shrubs. Similar quaking "bogs" in more southerly portions of the glaciated Northeast are placed in *Chamaedaphne calyculata - (Gaylussacia dumosa) - Decodon verticillatus / Woodwardia virginica* Acidic Peatland (CEGL006008), and have species of somewhat more southern affinity such as *Decodon verticillatus* and *Peltandra virginica*.

Element Distribution

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community occurs throughout the glaciated Northeast. It was sampled in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from two locations at Jones Pond and Ethel Pond in Maine.
Global Range: This type is found from Maine west to the Great Lakes, and probably in adjacent Canada.
Nations: CA, US
States/Provinces: ME, NH, NY, PA:S2S3, QC, VT
TNC Ecoregions: 59:C, 60:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Fa:CCC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ae:CCC, M212Af:CCC, M212Bc:CCC, M212Bd:CCC, M221Ac:CCC, M221Ad:CCC, M221Bf:CCC, M221Da:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFS (Green Mountain); USFWS (Moosehorn?, Nulhegan Basin)

Element Sources

Appalachian National Scenic Trail Map-Class Code: SSLF
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 2 accuracy assessment points): APPA.0396, APPA.0397, APPA_AA_2545, APPA_AA_2786.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 plot; 1 observation point; 11 accuracy assessment points): APPA.0701, APPA.1630, APPA_AA_1768, APPA_AA_1868, APPA_AA_2083, APPA_AA_2284, APPA_AA_2342, APPA_AA_2664, APPA_AA_2709, APPA_AA_3011, APPA_AA_3065, APPA_AA_3105, APPA_AA_3341.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler

References: Anderson and Davis 1997, Anderson and Davis 1998, CDPNQ unpubl. data, Damman and French 1987, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Engstrom 1998, Furedi 2011c, Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, Sperduto and Nichols 2004, Sperduto et al. 2000a, Thompson and Sorenson 2000, Zimmerman et al. 2012

[CEGL006225] *Kalmia angustifolia - Chamaedaphne calyculata - (Picea mariana) / Cladina* spp. Acidic Peatland

Translated Name: **Sheep Laurel - Leatherleaf - (Black Spruce) / Reindeer Lichen species Acidic Peatland**
Common Name: **Raised Dwarf-shrub Bog**

USNVC Classification

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Bog & Acidic Fen (M876)
Group	Eastern North American Sub-boreal Bog & Acidic Fen (G745)
Alliance	*Chamaedaphne calyculata / Carex lasiocarpa* Sub-boreal Acidic Shrub Bog & Fen Alliance (A3450)

Element Concept

Global Summary: These are the true ombrotrophic dwarf-shrub bogs of northern New England and Canada, occurring on the raised and relatively well-drained portions of raised peatlands. Peat accumulation has caused plant growth to be raised above the water table, and virtually all nutrients come from precipitation and deposition. The peat is typically saturated with water throughout the growing season, although standing water is often not apparent. Conditions are highly acidic, pH usually between 3.8-4.8. The classic vegetation pattern is drier hummocks and wet hollows across the peatland surface. Dwarf-shrubs dominate the vegetation, with overall heights usually 0.3-0.6 m. Trees are sparse and stunted; tall shrubs, if present, are usually confined to pockets near the peatland's upland border. Herb cover is low, usually <25%. The bryoid layer is very well-developed and forms the substrate for the vascular plants. *Kalmia angustifolia* is a constant and usually dominant shrub; *Gaylussacia baccata* may be important in some peatlands. Other important dwarf-shrubs include *Ledum groenlandicum, Rhododendron canadense*, and *Chamaedaphne calyculata*. *Kalmia polifolia, Vaccinium angustifolium*, and *Vaccinium oxycoccos* are often present but less abundant. Scattered stunted trees of *Picea mariana* (or, less commonly, *Larix laricina* or *Pinus strobus*) may be present, and there are often circular islands of shrub-form *Picea mariana* that has reproduced by layering. Frequent herbs include *Sarracenia purpurea, Drosera rotundifolia, Carex trisperma*, and *Eriophorum vaginatum var. spissum*. *Calopogon tuberosus (= Calopogon pulchellus)* is a typical orchid. *Sphagnum fuscum* is the diagnostic and usually dominant moss; others include *Sphagnum magellanicum* and *Sphagnum capillifolium*. *Polytrichum strictum* is common on the hummocks. In the drier portions of the raised heath, fruticose lichens may be important, including *Cladina rangiferina, Cladina mitis*, and *Cladonia* spp. (*Cladonia crispata, Cladonia cristatella, Cladonia cervicornis ssp. verticillata (= Cladonia verticillata), Cladonia uncialis*, and others). This association is distinguished from other dwarf-shrub bog associations by the raised bog setting, greater importance of *Kalmia angustifolia* compared to *Chamaedaphne*, and usual absence of maritime indicators such as *Rubus chamaemorus* and *Gaylussacia dumosa*.

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is only known from one location in Maine in a flat basin wetland at 490 m (1,610 feet) elevation. Soils are saturated and composed primarily of peat.
Global Environment: These are the true ombrotrophic dwarf-shrub bogs of northern New England and Canada, occurring on the raised and relatively well-drained portions of raised peatlands. Peat accumulation has caused plant growth to be raised above the water table, and virtually all nutrients come from precipitation and deposition. The peat is typically saturated with water throughout the growing season, although standing water is often not apparent. Conditions are highly acidic, pH usually between 3.8-4.8. The classic vegetation pattern is drier hummocks and wet hollows across the peatland surface.

Vegetation Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only known location of this fen community is dominated by a mix of dwarf heath species and short-statured trees that form a dense thicket. Species include *Chamaedaphne calyculata, Kalmia angustifolia, Kalmia polifolia, Larix laricina, Ledum groenlandicum, Myrica gale, Picea mariana, Picea rubens*, and *Vaccinium oxycoccos*. The understory is largely

dominated by *Sphagnum* spp. which form deep mats. Few herbaceous species occur and include *Drosera rotundifolia, Eriophorum virginicum*, and *Sarracenia purpurea*.

Global Vegetation: Dwarf-shrubs dominate the vegetation, with overall heights usually 0.3-0.6 m. Trees are sparse and stunted; tall shrubs, if present, are usually confined to pockets near the peatland's upland border. Herb cover is low, usually <25%. The bryoid layer is very well-developed and forms the substrate for the vascular plants. *Kalmia angustifolia* is a constant and usually dominant shrub; *Gaylussacia baccata* may be important in some peatlands. Other important dwarf-shrubs include *Ledum groenlandicum, Rhododendron canadense*, and *Chamaedaphne calyculata*. *Kalmia polifolia, Vaccinium angustifolium*, and *Vaccinium oxycoccos* are often present, but less abundant. Scattered stunted trees of *Picea mariana* (or, less commonly, *Larix laricina* or *Pinus strobus*) may be present, and there are often circular islands of shrub-form *Picea mariana* that has reproduced by layering. Frequent herbs include *Sarracenia purpurea, Drosera rotundifolia, Carex trisperma*, and *Eriophorum vaginatum var. spissum*. *Calopogon tuberosus (= Calopogon pulchellus)* is a typical orchid. *Sphagnum fuscum* is the diagnostic and usually dominant moss; others include *Sphagnum magellanicum* and *Sphagnum capillifolium*. *Polytrichum strictum* is common on the hummocks. In the drier portions of the raised heath, fruticose lichens may be important, including *Cladina rangiferina, Cladina mitis*, and *Cladonia* spp. (*Cladonia crispata, Cladonia cristatella, Cladonia cervicornis ssp. verticillata (= Cladonia verticillata), Cladonia uncialis*, and others).

Global Dynamics: Intentional or unintentional fires occur occasionally in the central portions of raised bogs and can cause lichen cover to increase.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Needle-leaved tree	*Larix laricina*, *Picea mariana*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia angustifolia*
Short shrub/sapling	Dwarf-shrub	*Chamaedaphne calyculata*, *Ledum groenlandicum*
Nonvascular	Moss	*Sphagnum* spp.

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Larix laricina*, *Picea mariana*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia angustifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Ledum groenlandicum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Chamaedaphne calyculata*, *Kalmia angustifolia*, *Picea mariana*

Global: *Chamaedaphne calyculata*, *Kalmia angustifolia*, *Picea mariana*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Chamaedaphne calyculata - Ledum groenlandicum - Kalmia polifolia* Bog (CEGL005278)
- *Rhododendron canadense - Chamaedaphne calyculata* Acidic Peatland (CEGL006514)

CLASSIFICATION

Status: Standard

Classification Confidence: 1 - Strong

Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This association is known from one location near Mountain View Pond in Maine.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from one location near Mountain View Pond in Maine.
Global Range: This dwarf-shrub bog from the Canadian maritimes across central and northern Maine and into Quebec; it is occasional in northern Vermont, New York, and (perhaps) New Hampshire.
Nations: CA, US
States/Provinces: ME, NH, NS, NY, QC:S5?, VT
TNC Ecoregions: 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCP, M212Ae:CCC, M212Af:CCC, M212B:CC, M212C:CC, M212D:CC, M212Ea:CCC, M212Eb:CCC
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians]); USFS (White Mountain); USFWS (Moosehorn?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SDBF
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 plot): APPA.0862.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Anderson and Davis 1997, Anderson and Davis 1998, CDPNQ unpubl. data, Cowardin et al. 1979, Damman and French 1987, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Engstrom 1998, Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, NAP pers. comm. 1998, Nichols 1918, Northern Appalachian Ecology Working Group 2000, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

[CEGL006514] *Rhododendron canadense - Chamaedaphne calyculata* Acidic Peatland

Translated Name: **Rhodora - Leatherleaf Acidic Peatland**
Common Name: **Near-Boreal Dwarf-shrub Poor Fen**

USNVC CLASSIFICATION

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Bog & Acidic Fen (M876)
Group	Eastern North American Sub-boreal Bog & Acidic Fen (G745)
Alliance	*Chamaedaphne calyculata / Carex lasiocarpa* Sub-boreal Acidic Shrub Bog & Fen Alliance (A3450)

ELEMENT CONCEPT

Global Summary: These open dwarf-shrub bogs are associated with peatlands in the northeastern U.S. and adjacent Canada. Though highly acidic (pH usually in the range of 3.8-4.6), they occur in oligotrophic to weakly minerotrophic conditions, such as on the sideslopes of a raised bog formation or along the margins of water tracks. The somewhat higher nutrient status compared to ombrotrophic bog communities is reflected in the abundance of *Rhododendron canadense*; in some areas, *Myrica gale* is also present, also indicating weak minerotrophy. The structure of this association is primarily dwarf-shrubs of 0.5-0.8 m tall forming a fairly uniform layer. Graminoids and forbs are sparse. The bryoid layer is essentially continuous, with some development of hummocks and hollows. *Chamaedaphne calyculata* and *Rhododendron canadense* are the dominant shrubs, with lesser contributions from *Myrica gale, Kalmia angustifolia, Kalmia polifolia*, and *Ledum groenlandicum*. *Eriophorum virginicum* is a characteristic sedge; others include *Eriophorum vaginatum var. spissum* and *Carex pauciflora*. *Drosera rotundifolia* is often present on the surface of the bryophyte layer. Prominent *Sphagnum* spp. are *Sphagnum magellanicum, Sphagnum recurvum*, and *Sphagnum capillifolium*; *Sphagnum fuscum* may be present but is less abundant than in more ombrotrophic associations (cf. CEGL006225). This association is intermediate in nutrient status and wetness between the drier ombrotrophic dwarf-shrub bog type *Kalmia angustifolia - Chamaedaphne calyculata - (Picea mariana) / Cladina* spp. Acidic Peatland (CEGL006225) and the wetter poor fen type *Chamaedaphne calyculata / Eriophorum virginicum / Sphagnum rubellum* Acidic Peatland (CEGL006513). The presence of *Rhododendron canadense* (and sometimes *Myrica gale* or *Carex stricta*) in an otherwise typical raised dwarf-shrub bog community is diagnostic.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: These open dwarf-shrub bogs are associated with peatlands in the northeastern U.S. and adjacent Canada. Though highly acidic (pH usually in the range 3.8-4.6), they occur in slightly minerotrophic conditions, such as on the sideslopes of a raised bog formation or along the margins of water tracks. The somewhat higher nutrient status compared to ombrotrophic bog communities is reflected in the abundance of *Rhododendron canadense*; in some areas, *Myrica gale* is also present, also indicating weak minerotrophy.

Global Environment: These open dwarf-shrub bogs are associated with peatlands in the northeastern U.S. and adjacent Canada. Though highly acidic (pH usually in the range 3.8-4.6), they occur in slightly minerotrophic conditions, such as on the sideslopes of a raised bog formation or along the margins of water tracks. The somewhat higher nutrient status compared to ombrotrophic bog communities is reflected in the abundance of *Rhododendron canadense*; in some areas, *Myrica gale* is also present, also indicating weak minerotrophy.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The structure of this association is primarily dwarf-shrubs 0.5-0.8 m tall forming a fairly uniform layer. Graminoids and forbs are sparse. The bryoid layer is essentially continuous, with some development of hummocks and hollows. *Chamaedaphne calyculata* and *Rhododendron canadense* are the dominant shrubs, with lesser contributions from *Myrica gale, Kalmia angustifolia, Kalmia polifolia*, and *Ledum groenlandicum*. *Eriophorum virginicum* is a characteristic sedge; others include *Eriophorum vaginatum var. spissum* and *Carex pauciflora*. *Drosera rotundifolia* is often present on the surface of the bryophyte layer. Prominent *Sphagnum* spp. are *Sphagnum magellanicum, Sphagnum recurvum*, and *Sphagnum capillifolium*; *Sphagnum fuscum* may be present but is less abundant than in more ombrotrophic associations (cf. CEGL006225).

Global Vegetation: The structure of this association is primarily dwarf-shrubs of 0.5-0.8 m tall forming a fairly uniform layer. Graminoids and forbs are sparse. The bryoid layer is essentially continuous, with some development of hummocks and hollows. *Chamaedaphne calyculata* and *Rhododendron canadense* are the dominant shrubs, with lesser contributions from *Myrica gale, Kalmia angustifolia, Kalmia polifolia*, and *Ledum groenlandicum*. *Eriophorum virginicum* is a characteristic sedge; others include *Eriophorum vaginatum var. spissum* and *Carex pauciflora*. *Drosera rotundifolia* is often present on the surface of the bryophyte layer. Prominent *Sphagnum* are *Sphagnum magellanicum, Sphagnum recurvum*, and *Sphagnum capillifolium*; *Sphagnum fuscum* may be present but is less abundant than in more ombrotrophic associations (cf. CEGL006225).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*, *Rhododendron canadense*
Nonvascular	Moss	*Sphagnum capillifolium*, *Sphagnum magellanicum*, *Sphagnum recurvum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area):
Global: *Chamaedaphne calyculata*, *Eriophorum virginicum*, *Rhododendron canadense*, *Sphagnum capillifolium*, *Sphagnum magellanicum*, *Sphagnum recurvum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Jul-1999).

RELATED CONCEPTS

Global Similar Types:
- *Chamaedaphne calyculata / Eriophorum virginicum / Sphagnum rubellum* Acidic Peatland (CEGL006513)
- *Kalmia angustifolia - Chamaedaphne calyculata - (Picea mariana) / Cladina* spp. Acidic Peatland (CEGL006225)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: Not observed, but mapped with Raised Dwarf-shrub Bog (CEGL006225) since it is observed and easy to map.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is listed as potentially occurring in the Northern Appalachian project area, but no plots or observation points have been collected.
Global Range: This dwarf-shrubland occurs in peatlands in the northeastern U.S. and adjacent Canada.
Nations: CA, US
States/Provinces: ME, NH, NY, QC, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Bb:CCC, 212C:CP, 212Da:CCC
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (Green Mountain); USFWS (Moosehorn?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SDBF
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: According to UMESC it was mapped with Raised Dwarf-shrub Bog (CEGL006225) since it is observed and easy to map. It was sampled during accuracy assessment.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 accuracy assessment point): APPA_AA_1745.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Anderson and Davis 1997, Anderson and Davis 1998, CDPNQ unpubl. data, Damman and French 1987, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Engstrom 1998, Gawler 1998, Gawler 2002, Gawler and Cutko 2010, Sperduto and Nichols 2004, Thompson and Sorenson 2000

A3452 *Dulichium arundinaceum - Carex canescens* Sub-boreal Acidic Graminoid Fen Alliance

Alliance Summary Description: This alliance contains basins, swales, moats of bog mats, and pondshores typically dominated by *Dulichium arundinaceum*. Communities in this alliance typically occur in basins of porous substrate where the water level drops significantly during dry years. Substrate is variously mucky or sandy. Typical communities also contain a mix of low grasses, sedges, rushes, and scattered shrubs. This vegetation type occurs as a narrow zone in semipermanently flooded or saturated conditions along pond borders, bog moats, and other areas where minerotrophic conditions exist. Associated species are variable depending upon ecological and geographic conditions, but often include *Bidens* spp., *Carex canescens, Carex lasiocarpa, Carex stricta, Carex utriculata, Dulichium arundinaceum, Juncus pelocarpus*, and other *Juncus* spp. *Sphagnum* mosses (*Sphagnum cuspidatum, Sphagnum papillosum*, or *Sphagnum torreyanum*) generally form a continuous, often monotypic carpet. This alliance may also occur in seasonally flooded vegetation, and in this setting extends from New England southward. In these seasonally flooded situations, the vegetation is dominated by *Dulichium arundinaceum* in association with sedges and grasses. Aquatic species *Sphagnum cuspidatum* and/or *Sphagnum fallax* form a pronounced nonvascular layer overlying peat of variable depth. Associated species include *Carex canescens, Eriophorum virginicum, Glyceria acutiflora, Glyceria obtusa, Triadenum fraseri*, and *Triadenum virginicum*.

[CEGL006131] *Dulichium arundinaceum / Sphagnum* spp. Fen

Translated Name: **Threeway Sedge / Peatmoss species Fen**
Common Name: **Southern New England Threeway Sedge Fen**

USNVC CLASSIFICATION

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Bog & Acidic Fen (M876)
Group	Eastern North American Sub-boreal Bog & Acidic Fen (G745)
Alliance	*Dulichium arundinaceum* - *Carex canescens* Sub-boreal Acidic Graminoid Fen Alliance (A3452)

ELEMENT CONCEPT

Global Summary: This vegetation type occurs as a narrow zone in semipermanently flooded or saturated conditions along pond borders, bog moats, and other areas where minerotrophic conditions exist. Associated species are variable depending upon ecological and geographic conditions, but often include *Dulichium arundinaceum, Juncus pelocarpus*, (and other *Juncus* spp.), *Carex stricta, Carex lasiocarpa, Carex utriculata, Carex canescens*, and *Bidens* spp. *Sphagnum* mosses (*Sphagnum cuspidatum, Sphagnum papillosum,* or *Sphagnum torreyanum*) generally form a continuous, often monotypic carpet.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: Narrow zone in semipermanently flooded or saturated conditions along pond borders, bog moats, regenerating beaver wetlands, and other areas where minerotrophic conditions exist.
Global Environment: Narrow zone in semipermanently flooded or saturated conditions along pond borders, bog moats, and other areas where minerotrophic conditions exist.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This community consists of a floating mat composed almost entirely of *Dulichium arundinaceum*.
Global Vegetation: *Dulichium arundinaceum* is characteristic, generally forming a continuous, often monotypic carpet. Associates may include *Juncus pelocarpus* (and other *Juncus* spp.), *Carex stricta, Carex lasiocarpa, Carex utriculata, Carex canescens, Bidens* spp., and *Sphagnum* mosses (*Sphagnum cuspidatum, Sphagnum papillosum*, or *Sphagnum torreyanum*).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Dulichium arundinaceum*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Bidens* spp.
Herb (field)	Graminoid	*Carex canescens*, *Carex lasiocarpa*, *Carex stricta*, *Carex utriculata*, *Dulichium arundinaceum*, *Juncus pelocarpus*, *Juncus* spp.
Nonvascular	Moss	*Sphagnum* spp.

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Dulichium arundinaceum*
Global: *Dulichium arundinaceum*, *Sphagnum* spp.

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (21-Apr-2004).

RELATED CONCEPTS

Global Similar Types:
- *Carex limosa - Rhynchospora alba / Sphagnum pulchrum - Cladopodiella* sp. Fen (CEGL006522)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Observed in the Lower New England project area during map reconnaissance by the UMESC mapping team, no plots or observation points were collected.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This vegetation is habitat for ringed boghaunter (*Williamsonia lintneri*) and generally occurs to the south of *Carex limosa - Rhynchospora alba / Sphagnum pulchrum - Cladopodiella* sp. Fen (CEGL006522).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: One example of this community was observed in Massachusetts.
Global Range: Currently described from southern New England.
Nations: US
States/Provinces: CT, MA, NH, RI
TNC Ecoregions: 61:C
USFS Ecoregions (1994/95): 221Ag:CCC, 221Ai:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HTSM, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (7 accuracy assessment points): APPA_AA_1651, APPA_AA_2016, APPA_AA_2370, APPA_AA_2522, APPA_AA_2627, APPA_AA_3158, APPA_AA_3242.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): S.L. Neid
References: Eastern Ecology Working Group n.d.*, Enser 1999, Lundgren 1999b, Metzler and Barrett 2001, Metzler and Barrett 2003, Metzler and Barrett 2006, Swain and Kearsley 2001

A1018 *Vaccinium corymbosum* Peat Shrubland Alliance

Alliance Summary Description: This alliance, found in the eastern midwestern and northeastern United States and probably many of the eastern Canadian provinces, contains tall-shrub swamps dominated by *Vaccinium corymbosum*. This tall-shrub bog thicket occurs on oligotrophic to weakly minerotrophic peat soils, commonly as a border thicket around more open dwarf heath shrub peatlands or within small, isolated basins. Significant seasonal water level fluctuation can occur, especially in isolated basins without inlet or outlet streams. A tall-shrub layer is characterized by abundant *Vaccinium corymbosum*, with *Chamaedaphne calyculata, Gaylussacia baccata, Kalmia angustifolia, Lyonia ligustrina, Nemopanthus mucronatus*, and *Rhododendron canadense* in more northern or cooler microclimates, and *Ilex verticillata* and *Rhododendron viscosum* in the south. In locally wetter areas, *Cephalanthus occidentalis* or *Decodon verticillatus* can occur. Coastal occurrences may have additional shrub species such as *Leucothoe racemosa, Clethra alnifolia*, and *Gaylussacia dumosa*. Sparse, scattered trees may occur, including *Acer rubrum, Betula populifolia, Larix laricina, Nyssa sylvatica, Picea mariana, Pinus rigida*, or *Pinus strobus*, with species dependent on environmental setting. The herbaceous layer tends to be sparse, although can be locally abundant. Common herbs include *Carex trisperma, Maianthemum trifolium, Osmunda cinnamomea, Sarracenia purpurea, Thelypteris palustris, Triadenum virginicum*, and *Woodwardia virginica*. *Sphagnum* mosses blanket well-developed hummocks and hollows, including *Sphagnum capillifolium, Sphagnum centrale, Sphagnum fimbriatum, Sphagnum fuscum, Sphagnum magellanicum*, and *Sphagnum rubellum*. These tall shrublands can occur at margins of kettles in glaciated regions, and in basins or at the heads of streams throughout the range. Soils are usually deep peats or mucks, and the water is often acidic.

[CEGL006158] *Alnus incana ssp. rugosa - Nemopanthus mucronatus / Sphagnum* spp. Acidic Peatland

Translated Name: **Speckled Alder - Catberry / Peatmoss species Acidic Peatland**
Common Name: **Northern Peatland Shrub Swamp**

USNVC CLASSIFICATION

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Bog & Acidic Fen (M876)
Group	Eastern North American Sub-boreal Bog & Acidic Fen (G745)
Alliance	*Vaccinium corymbosum* Peat Shrubland Alliance (A1018)

ELEMENT CONCEPT

Global Summary: This alder-dominated community is associated with peatlands across northern New England and adjacent Canada. It is most often found at the landward edge of acidic peat mats (i.e., the lagg), where it receives slightly more enriched waters than those of the adjacent oligotrophic or ombrotrophic peatland. Nitrogen levels are higher than in other peatland communities, presumably as a result of nitrogen fixing by the alders. Occasionally, it occurs in a montane setting (>730 m [2400 feet]) on thin organic soils over coarse cryic soils. Tall shrubs are the dominant physiognomy, with at least 50% cover; trees may be present but are sparse. Herb cover varies from sparse to extensive depending on the shrub cover. The bryophyte layer is well-developed, usually with at least 50% cover. *Alnus incana ssp. rugosa (= Alnus rugosa)* is the dominant or characteristic tall shrub; *Ilex verticillata* or *Nemopanthus mucronatus* are often present and sometimes abundant. Other shrubs include *Alnus viridis, Viburnum nudum var. cassinoides (= Viburnum cassinoides), Vaccinium corymbosum*, or *Spiraea tomentosa*. A tree canopy is lacking, but there may be scattered trees of *Acer rubrum, Picea mariana, Thuja occidentalis*, or *Abies balsamea*. Dwarf-shrub cover is variable, with *Rhododendron canadense* and *Chamaedaphne calyculata* the most typical, and *Kalmia angustifolia, Gaylussacia baccata*, and *Ledum groenlandicum* often also present. (*Nemopanthus mucronatus, Picea mariana, Thuja occidentalis, Abies balsamea*, and *Ledum groenlandicum* drop out at the southern extent of the range.) The most characteristic herbs are *Carex trisperma, Calla palustris*, and *Osmunda cinnamomea*; other species include *Triadenum virginicum, Carex intumescens, Carex magellanica ssp. irrigua (= Carex paupercula), Doellingeria umbellata (= Aster umbellatus), Iris versicolor, Gaultheria hispidula, Lysimachia terrestris, Maianthemum trifolium, Onoclea sensibilis, Sarracenia purpurea, Thalictrum pubescens*, and *Trientalis borealis*. The bryoid layer consists of *Sphagnum* spp., including *Sphagnum recurvum, Sphagnum palustre, Sphagnum fallax*, and *Sphagnum magellanicum*. The combination of *Alnus incana* dominance with *Nemopanthus mucronatus* and understory plants characteristic of peatlands is diagnostic.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This peatland association is only known from one location in New Hampshire in a basin floor at 700 m (2,300 feet)elevation. Soils are saturated peat.

Global Environment: This alder-dominated community is associated with peatlands across northern New England and adjacent Canada. It is most often at the landward edge of acidic peat mats (i.e., the lagg), where it receives slightly more enriched waters than those of the adjacent oligotrophic or ombrotrophic peatland. Nitrogen levels are higher than in other peatland communities, presumably as a result of nitrogen fixing by the alders. Occasionally, it occurs in a montane setting (>730 m [2400 feet]) on thin organic soils over coarse cryic soils.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only occurrence of this association is a open shrubland not exceeding 20% cover and codominated by *Alnus incana* and *Viburnum nudum var. cassinoides*. Other shrub species present include *Kalmia angustifolia, Larix laricina, Nemopanthus mucronatus, Spiraea alba*, and *Vaccinium myrtilloides*. Scattered saplings of tree species are present in the shrub layer, including *Abies balsamea, Larix laricina*, and *Picea rubens*. The herbaceous layer is open and dominated by *Eriophorum virginicum*. No other herbaceous species have substantial cover, but include *Calamagrostis canadensis, Carex echinata, Carex gynandra, Drosera rotundifolia, Gaultheria hispidula, Glyceria canadensis, Juncus brevicaudatus, Oclemena acuminata, Osmunda cinnamomea, Rubus pubescens, Scirpus atrocinctus*, and *Thalictrum pubescens*. The nonvascular layer is heavily dominated by *Sphagnum* spp. at >90%.

Global Vegetation: Tall shrubs are the dominant physiognomy, with at least 50% cover; trees may be present but are sparse. Herb cover varies from sparse to extensive depending on the shrub cover. The bryophyte layer is well-developed, usually with at least 50% cover. *Alnus incana ssp. rugosa (= Alnus rugosa)* is the dominant or characteristic tall shrub; *Ilex verticillata* or *Nemopanthus mucronatus* are often present and sometimes abundant. Other shrubs include *Alnus viridis, Viburnum nudum var. cassinoides (= Viburnum cassinoides), Vaccinium corymbosum*, or *Spiraea tomentosa*. A tree canopy is lacking, but there may be scattered trees of *Acer rubrum, Picea mariana, Thuja occidentalis*, or *Abies balsamea*. Dwarf-shrub cover is variable, with *Rhododendron canadense* and *Chamaedaphne calyculata* the most typical, and *Kalmia angustifolia, Gaylussacia baccata*, and *Ledum*

groenlandicum often also present. The most characteristic herbs are *Carex trisperma, Calla palustris*, and *Osmunda cinnamomea*; other species include *Triadenum virginicum, Carex intumescens, Carex magellanica ssp. irrigua (= Carex paupercula), Doellingeria umbellata (= Aster umbellatus), Iris versicolor, Gaultheria hispidula, Lysimachia terrestris, Maianthemum trifolium, Onoclea sensibilis, Sarracenia purpurea, Thalictrum pubescens*, and *Trientalis borealis*. The bryoid layer consists of *Sphagnum* spp., including *Sphagnum recurvum, Sphagnum palustre, Sphagnum fallax*, and *Sphagnum magellanicum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Alnus incana*, *Viburnum nudum* var. *cassinoides*
Herb (field)	Graminoid	*Eriophorum virginicum*
Nonvascular	Moss	*Sphagnum* spp.

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus incana*, *Viburnum nudum* var. *cassinoides*
Herb (field)	Graminoid	*Eriophorum virginicum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Alnus incana*, *Eriophorum virginicum*, *Viburnum nudum* var. *cassinoides*
Global: *Alnus incana*, *Eriophorum virginicum*, *Viburnum nudum* var. *cassinoides*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Alnus incana - Cornus (amomum, sericea) / Clematis virginiana* Shrub Swamp (CEGL006062)
- *Alnus incana* Shrub Swamp (CEGL002381)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This association is only known from Eliza Brook in New Hampshire.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Eliza Brook in New Hampshire.
Global Range: This peatland lagg community occurs in northern New England and adjacent Canada.
Nations: CA?, US
States/Provinces: ME, NB?, NH, NS?, NY, PA, PE?, QC?, VT
TNC Ecoregions: 60:?, 61:C, 63:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 212E:CP, M212Aa:CCC, M212Ab:CCC, M212Ae:CCC, M212Af:CCC, M212B:CC, M212C:CC, M212D:CC
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians]); USFWS (Carlton Pond?, Pondicherry?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 plot; 3 accuracy assessment points): APPA.0464, APPA_AA_2000, APPA_AA_2511, APPA_AA_3176.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler

References: Anderson and Davis 1997, CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Furedi 2011e, Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, Sorenson 1986, Sperduto 2000b, Sperduto and Nichols 2004, Thompson and Sorenson 2000, Zimmerman et al. 2012

[CEGL006371] *Vaccinium corymbosum - Rhododendron viscosum - Clethra alnifolia* Acidic Peatland

Translated Name: **Highbush Blueberry - Swamp Azalea - Coastal Sweet-pepperbush Acidic Peatland**
Common Name: **Blueberry Wetland Thicket**

USNVC Classification

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Bog & Acidic Fen (M876)
Group	Eastern North American Sub-boreal Bog & Acidic Fen (G745)
Alliance	*Vaccinium corymbosum* Peat Shrubland Alliance (A1018)

Element Concept

Global Summary: This is a tall-shrub swamp of seasonally flooded basins in the eastern United States. It occurs in small open basins, closed sandplain basins, and seasonally flooded zones within larger wetlands. It may also form as a result of beaver activity. This vegetation can occur on the margins of Coastal Plain ponds. This community is influenced by a strongly fluctuating water table with flooded conditions in spring and early summer followed by a drop in the water table below soil surface usually by late summer. There is usually a shallow organic layer often over sand. Dominant shrubs include *Vaccinium corymbosum, Ilex verticillata*, and *Rhododendron viscosum*. Scattered *Acer rubrum* are not uncommon. *Lyonia ligustrina* and *Cephalanthus occidentalis* are characteristic although not necessarily dominant. Associated shrub species may include *Clethra alnifolia, Spiraea tomentosa, Chamaedaphne calyculata, Ilex glabra, Leucothoe racemosa, Decodon verticillatus, Kalmia angustifolia, Alnus serrulata, Myrica gale*, and *Photinia* spp. (= *Aronia* spp.). Herbaceous composition is variable; some of the more typical species include *Osmunda cinnamomea, Osmunda regalis, Thelypteris palustris, Onoclea sensibilis, Calla palustris, Lycopus uniflorus, Triadenum virginicum, Glyceria striata, Leersia oryzoides, Dulichium arundinaceum, Juncus effusus*, and *Woodwardia virginica*. A layer of peatmoss is common and varies in cover; species include *Sphagnum fimbriatum, Sphagnum rubellum, Sphagnum magellanicum, Sphagnum fallax*, and *Sphagnum viridum*.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This community is influenced by a strongly fluctuating water table with flooded conditions in spring and early summer, often followed by a drop in the water table below soil surface usually by late summer. There is usually a shallow organic layer, often over mineral soil.
Global Environment: This community is influenced by a strongly fluctuating water table with flooded conditions in spring and early summer, often followed by a drop in the water table below soil surface usually by late summer. There is usually a shallow organic layer often over mineral soil.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This association is a tall-shrub swamp where the dominant shrubs include *Vaccinium corymbosum, Ilex verticillata*, and *Rhododendron viscosum*. Scattered *Acer rubrum* are not uncommon. *Lyonia ligustrina* and *Cephalanthus occidentalis* are characteristic although not necessarily dominant. Associated shrub species may include *Clethra alnifolia, Spiraea tomentosa, Chamaedaphne calyculata, Ilex glabra, Leucothoe racemosa, Decodon verticillatus, Kalmia angustifolia, Alnus serrulata, Myrica gale*, and *Photinia* spp. (= *Aronia* spp.). Herbaceous composition is variable; some of the more typical species include *Osmunda cinnamomea, Osmunda regalis, Thelypteris palustris, Onoclea sensibilis, Calla palustris, Lycopus uniflorus, Triadenum virginicum, Glyceria striata, Leersia oryzoides, Dulichium arundinaceum, Juncus effusus*, and *Woodwardia virginica*. A layer of peatmoss is common and varies in cover; species include *Sphagnum fimbriatum, Sphagnum rubellum, Sphagnum magellanicum, Sphagnum fallax*, and *Sphagnum viridum*.
Global Vegetation: This association is a tall-shrub swamp where the dominant shrubs include *Vaccinium corymbosum, Ilex verticillata*, and *Rhododendron viscosum*. Scattered *Acer rubrum* are not uncommon. *Lyonia ligustrina* and *Cephalanthus occidentalis* are characteristic although not necessarily dominant. Associated shrub species may include *Clethra alnifolia, Spiraea tomentosa, Chamaedaphne calyculata, Ilex glabra, Leucothoe racemosa, Decodon verticillatus, Kalmia angustifolia, Alnus serrulata, Myrica gale*, and *Photinia* spp. (= *Aronia* spp.). Herbaceous composition is variable; some of the more typical species include *Osmunda cinnamomea,*

Osmunda regalis, Thelypteris palustris, Onoclea sensibilis, Calla palustris, Lycopus uniflorus, Triadenum virginicum, Glyceria striata, Leersia oryzoides, Dulichium arundinaceum, Juncus effusus, and *Woodwardia virginica*. A layer of peatmoss is common and varies in cover; species include *Sphagnum fimbriatum, Sphagnum rubellum, Sphagnum magellanicum, Sphagnum fallax*, and *Sphagnum viridum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Ilex verticillata*, *Rhododendron viscosum*, *Vaccinium corymbosum*
Herb (field)	Flowering forb	*Lycopus uniflorus*
Herb (field)	Graminoid	*Glyceria striata*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*, *Osmunda regalis*, *Woodwardia virginica*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Ilex verticillata*, *Rhododendron viscosum*, *Vaccinium corymbosum*
Herb (field)	Flowering forb	*Lycopus uniflorus*
Herb (field)	Graminoid	*Glyceria striata*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*, *Osmunda regalis*, *Woodwardia virginica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Calla palustris*, *Rhododendron viscosum*, *Sphagnum fallax*, *Sphagnum fimbriatum*, *Sphagnum magellanicum*, *Sphagnum rubellum*, *Sphagnum viridum*, *Thelypteris palustris*
Global: *Calla palustris*, *Lyonia ligustrina*, *Rhododendron viscosum*, *Sphagnum fallax*, *Sphagnum fimbriatum*, *Sphagnum magellanicum*, *Sphagnum rubellum*, *Sphagnum viridum*, *Thelypteris palustris*, *Vaccinium corymbosum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Other Plants: *Lyonia ligustrina* (G5)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (20-May-2011). This association is considered moderately vulnerable to extinction. There are an estimated 1000 occurrences of this association rangewide. As a small-patch wetland community occurring in many cases in isolated wetland settings, it is not always afforded Federal protection under the Clean Water Act.

RELATED CONCEPTS

Global Similar Types:
- *Vaccinium corymbosum / Sphagnum* spp. Acidic Peatland (CEGL006190)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community (CEGL006371) may be confused with Highbush Blueberry Bog Thicket (CEGL006190), but it occurs in seasonally flooded basins, closed sandplain basins, and seasonally flooded zones within larger wetlands, while CEGL006190 is a peat bog occurring on oligotrophic to weakly minerotrophic peat soils, commonly as a border thicket around more open dwarf heath shrub peatlands or within small, isolated basins.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: More inland examples of this association may lack some characteristically Coastal Plain species such as *Clethra alnifolia* and *Ilex glabra*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed in south-central New York just to the east of the Hudson River on the trail. There are likely more examples in this region. It most likely does not occur north of the NY-CT stateline.
Global Range: This type occurs from New Hampshire south to New Jersey and possibly Delaware over an estimated range of 388,000 square km (total acreage of subsections of occurrence).
Nations: US
States/Provinces: CT, DE:S1, MA, NH:S4, NJ:S3S4, NY, PA, RI
TNC Ecoregions: 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Ab:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Bd:CCC, 232Ab:CCC, 232Ac:CCC, M212Bd:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Cape Cod, Delaware Water Gap, Fire Island, Weir Farm); USFWS (Assabet River, Cape May, E.B. Forsythe, Great Meadows, Great Swamp, Oxbow, Parker River, Rachel Carson)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SBBT, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed by the UMESC mapping team during mapping reconnaissance field work and during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (9 accuracy assessment points): APPA_AA_1770, APPA_AA_1936, APPA_AA_2488, APPA_AA_2566, APPA_AA_2675, APPA_AA_2720, APPA_AA_2945, APPA_AA_3202, APPA_AA_3271.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): L.A. Sneddon, S.L. Neid, S.C. Gawler
References: Breden et al. 2001, Conard 1935, Coxe 2009, Davis 2011h, Dowhan and Rozsa 1989, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Enser 1999, Enser and Lundgren 2006, Fike 1999, Furedi 2011a, Golet 1973, Johnson 1981b, Klopfer et al. 2002, Lynn and Karlin 1985, Metzler and Barrett 2001, Metzler and Barrett 2006, Metzler et al. 2009, NatureServe 2009, Niering and Egler 1966, Perles et al. 2007, Reschke 1990, Schall and Murley 1984, Sneddon et al. 2010, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Zimmerman et al. 2012

[CEGL006190] *Vaccinium corymbosum / Sphagnum* spp. Acidic Peatland

Translated Name: **Highbush Blueberry / Peatmoss species Acidic Peatland**
Common Name: **Highbush Blueberry Bog Thicket**

USNVC CLASSIFICATION

Division	North American Bog & Fen (2.C.2.Na)
Macrogroup	North American Boreal & Sub-boreal Bog & Acidic Fen (M876)
Group	Eastern North American Sub-boreal Bog & Acidic Fen (G745)
Alliance	*Vaccinium corymbosum* Peat Shrubland Alliance (A1018)

ELEMENT CONCEPT

Global Summary: Highbush blueberry peat bog of glaciated regions in the eastern and northeastern United States. This tall-shrub bog thicket occurs on oligotrophic to weakly minerotrophic peat soils, commonly as a border thicket around more open dwarf heath shrub peatlands or within small, isolated basins. Significant seasonal water level fluctuation can occur, especially in isolated basins without inlet or outlet streams. A tall-shrub layer is characterized by abundant *Vaccinium corymbosum* plus *Gaylussacia baccata, Chamaedaphne calyculata, Kalmia angustifolia, Rhododendron canadense, Lyonia ligustrina*, and *Nemopanthus mucronatus* in more northern or cooler microclimates, and *Ilex verticillata* and *Rhododendron viscosum* in the south. In locally wetter areas, *Cephalanthus occidentalis* or *Decodon verticillatus* can occur. Coastal occurrences may have additional shrub species such as *Leucothoe racemosa, Clethra alnifolia*, and *Gaylussacia dumosa*. Sparse, scattered trees may occur, including *Acer rubrum, Picea mariana, Larix laricina, Pinus strobus, Pinus rigida, Betula populifolia*, or *Nyssa sylvatica*, with species dependent on environmental setting. The herbaceous layer tends to be sparse, although can be locally abundant. Common herbs include *Osmunda cinnamomea, Woodwardia virginica, Carex trisperma, Sarracenia purpurea, Thelypteris palustris, Triadenum virginicum*, and *Maianthemum trifolium*. *Sphagnum* mosses blanket well-developed hummocks and hollows, including *Sphagnum magellanicum, Sphagnum centrale, Sphagnum rubellum, Sphagnum capillifolium, Sphagnum fimbriatum*, and *Sphagnum fuscum*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This highbush blueberry peat bog was sampled once in the Central Appalachian project area in a deep, seasonally flooded basin with saturated muck soil. It occurs within a mosaic of dry oak types (dry oak-heath, dry oak-mixed hardwoods). The unvegetated surface is dominated by leaf litter with some downed wood. No evidence of disturbance was reported.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: This highbush blueberry peat bog occurs as a peat bog and/or border thicket around more open dwarf heath shrub peatlands or within small isolated basins. Sites are saturated, semipermanently or permanently flooded basins and depressions. Soils are poorly to very poorly drained peat or muck. The unvegetated surface includes leaf litter, standing water or a combination of both, sometimes with small amounts downed wood or bare soil. Evidence of disturbance includes wind/ice damage and a minor presence of exotic plants.
Global Environment: This tall-shrub bog thicket occurs on oligotrophic to weakly minerotrophic peat soils, commonly as a border thicket around more open dwarf heath shrub peatlands or within small, isolated basins. Significant seasonal water level fluctuation can occur, especially in isolated basins without inlet or outlet streams.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This bog thicket is dominated by *Vaccinium corymbosum*. Other common shrubs include *Rhododendron viscosum, Clethra alnifolia, Gaylussacia baccata, Kalmia angustifolia*, and *Ilex verticillata*. The herb layer is sparse but there is thick cover of *Sphagnum* spp.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Vaccinium corymbosum* is dominant. Other common shrubs include *Nemopanthus mucronatus, Ilex verticillata, Photinia melanocarpa, Kalmia latifolia, Rhododendron viscosum, Clethra alnifolia, Gaylussacia baccata, Kalmia angustifolia*, and/or *Lyonia ligustrina*. Scattered trees may include *Tsuga canadensis, Nyssa sylvatica*, and/or *Acer rubrum*. The herb layer is sparse but may include *Carex trisperma, Carex canescens, Osmunda regalis, Osmunda cinnamomea, Thelypteris palustris, Drosera rotundifolia*, and usually a thick *Sphagnum* spp. mat.
Global Vegetation: A tall-shrub layer is characterized by abundant *Vaccinium corymbosum* plus *Gaylussacia baccata, Chamaedaphne calyculata, Kalmia angustifolia, Rhododendron canadense, Lyonia ligustrina*, and *Nemopanthus mucronatus* in more northern or cooler microclimates, and *Ilex verticillata* and *Rhododendron viscosum* in the south. In locally wetter areas, *Cephalanthus occidentalis* or *Decodon verticillatus* can occur. Sparse, scattered trees may occur, including *Acer rubrum, Picea mariana, Larix laricina, Pinus strobus, Pinus rigida, Betula populifolia*, or *Nyssa sylvatica*, with species dependent on environmental setting. The herbaceous layer tends to be sparse, although can be locally abundant. Common herbs include *Osmunda cinnamomea, Woodwardia virginica, Carex trisperma, Sarracenia purpurea, Thelypteris palustris, Triadenum virginicum*, and *Maianthemum trifolium*. *Sphagnum* mosses blanket well-developed hummocks and hollows, including *Sphagnum magellanicum, Sphagnum centrale, Sphagnum rubellum, Sphagnum capillifolium, Sphagnum fimbriatum*, and *Sphagnum fuscum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium corymbosum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia angustifolia*
Nonvascular	Moss	*Sphagnum* spp.

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium corymbosum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Kalmia angustifolia*
Nonvascular	Moss	*Sphagnum* spp.

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lyonia ligustrina*, *Vaccinium corymbosum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Kalmia angustifolia*, *Rhododendron viscosum*, *Sphagnum* spp., *Vaccinium corymbosum*
Appalachian National Scenic Trail (Lower New England Project Area): *Kalmia angustifolia*, *Osmunda cinnamomea*, *Rhododendron viscosum*, *Sphagnum* spp., *Vaccinium corymbosum*
Global: *Chamaedaphne calyculata*, *Gaylussacia baccata*, *Lyonia ligustrina*, *Osmunda cinnamomea*, *Rhododendron viscosum*, *Vaccinium corymbosum*, *Woodwardia virginica*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Iris pseudacorus* (High/Medium)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (20-May-2011). There are an estimated 1200 occurrences of this small-patch vegetation type throughout the northeastern U.S. from New Jersey to southern Maine. Although larger examples are protected by some state laws, smaller examples, and those in isolated basins, do not receive Federal protection under the Clean Water Act. Much of this vegetation continues to be threatened by adjacent development and runoff associated with these activities, as well as hydrological manipulations such as ditching and filling, or flooding by beaver dams.

RELATED CONCEPTS

Global Similar Types:
- *Vaccinium corymbosum - Gaylussacia baccata - Photinia melanocarpa / Calla palustris* Acidic Peatland (CEGL005085)
- *Vaccinium corymbosum - Rhododendron viscosum - Clethra alnifolia* Acidic Peatland (CEGL006371)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: These small-patch isolated wetlands may occur on the landscape below the minimum map unit.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Some of the New York sites have high *Acer rubrum* and *Nyssa sylvatica* cover and are verging on forested wetlands. Not all sites had dense *Sphagnum* spp. cover.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: This community (CEGL006190) maybe confused with Blueberry Wetland Thicket (CEGL006371), a tall-shrub swamp dominated by *Vaccinium corymbosum* that occurs in seasonally flooded basins, closed sandplain basins, and seasonally flooded zones within larger wetlands.
Global Classification Comments: These tall heath shrub bog thickets tend to occur in wetter, more minerotrophic settings relative to dwarf heath shrub bogs.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs in the glaciated regions in the eastern and northeastern United States. It was sampled in Northampton County, Pennsylvania. It is peripheral in the Central Appalachian project area and more common in the Lower New England project area.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut; at Culvers Gap North and High Point South in New Jersey; and at Bearfort Mountain, Bellvale Mountain South, Canopus Lake North/Fahnestock State Park, Hammersley Ridge, Harriman State Park, Nuclear Lake, and West Mountain - Bear Mountain State Park in New York.
Global Range: This association occurs from Pennsylvania and New Jersey north to New Hampshire, Maine and possibly Vermont.
Nations: US
States/Provinces: CT, MA:S4, ME, NH, NJ:S1S3, NY, PA, RI, VT
TNC Ecoregions: 48:C, 59:C, 60:C, 61:C, 62:C

USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCP, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCP, 221Ab:CCC, 221Ac:CCP, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Bd:CCC, 221D:CC, 232Aa:CCC, M212Ad:CCC, M212Bc:CCC, M212Bd:CCC, M212Ea:CCC, M212Eb:CCC, M221Ac:CCC, M221Bb:CCC, M221Bf:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Cape Cod, Delaware Water Gap, Upper Delaware); USFWS (Assabet River?, Great Meadows?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SBBT, XBMV
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 1 accuracy assessment point): APPA.0657, APPA_AA_1162.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (6 plots; 6 observation points): APPA.0016, APPA.0564, APPA.0682, APPA.0685, APPA.0687, APPA.0924, APPA.1344, APPA.1353, APPA.1354, APPA.1378, APPA.1396, APPA.1417.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid and S.C. Gawler
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Conard 1935, Damman and French 1987, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Enser 1999, Enser and Lundgren 2006, Fike 1999, Furedi 2011a, Furedi 2011f, Gawler 2002, Gawler and Cutko 2010, Johnson 1981b, Karlin and Lynn 1988, Kearsley 1999a, Lundgren et al. 2000, Lynn and Karlin 1985, Metzler and Barrett 1982, Metzler and Barrett 2001, Metzler and Barrett 2006, NYNHP 2009, Perles et al. 2007, Perles et al. 2008, Radis 1986, Rawinski 1984a, Rozsa and Metzler n.d., Sneddon et al. 2010, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2000, Swain and Kearsley 2001, Zimmerman et al. 2012

2.C.4. Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland

2.C.4.ND. EASTERN NORTH AMERICAN TEMPERATE & BOREAL FRESHWATER MARSH, WET MEADOW & SHRUBLAND

M061. Eastern North American Cool Temperate Seep

G184. CENTRAL & SOUTHERN APPALACHIAN SEEP

Group Summary Description: Vegetation of this group is associated with wetlands typically found on flat to gently sloping sites in the Southern Blue Ridge, Cumberland Mountains, upper Piedmont, Ridge and Valley, and parts of the Central Appalachians. These wetlands are found over a wide range of elevations and a variety of substrate types, including low-elevation limestone and ultramafic rocks as well as high-elevation acidic rocks. These sites occur at elevations below 1220 m (4000 feet) in poorly drained bottomlands on soils which are often saturated and mucky. Wetness results from a combination of groundwater input, seepage from adjacent slopes, rainfall and impeded drainage. The amount of seepage water input is variable among examples. In a hydrogeomorphic sense these wetlands would be regarded as primarily a slope type, although typically on very gentle slopes. The vegetation is at least partially open, with herbaceous-dominated areas as well as shrub thickets and often forested zones, exhibiting a complex of zones or patches with a mix of physiognomies. The wettest areas have herbaceous vegetation dominated by *Carex* spp., usually with abundant *Sphagnum*. Scattered trees and shrubs may be present in the herbaceous zones. Most examples also have a dense shrub zone around the edges. Some examples have forested zones, as well, around the edges or as a matrix in which numerous small herbaceous openings are embedded. Characteristic tree species include *Acer rubrum, Nyssa sylvatica, Picea rubens, Pinus rigida*, and *Tsuga canadensis*. Characteristic shrubs include *Alnus serrulata, Toxicodendron vernix*, and *Viburnum nudum var. cassinoides*.

A3381 *Carex atlantica - Solidago patula - Parnassia asarifolia* Seep Alliance

Alliance Summary Description: This alliance accommodates shrub- and herb-dominated vegetation of Southern Appalachian "bogs," seeps or poor fens, found at a variety of elevations. Physiognomy is variable and may include herbaceous-dominated patches, shrubby areas, and areas with an open canopy of trees. There may be a mosaic or zoned pattern of shrub thickets and herb-dominated areas, much of it underlain by *Sphagnum* mats. The shrub stratum is open to dense, and is dominated by *Alnus serrulata, Kalmia latifolia, Lindera benzoin var. benzoin, Lyonia ligustrina, Rhododendron maximum*, and *Vaccinium fuscatum*. Typical herbaceous species include *Carex atlantica, Carex folliculata, Carex gynandra, Carex leptalea, Impatiens capensis, Juncus gymnocarpus, Mimulus ringens, Osmunda cinnamomea, Oxypolis rigidior, Rhynchospora capitellata, Rudbeckia laciniata var. laciniata, Scirpus georgianus, Scutellaria lateriflora, Solidago patula var. patula*, and *Thelypteris noveboracensis*. *Sphagnum* species include *Sphagnum affine (= Sphagnum imbricatum), Sphagnum bartlettianum, Sphagnum palustre*, and *Sphagnum recurvum*. If a tree canopy is present, it will be open and contain species such as *Acer rubrum var. trilobum, Betula lenta, Magnolia tripetala*, and *Nyssa sylvatica*. Examples can be physiognomically mixed or variable, with shrubby examples interspersed with small to moderately large herbaceous openings. Examples may occur in stream headwaters and on the edges of small stream floodplains where groundwater seepage emerges and provides a relatively constant flow and saturated conditions. Examples also occur on slight to fairly steep slopes (1-15%) on shallow soils over bedrock.

[CEGL003909] *Alnus serrulata - Lindera benzoin / Scutellaria lateriflora - Thelypteris noveboracensis* Seepage Shrubland

Translated Name: **Hazel Alder - Northern Spicebush / Blue Skullcap - New York Fern Seepage Shrubland**
Common Name: **Montane Low-Elevation Seep**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	*Carex atlantica* - *Solidago patula* - *Parnassia asarifolia* Seep Alliance (A3381)

ELEMENT CONCEPT

Global Summary: This low-elevation seep is known from low elevations in the Southern Blue Ridge of North Carolina and Georgia, but is likely more widespread. The type may need substantial revision as more information is collected. This community occurs in stream headwaters and on the edges of small stream floodplains, where groundwater seepage emerges and provides a relatively constant flow and saturated conditions. A small streamlet (less than 1 m wide) flows through the community, and saturated and upland conditions form a mosaic through the remainder of the community. Physiognomy is variable, and may include herbaceous-dominated patches, shrubby areas, and areas with an open canopy of trees. The open to scattered canopy includes species such as *Betula lenta, Magnolia tripetala, Acer rubrum var. trilobum*, and *Nyssa sylvatica*. The shrub stratum is open to dense, and is dominated by *Alnus serrulata, Lyonia ligustrina, Kalmia latifolia, Lindera benzoin var. benzoin*, and *Vaccinium fuscatum*. Typical herbaceous species include *Scutellaria lateriflora, Thelypteris noveboracensis, Mimulus ringens, Osmunda cinnamomea, Ludwigia palustris, Apios americana, Oxypolis rigidior, Leersia virginica, Galium obtusum, Viola cucullata, Lycopus virginicus, Vernonia noveboracensis, Boehmeria cylindrica, Solidago canadensis, Impatiens capensis, Scirpus georgianus, Hypericum mutilum, Rhexia virginica, Ludwigia alternifolia, Solidago patula var. patula, Rudbeckia laciniata var. laciniata, Carex gynandra*, and *Juncus gymnocarpus*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This community is associated with low-elevation stream headwater seeps.

Global Environment: This community occurs in stream headwaters and on the edges of small stream floodplains, where groundwater seepage emerges and provides a relatively constant flow and saturated conditions. A small streamlet (less than 1 m wide) flows through the community, and saturated and upland conditions form a mosaic through the remainder of the community.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The shrub stratum is open to dense, and is dominated by *Alnus serrulata*. Physiognomy is variable and may include herbaceous-dominated patches, shrubby areas, and areas with an open canopy of trees. *Rubus argutus* is common; other shrubs include *Lyonia ligustrina, Kalmia latifolia, Lindera benzoin var. benzoin*, and *Vaccinium fuscatum*. *Carex gynandra, Juncus effusus*, and *Impatiens capensis* dominate the herb layer; other herbaceous species include *Scutellaria lateriflora, Thelypteris noveboracensis, Mimulus ringens, Osmunda cinnamomea*, and *Ludwigia palustris*.

Global Vegetation: Physiognomy is variable and may include herbaceous-dominated patches, shrubby areas, and areas with an open canopy of trees. The open to scattered canopy includes species such as *Betula lenta, Magnolia tripetala, Acer rubrum var. trilobum*, and *Nyssa sylvatica*. The shrub stratum is open to dense, and is dominated by *Alnus serrulata, Lyonia ligustrina, Kalmia latifolia, Lindera benzoin var. benzoin*, and *Vaccinium fuscatum*. Typical herbaceous species include *Scutellaria lateriflora, Thelypteris noveboracensis, Mimulus ringens, Osmunda cinnamomea, Ludwigia palustris, Apios americana, Oxypolis rigidior, Leersia virginica, Galium obtusum, Viola cucullata, Lycopus virginicus, Vernonia noveboracensis, Boehmeria cylindrica, Solidago altissima, Impatiens capensis, Scirpus georgianus, Hypericum mutilum, Rhexia virginica, Ludwigia alternifolia, Solidago patula var. patula, Rudbeckia laciniata var. laciniata, Carex gynandra*, and *Juncus gymnocarpus*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus serrulata*
Herb (field)	Flowering forb	*Impatiens capensis*
Herb (field)	Graminoid	*Carex gynandra*, *Juncus effusus*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus serrulata*, *Lindera benzoin* var. *benzoin*, *Lyonia ligustrina*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia latifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Alnus serrulata*, *Carex gynandra*, *Juncus effusus*, *Rubus argutus*
Global: *Alnus serrulata*, *Lindera benzoin* var. *benzoin*, *Scutellaria lateriflora*, *Thelypteris noveboracensis*

OTHER NOTEWORTHY SPECIES

Global: Other Plants: *Vaccinium fuscatum* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2? (1-Nov-2002).

RELATED CONCEPTS

Global Similar Types:
- *Acer rubrum / Alnus serrulata - Lindera benzoin / Glyceria striata - Impatiens capensis* Seep Forest (CEGL007031) apparently a more "forested" version of the same thing or something very similar; they may be combined somehow.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: More information is needed in order to fully understand the composition and distribution of this type.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: One site is located adjacent to Blackwell Creek in Union County, Georgia.
Global Range: This low-elevation seep is found in the Southern Appalachians at low elevations. It has been documented from North Carolina and Georgia, and is likely to occur in adjacent states (South Carolina, Tennessee).
Nations: US
States/Provinces: GA, NC, SC, TN?
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Sumter (Mountains)?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 1 accuracy assessment point): APPA.0553, APPA_AA_0169.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay
Global Description Author(s): A.S. Weakley
References: NatureServe Ecology - Southeastern U.S. unpubl. data, Southeastern Ecology Working Group n.d.*, TDNH unpubl. data

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[CEGL003913] *Rhododendron (maximum, catawbiense) - Ilex collina - Salix sericea / Eriophorum virginicum* Seepage Shrubland

Translated Name: **(Great Laurel, Catawba Rosebay) - Long-stalk Holly - Silky Willow / Tawny Cottongrass Seepage Shrubland**
Common Name: **Southern Appalachian Shrub Bog (Long Hope Valley Type)**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	*Carex atlantica - Solidago patula - Parnassia asarifolia* Seep Alliance (A3381)

ELEMENT CONCEPT

Global Summary: This community includes non-alluvial, wetland vegetation at very high elevations (1170-1490 m [3850-4900 feet]) in the southern Appalachian Mountains. It is known only from the valley of Long Hope Creek, Ashe and Watauga counties, North Carolina, where about 20 examples occur, and from Mount Rogers, Grayson County, Virginia. This palustrine shrubland is known to occur over amphibolite (a mafic metamorphic rock) and over rhyolite (a felsic igneous rock), on slight to fairly steep slopes (1-15%), is slightly to strongly seepage-fed, and generally has shallow soils over bedrock. Examples are structurally variable, but usually have greater than 25% shrub cover (ranges to 100%). The vegetation generally consists of a mosaic of shrub thickets and small herb-dominated areas, much of it underlain by *Sphagnum* mats. *Sphagnum* coverage is 50-100%. Trees such as *Picea rubens, Abies fraseri, Pinus strobus*, and *Tsuga canadensis* may be scattered throughout or may dominate in patches or on the edges. Dominant shrubs include *Salix sericea, Viburnum nudum var. cassinoides, Ilex collina, Rhododendron catawbiense*, and *Rhododendron maximum*. Other characteristic species include *Taxus canadensis* (Long Hope Valley only), *Picea rubens, Rosa palustris, Salix humilis, Carex atlantica, Carex baileyi, Carex echinata, Carex gynandra, Carex leptalea, Carex lurida, Carex trisperma, Eriophorum virginicum, Galium asprellum, Houstonia serpyllifolia, Juncus effusus, Osmunda cinnamomea, Oxypolis rigidior, Rhynchospora capitellata, Scirpus cyperinus, Scirpus expansus, Scirpus polyphyllus, Packera aurea (= Senecio aureus), Solidago patula var. patula, Sphagnum fuscum, Sphagnum recurvum*, and *Rhizomnium appalachianum*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This uncommon bog community was sampled once in the park on basic substrate. The site is a gently sloping, northeast-facing, semipermanently flooded braided seep with floristic diversity increased by the presence of numerous terrestrial species growing on the hummocks. The soil is somewhat poorly drained and extremely stony. The unvegetated surface is a mix of large and small rocks, litter/duff, downed wood, standing water, and bare soil. No evidence of disturbance was reported.

Global Environment: The type occupies non-alluvial wetland habitats at high elevations (1170-1490 m [3850-4900 feet]) in the southern Appalachian Mountains. North Carolina sites occur over amphibolite (a mafic metamorphic rock), while Virginia sites are underlain by rhyolite (a felsic igneous rock) and sandstone. Habitats are situated on slight to moderate slopes (1-10°), sometimes shallow to bedrock, or in shallow, concave basins along seepage-fed headwaters streams. Percent organic matter in soil samples from Virginia plots varies from <2% in gravelly/sandy seepage rills to >45% on hummocks. These soils are very strongly acidic (mean pH = 4.8) with low base status. Surface cover of bryophytes, especially *Sphagnum* spp. is typically >70%.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: *Picea rubens, Abies fraseri, Pinus strobus*, and *Tsuga canadensis* may be scattered throughout or may dominate in patches or on the edges. Dominant shrubs include *Salix sericea, Viburnum nudum var. cassinoides, Ilex collina, Rhododendron catawbiense, Rhododendron maximum*, and *Rosa palustris*. Characteristic herbs include *Carex atlantica, Carex baileyi, Carex echinata, Carex gynandra, Carex leptalea, Carex lurida, Carex trisperma, Eriophorum virginicum, Galium asprellum, Houstonia serpyllifolia, Juncus effusus, Osmunda cinnamomea, Oxypolis rigidior, Rhynchospora capitellata, Scirpus cyperinus, Scirpus expansus, Scirpus polyphyllus, Packera aurea*, and *Solidago patula var. patula*. Nonvascular taxa include *Sphagnum fuscum, Sphagnum recurvum*, and *Rhizomnium appalachianum*. In addition, this community supports VA-state imperiled *Epilobium ciliatum ssp. ciliatum* and *Epilobium leptophyllum*.

Global Vegetation: Examples are structurally variable, but usually have >25% shrub cover and occasionally have nearly 100% shrub cover. The vegetation generally consists of a mosaic of shrub thickets and small herb-dominated areas, much of it underlain by *Sphagnum* mats. Trees such as *Picea rubens, Abies fraseri, Pinus strobus*, and *Tsuga canadensis* may be scattered throughout or may dominate in patches or on the edges. Dominant shrubs include *Salix sericea, Viburnum nudum var. cassinoides, Ilex collina, Rhododendron catawbiense*, and *Rhododendron maximum*. Other characteristic woody species include *Taxus canadensis* (North Carolina only), *Picea rubens, Vaccinium simulatum, Rosa palustris*, and *Salix humilis*. Characteristic herbs include *Carex atlantica, Carex baileyi, Carex*

echinata, Carex gynandra, Carex leptalea, Carex lurida, Carex trisperma, Eriophorum virginicum, Galium asprellum, Houstonia serpyllifolia, Juncus effusus, Juncus subcaudatus, Lycopus uniflorus, Osmunda cinnamomea, Oxypolis rigidior, Rhynchospora capitellata, Scirpus cyperinus, Scirpus expansus, Scirpus polyphyllus, Packera aurea (= Senecio aureus), Solidago patula, Solidago rugosa, and *Viola macloskeyi ssp. pallens*. *Sphagnum fuscum, Sphagnum recurvum*, and *Rhizomnium appalachianum* are typical bryophytes. Species richness of six plot-sampled Virginia stands ranges from 20 to 40 taxa per 100 m2 (mean = 31).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Rosa palustris*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron maximum*
Herb (field)	Graminoid	*Carex gynandra*, *Eriophorum virginicum*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex collina*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Carex atlantica*, *Carex gynandra*, *Carex trisperma*, *Eriophorum virginicum*, *Osmunda cinnamomea*, *Rhododendron maximum*, *Rhynchospora capitellata*, *Rosa palustris*

Global: *Carex atlantica*, *Carex ruthii*, *Carex trisperma*, *Eriophorum virginicum*, *Juncus subcaudatus*, *Osmunda cinnamomea*, *Scirpus cyperinus*, *Solidago rugosa*, *Vaccinium simulatum*, *Viola macloskeyi* ssp. *pallens*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Abies fraseri* (G2, globally imperiled & VA-state critically imperiled), *Epilobium ciliatum* ssp. *ciliatum* (G5T5, VA state-imperiled), *Epilobium leptophyllum* (G5, VA state-imperiled); **Invasive/Exotic Plants**: *Holcus lanatus* (High/Medium, invasive/exotic)

Global: Vulnerable Plants: *Abies fraseri* (G2, Southern Blue Ridge endemic), *Carex ruthii* (G3), *Epilobium leptophyllum* (G5, VA state-rare), *Ilex collina* (G3, Southern Blue Ridge endemic), *Juncus brevicaudatus* (G5, VA state-rare), *Lilium grayi* (G3, Southern Blue Ridge endemic), *Rudbeckia laciniata* var. *humilis* (G5T3?)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (22-Oct-2002). This community includes non-alluvial, wetland vegetation influenced by circumneutral seepage, in the southern Appalachian Mountains. It is definitely known only from the valley of Long Hope Creek, Ashe and Watauga counties, North Carolina. There are 25 known examples, totaling 40-80 hectares (100-200 acres) in a 13-square-kilometer (5-square-mile) area. Additionally, in the Mount Rogers area, Grayson County, Virginia, there are three known examples, totaling about 11 hectares (26 acres) in a 6-square-kilometer (2.5-square-mile) area; and at Mann's Bog (headwaters of Stony Creek) on Salt Pond Mountain, Giles County, Virginia, there is a single occurrence covering about 0.4 hectare (1 acre). Stands may be threatened by alteration of the natural hydrologic regime in terms of the amount, seasonality, and chemistry of water. Grazing of cattle can also be destructive to this community, resulting in trampling and nutrient inputs. These lead to detrimental modification of hydrologic regimes and promote rapid succession by woody species.

RELATED CONCEPTS

Global Similar Types:

- *Carex atlantica - Rhynchospora alba - Parnassia asarifolia / Sphagnum warnstorfii* Herbaceous Seep (CEGL004157) are these 2 associations redundant?

CLASSIFICATION

Status: Standard

Classification Confidence: 1 - Strong

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: A rare Southern Appalachian bog known from Long Hope Valley, North Carolina, the Grayson Highlands area, and Salt Pond Mountain in Virginia.

Global Classification Comments: In North Carolina, this shrubland often occurs in association with *Carex atlantica - Rhynchospora alba - Parnassia asarifolia / Sphagnum warnstorfii* Herbaceous Seep (CEGL004157) and

is surrounded by *Picea rubens - (Tsuga canadensis) / Rhododendron maximum* Swamp Forest (CEGL006277) or forests dominated by *Fagus grandifolia, Betula alleghaniensis, Picea rubens*, and *Quercus rubra*, or land cleared from these communities. Most of the Grayson Highlands State Park occurrences are surrounded by cleared lands or northern hardwood forests, while the Giles County occurrence is associated with *Quercus rubra*-dominated slope forest and acidic cove forests dominated by *Tsuga canadensis, Betula alleghaniensis*, and *Rhododendron maximum*. Six plots, all from Virginia, were classified as this association in the Appalachian Trail project (Fleming and Patterson 2009a). Species with 100% constancy include *Acer rubrum, Carex trisperma var. trisperma, Eriophorum virginicum, Juncus subcaudatus var. subcaudatus, Kalmia latifolia, Osmunda cinnamomea, Picea rubens, Vaccinium simulatum*, and *Viola macloskeyi ssp. pallens*. Less constant species that have high cover in these plots include *Carex atlantica ssp. atlantica, Juncus effusus, Rhododendron catawbiense, Rhododendron maximum, Rhynchospora capitellata, Scirpus cyperinus*, and *Solidago rugosa*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is known from near Mount Rogers in Grayson Highlands State Park, Virginia.
Global Range: This community is restricted to high elevations in the southern Appalachian Mountains of North Carolina and Virginia.
Nations: US
States/Provinces: NC:S1, VA:S1
TNC Ecoregions: 50:C, 51:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Db:CCC, M221Dc:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge]); USFS (Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SASB
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot): APPA.0333, APPA_AA_0180, APPA_AA_0203, APPA_AA_0321, APPA_AA_0727, APPA_AA_1119, APPA_AA_1499, APPA_AA_1572.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming and P. Coulling
References: Allard 1990, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Peet et al. unpubl. data, Schafale 1998b, Schafale 2002, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, VDNH 2003, Weakley and Schafale 1994, Wichmann 2009

[CEGL003849] *Rhododendron maximum / Sphagnum* spp. Seepage Shrubland

Translated Name: **Great Laurel / Peatmoss species Seepage Shrubland**
Common Name: **Southern Appalachian Bog (Rhododendron Type)**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	*Carex atlantica - Solidago patula - Parnassia asarifolia* Seep Alliance (A3381)

ELEMENT CONCEPT

Global Summary: This wetland shrubland with saturated substrates is found on mountain stream floodplains. This association includes some bogs in the Southern Appalachians and does not extend into the Piedmont. Stands are dominated by *Rhododendron maximum* with *Kalmia latifolia* and *Ilex opaca*. There may be limited coverage by *Sphagnum* spp., but peat development is typical. In addition, *Chelone* sp. may be present in the ground layer.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This large shrub-dominated seepage-fed saturated wetland occurs at 1,005 m (3,300 feet) elevation in the Southern Blue Ridge project area. It has peaty soils with fine sediment.
Global Environment: This shrubland occurs on saturated substrates within mountain stream floodplains.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: This seepage-fed wetland community is dominated by *Rhododendron maximum, Kalmia latifolia*, and *Ilex opaca*, without much sphagnum but a lot of peat and *Chelone* sp. in the ground layer.
Global Vegetation: Stands are dominated by *Rhododendron maximum* with *Kalmia latifolia* and *Ilex opaca*. There may be limited coverage by *Sphagnum* spp., but peat development is typical. In addition, *Chelone* sp. may be present in the ground layer.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Ilex opaca*, *Kalmia latifolia*, *Rhododendron maximum*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Ilex opaca*, *Kalmia latifolia*, *Rhododendron maximum*
Nonvascular	Moss	*Sphagnum* sp.

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Rhododendron maximum*
Global: *Chelone* sp., *Rhododendron maximum*, *Sphagnum* sp.

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3Q (31-Dec-1997). Bogs, in general, are uncommon and highly threatened in the Southern Blue Ridge. Few examples remain, and many of these are in degraded condition. Threats include grazing, agricultural inputs, aerial deposition of air pollutants, and watershed alteration, including road building and development, all which can alter the natural hydrologic regime. This association needs further taxonomic assessment in order to better distinguish it from other bog communities.

RELATED CONCEPTS

Global Similar Types:
- *Carex atlantica - Solidago patula var. patula - Lilium grayi / Sphagnum bartlettianum* Herbaceous Seep (CEGL004158)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This is a small-patch community. Some polygons may be as small as 0.25 ha.
Global Classification Comments: Southern Blue Ridge shrub bogs of Virginia are treated as *Rhododendron (maximum, catawbiense) - Ilex collina - Salix sericea / Eriophorum virginicum* Seepage Shrubland (CEGL003913).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community is known from Springer Mountain, Georgia.
Global Range: This association includes some bogs in the Southern Appalachians and does not extend into the Piedmont. North Carolina and Virginia do not recognize it, so it is at least conceptually restricted to Georgia and Tennessee.
Nations: US
States/Provinces: GA, TN
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Db:CCP, M221Dc:CCC, M221Dd:CC?
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SABR
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: This community was observed by Tom Govus in Georgia during map verification field work during the summer of 2010 and during accuracy assessment.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (4 accuracy assessment points): APPA_AA_0149, APPA_AA_0531, APPA_AA_0597, APPA_AA_1535.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay
Global Description Author(s): M.P. Schafale, A.S. Weakley, K.D. Patterson
References: Allard 1990, Schafale 1998b, Schafale 2002, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

A3382 *Carex gynandra - Glyceria melicaria - Glyceria striata* Seep Alliance

Alliance Summary Description: These are Southern Appalachian, primarily high-elevation seeps and other non-alluvial wetlands found on a variety of sites associated with groundwater seepage. Some characteristic herbaceous species include *Calopogon* sp., *Carex atlantica, Carex gynandra, Carex leptalea ssp. harperi, Carex lurida, Carex scoparia var. scoparia, Carex stipata, Chelone glabra, Doellingeria umbellata (= Aster umbellatus), Dryopteris cristata, Eriophorum virginicum, Glyceria melicaria, Glyceria striata, Impatiens capensis, Lycopus virginicus, Lygodium palmatum, Platanthera clavellata, Platanthera flava var. flava, Pogonia ophioglossoides, Osmunda cinnamomea, Osmunda regalis var. spectabilis, Oxypolis rigidior, Polygonum sagittatum, Solidago patula var. patula, Solidago rugosa*, and *Solidago uliginosa*. *Sphagnum* spp. may occur in mats and include *Sphagnum palustre* and *Sphagnum recurvum*. Shrubs can occur as scattered clumps or zones and include *Hypericum densiflorum, Ilex opaca, Kalmia latifolia, Photinia pyrifolia (= Aronia arbutifolia), Rhododendron maximum, Salix sericea*, and *Viburnum nudum var. cassinoides*. At higher elevations, component species may include *Calamagrostis cainii, Carex debilis, Carex misera, Carex ruthii, Dennstaedtia punctilobula, Gentiana linearis, Glyceria nubigena, Hypericum graveolens, Krigia montana, Parnassia asarifolia*, and *Solidago glomerata*. Woody species in these examples include *Abies fraseri, Picea rubens, Prunus pensylvanica, Rhododendron catawbiense, Rubus canadensis*, and *Vaccinium erythrocarpum*. Sites are influenced by high rainfall and low evaporation rates in the mountainous landscapes. Examples may be small-scale patches. These non-alluvial wetlands are generally graminoid-dominated but may have significant coverage by trees or shrubs, especially around their edges. Particularly small examples may be completely shaded by trees within the community occurrence and in the adjacent forests. Examples of this alliance may occur on a variety of sites associated with groundwater seepage. These include areas of flat to very gently sloping topography (0-2°) located near streams, in flats away from the immediate streambed, along wetland margins, and in seepage-fed oxbow fens. These small palustrine, open seeps generally occur at higher elevations, greater than 1200 m [4000 feet]), on upper slopes and ridgetops. Some associations occur on pronounced slopes at elevations over 1525 m (5000 feet).

[CEGL007697] *Carex gynandra - Platanthera clavellata - Drosera rotundifolia - Carex ruthii / Sphagnum* spp. Herbaceous Seep

Translated Name: **Nodding Sedge - Small Green Wood Orchid - Roundleaf Sundew - Ruth's Sedge / Peatmoss species**
Herbaceous Seep
Common Name: **Southern Blue Ridge High-Elevation Seep (Sedge Type)**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	*Carex gynandra - Glyceria melicaria - Glyceria striata* Seep Alliance (A3382)

ELEMENT CONCEPT

Global Summary: This association accommodates sedge-dominated, seepage slopes scattered throughout the high elevations (>1524 m [5000 feet]) of the Southern Blue Ridge. This non-alluvial wetland is generally graminoid-dominated but may have significant coverage by trees or shrubs, especially around the edges. Particularly small

examples may be completely shaded by trees in the community and in the adjacent forests. Typically this community has well-developed *Sphagnum* mats. Characteristic species include *Carex gynandra, Carex ruthii, Carex atlantica, Carex debilis var. rudgei (= Carex flexuosa), Glyceria striata, Glyceria melicaria, Hypericum graveolens, Hypericum mitchellianum, Hypericum mutilum, Chelone lyonii, Platanthera clavellata*, and *Drosera rotundifolia*. Occurrences of this community are surrounded by or were formerly surrounded by forests dominated by *Abies fraseri* and *Picea rubens* or by the highest northern hardwood forests (forests dominated by *Fagus grandifolia, Betula alleghaniensis*, and *Aesculus flava*). They are influenced by the high rainfall and low evaporation rates in these high mountain landscapes.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: Nearly flat seep around Icewater Springs at Mt. LeConte in Tennessee occurring at 1,798 m elevation.
Global Environment: These seepage slopes are scattered throughout the high elevations (>1525 m [>5000 feet]) of the Southern Blue Ridge. They are influenced by the high rainfall and low evaporation rates in these high mountain landscapes. This non-alluvial wetland is generally graminoid-dominated but may have significant coverage by trees or shrubs, especially around the edges. Particularly small examples may be completely shaded by trees in the community and in the adjacent forests.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: *Ageratina altissima var. roanensis, Chelone obliqua, Carex ruthii, Carex gynandra*, and *Sphagnum* spp. are common.
Global Vegetation: Characteristic species in stands of this type include *Carex gynandra, Carex ruthii, Carex atlantica, Carex debilis var. rudgei (= Carex flexuosa), Glyceria striata, Glyceria melicaria, Hypericum graveolens, Hypericum mitchellianum, Hypericum mutilum, Chelone lyonii, Platanthera clavellata*, and *Drosera rotundifolia*. Typically this community has well-developed *Sphagnum* mats.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Ageratina altissima* var. *roanensis*, *Chelone obliqua*
Herb (field)	Graminoid	*Carex ruthii*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Ageratina altissima* var. *roanensis*, *Chelone obliqua*
Herb (field)	Graminoid	*Carex crinita*, *Carex gynandra*, *Carex ruthii*
Nonvascular	Moss	*Sphagnum* spp.

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area):
Global: *Carex atlantica*, *Carex debilis* var. *rudgei*, *Carex gynandra*, *Carex ruthii*, *Chelone lyonii*, *Drosera rotundifolia*, *Glyceria melicaria*, *Glyceria striata*, *Hypericum graveolens*, *Hypericum mitchellianum*, *Hypericum mutilum*, *Platanthera clavellata*, *Sphagnum* spp.

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4), *Carex ruthii* (G3)
Global: Vulnerable Plants: *Ageratina altissima* var. *roanensis* (G5T3T4), *Carex ruthii* (G3), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum buckleii* (G3, Southern Blue Ridge endemic), *Hypericum graveolens* (G3), *Hypericum mitchellianum* (G3), *Krigia montana* (G3), *Rudbeckia laciniata* var. *humilis* (G5T3?), *Solidago glomerata* (G3); **Other Plants**: *Carex oklahomensis* (G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (14-Dec-1998). This community occurs in a limited portion of high-elevation areas of the Southern Blue Ridge. Occurrences are small and embedded in forests or sometimes high-elevation grassy balds or heath balds. Many examples are in protected areas. Those which are not are vulnerable to logging and alteration of hydrology.

RELATED CONCEPTS

Global Similar Types:
- *Calamagrostis cainii - Carex ruthii - Parnassia asarifolia / Sphagnum* spp. Herbaceous Seep (CEGL007877)
- *Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis* Forested Herbaceous Seep (CEGL004296)
- *Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata var. humilis* Herbaceous Seep (CEGL004293)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Sampled twice at Icewater Springs at Mt. LeConte in Tennessee.
Global Classification Comments: This community is distinguished from other high-elevation seeps in the Blue Ridge, such as *Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata var. humilis* Herbaceous Seep (CEGL004293) and *Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis* Forested Herbaceous Seep (CEGL004296), by being graminoid-dominated and having *Sphagnum* present. Examples of this association generally lack *Rudbeckia laciniata, Laportea canadensis, Monarda didyma*, and *Diphylleia cymosa*. It is distinguished from Southern Blue Ridge bog communities by floristic differences and by occurring on a pronounced slope at high elevations.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: Sampled twice at Icewater Springs at Mt. LeConte in Tennessee.
Global Range: This community occurs in a limited portion of high-elevation areas of the Southern Blue Ridge (Tennessee, North Carolina, Virginia?).
Nations: US
States/Provinces: NC, TN, VA?
TNC Ecoregions: 51:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 1 observation point): APPA.0092, APPA.0180.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay
Global Description Author(s): M.P. Schafale and A.S. Weakley
References: Newell and Peet 1996a, Peet et al. unpubl. data, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data, Wichmann 2009, Wichmann et al. 2007, Wichmann et al. 2007*

[CEGL008438] *Glyceria striata - Carex gynandra - Chelone glabra - Symphyotrichum puniceum / Sphagnum* spp. Herbaceous Seep

Translated Name: **Fowl Mannagrass - Nodding Sedge - White Turtlehead - Purple-stem Aster / Peatmoss species Herbaceous Seep**
Common Name: **Southern Appalachian Wet Seepage Meadow**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	*Carex gynandra - Glyceria melicaria - Glyceria striata* Seep Alliance (A3382)

ELEMENT CONCEPT

Global Summary: This acidic seep occurs as small-scale patches along streams in the Southern Appalachians. Occurrences are nearly always less than 0.4 hectare (1 acre) in size. Hydrology is seepage-fed, and these sites may also receive short-term flooding from adjacent streams. Characteristic species include *Glyceria striata, Glyceria melicaria, Osmunda cinnamomea, Carex gynandra, Symphyotrichum puniceum (= Aster puniceus), Solidago patula var. patula, Chelone glabra*, and *Sphagnum recurvum*. Most occurrences are herbaceous-dominated, though scattered shrubs and trees may occur, and trees rooted outside the community sometimes provide substantial shade.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: These herb-dominated saturated seepage wetlands are found on slopes and some flat areas near small to large creeks and are best developed below 1,100 m (3,600 feet) elevation, although some apparent examples may occur at higher elevation. The sampled stands occur on moderate to gently sloping seepages with saturated, poorly to very poorly drained muck soils. The unvegetated surface is dominated by leaf litter with some large and small rocks, wood, bare soil, and standing water.
Global Environment: This acidic seep occurs as small-scale patches along streams in the Southern Appalachians. Occurrences are nearly always less than 0.4 hectare (1 acre) in size. Hydrology is seepage-fed, and these sites may also receive short-term flooding from adjacent streams.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: Characteristic species in the dense (up to 90% cover) herbaceous layer include *Glyceria striata, Glyceria melicaria* (GA-state critically imperiled), *Osmunda cinnamomea, Carex gynandra, Symphyotrichum puniceum, Solidago patula var. patula, Chelone glabra*, and *Sphagnum recurvum*. Additional abundant and/or common species include *Carex ruthii* (GA-state vulnerable), *Carex scabrata* (GA-state imperiled), *Parnassia asarifolia, Oxypolis rigidior, Rudbeckia laciniata, Scirpus polyphyllus*, and *Thalictrum clavatum*.
Global Vegetation: The physiognomic structure of this community type is variable. Most occurrences are herbaceous-dominated, though scattered shrubs and trees may occur, and trees rooted outside the community sometimes provide substantial shade. The most characteristic species include *Glyceria striata, Glyceria melicaria, Osmunda cinnamomea, Carex gynandra, Symphyotrichum puniceum (= Aster puniceus), Solidago patula var. patula, Chelone glabra*, and *Sphagnum recurvum*. Other species reported from some occurrences include *Betula lenta, Liriodendron tulipifera, Pinus strobus, Acer rubrum, Kalmia latifolia, Lyonia ligustrina var. ligustrina, Vaccinium fuscatum, Oxypolis rigidior, Athyrium filix-femina ssp. asplenioides, Salix nigra, Salix sericea*, and *Laportea canadensis*.
Global Dynamics: These communities appear to be relatively stable. They can be affected by beaver activity.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Solidago patula*
Herb (field)	Graminoid	*Glyceria melicaria*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Solidago patula* var. *patula*
Herb (field)	Graminoid	*Carex gynandra*, *Glyceria melicaria*, *Glyceria striata*
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Carex gynandra*, *Chelone glabra*, *Glyceria melicaria*, *Osmunda cinnamomea*, *Solidago patula*
Global: *Carex gynandra*, *Chelone glabra*, *Glyceria melicaria*, *Glyceria striata*, *Osmunda cinnamomea*, *Solidago patula* var. *patula*, *Symphyotrichum puniceum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Carex ruthii* (G3, GA state-imperiled), *Carex scabrata* (G5, GA state-imperiled), *Glyceria melicaria* (G5, GA state-critically imperiled)
Global: Vulnerable Plants: *Carex ruthii* (G3); **Other Plants**: *Sphagnum recurvum* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (26-Jun-2001). This community is rather widespread but always occurs in very small patches.

RELATED CONCEPTS

Global Similar Types:

- *Carex gynandra - Scirpus cyperinus - Eriophorum virginicum - Osmunda cinnamomea* Herbaceous Seep (CEGL007771) is associated with smaller streams in the Cumberland Plateau from Virginia south possibly to Tennessee.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Woodland seep.
Global Classification Comments: These communities are sometimes regarded as "poorly-developed bogs." This type needs additional study and reconciliation against communities in North Carolina currently treated as forests ("Swamp Forest - Bog Complexes"). Three plots from North Carolina and Georgia (APPA.545, APPA.652, and CVS plot 020-03-0351) in the Appalachian Trail study (Fleming and Patterson 2009a) were classified as this association. While the composition of these samples varies, *Carex gynandra, Chelone glabra*, and *Oxypolis rigidior* are 100% constant and have 2-25% coverage in the samples. Other species that have high diagnostic value are *Carex ruthii, Juncus gymnocarpus, Parnassia asarifolia, Scirpus polyphyllus*, and *Solidago patula var. patula*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled on Chattahoochee National Forest, Georgia, and in Graham and Macon counties in North Carolina, including at Standing Indian Mountain in Nantahala National Forest.
Global Range: This community was defined from the western fringe of the Southern Blue Ridge in northern Georgia, eastern Tennessee, and western North Carolina, but likely extends into adjacent areas of Alabama, Kentucky, and South Carolina.
Nations: US
States/Provinces: AL?, GA, NC, SC, TN
TNC Ecoregions: 50:P, 51:C
USFS Ecoregions (1994/95): 231Dc:CCC, 231De:CCP, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Sumter (Mountains)?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (3 plots): APPA.0141, APPA.0545, APPA.0652.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A.S. Weakley
References: Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Wichmann 2009, Wichmann 2009*

[CEGL004293] *Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata var. humilis* Herbaceous Seep

Translated Name: **(Jewelweed, Pale Touch-me-not) - Scarlet Beebalm - Greenhead Coneflower Herbaceous Seep**
Common Name: **Rich Montane Seep (High-Elevation Type)**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	*Carex gynandra - Glyceria melicaria - Glyceria striata* Seep Alliance (A3382)

ELEMENT CONCEPT

Global Summary: This association covers forb-dominated palustrine vegetation occurring as small wetlands at high elevations (greater than 1200 m [4000 feet]), on upper slopes and ridgetops in the Southern Blue Ridge ecoregion. These areas lack extensive *Sphagnum* and are typically open, without shading from a forest canopy. Typical dominant species include *Impatiens capensis, Impatiens pallida, Monarda didyma*, and *Rudbeckia laciniata var. humilis*. Other characteristic species include *Aconitum reclinatum, Cardamine clematitis, Carex leptonervia, Carex debilis var. rudgei (= Carex flexuosa), Carex ruthii, Chelone lyonii, Cicuta maculata, Claytonia caroliniana, Conioselinum chinense, Euonymus obovatus, Geum geniculatum, Helenium autumnale, Houstonia serpyllifolia, Lilium superbum, Lilium grayi, Packera aurea (= Senecio aureus), Solidago patula, Thalictrum clavatum, Trautvetteria caroliniensis, Veratrum viride, Viola cucullata*, and *Viola macloskeyi ssp. pallens*. This vegetation is often associated with boulderfield forests or other northern hardwood forests [see *Betula alleghaniensis - Aesculus flava* Forest Alliance (A0266)].

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This herbaceous association is found on slopes from 1,100 to 1,525 m (3,600-5,000 feet) elevation, primarily in open seeps that are small patches within a matrix of rich coves and rich northern hardwood forests. These montane seeps were sampled at four locations in the park. Sites range from steep to moderate mid and upper slopes with saturated, poorly drained silt loam and sandy soils. The unvegetated surface is typically dominated by leaf litter (up to 80% cover) but may include exposed bedrock, large and small rocks, downed wood, and standing water. No evidence of disturbance was reported at these sites.

Global Environment: Stands of this association are forb-dominated palustrine vegetation occurring as small wetlands at high elevations (greater than 1200 m [4000 feet]), on upper slopes and ridgetops in the Southern Blue Ridge ecoregion. These areas lack extensive *Sphagnum* and are typically open, without shading from a forest canopy. This vegetation is often associated with boulderfield forests or other northern hardwood forests.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The moderately dense (up to 70% cover) herbaceous layer is dominated by forbs including *Impatiens pallida, Monarda didyma*, and *Rudbeckia laciniata*. Additional common and/or abundant herbs may include *Chelone glabra, Chelone lyonii, Dryopteris carthusiana* (NC-state imperiled), *Impatiens capensis, Laportea canadensis*, and *Packera aurea*. Mosses may have up to 20% cover. No exotic species were reported from the four sampled plots.

Global Vegetation: Typical dominant species include *Impatiens capensis, Impatiens pallida, Monarda didyma*, and *Rudbeckia laciniata var. humilis*. Other characteristic species include *Aconitum reclinatum, Cardamine clematitis, Carex leptonervia, Carex debilis var. rudgei (= Carex flexuosa), Carex ruthii, Chelone lyonii, Cicuta maculata, Claytonia caroliniana, Conioselinum chinense, Euonymus obovatus, Geum geniculatum, Helenium autumnale, Houstonia serpyllifolia, Lilium superbum, Lilium grayi, Packera aurea (= Senecio aureus), Solidago patula, Thalictrum clavatum, Trautvetteria caroliniensis, Veratrum viride, Viola cucullata*, and *Viola macloskeyi ssp. pallens*. These stands lack extensive cover by *Sphagnum* spp., and are typically open, without shading from a forest canopy.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Impatiens capensis*, *Impatiens pallida*, *Laportea canadensis*, *Monarda didyma*, *Packera aurea*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Impatiens capensis*, *Impatiens pallida*, *Monarda didyma*, *Rudbeckia laciniata* var. *humilis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Impatiens capensis*, *Impatiens pallida*, *Laportea canadensis*, *Monarda didyma*, *Packera aurea*
Global: *Impatiens capensis*, *Impatiens pallida*, *Monarda didyma*, *Rudbeckia laciniata* var. *humilis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Dryopteris carthusiana* (G5, NC state-imperiled)
Global: Vulnerable Plants: *Aconitum reclinatum* (G3), *Cardamine clematitis* (G3), *Carex bromoides* ssp. *montana* (G5T3?), *Carex ruthii* (G3), *Geum geniculatum* (G2), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum mitchellianum* (G3), *Lilium grayi* (G3, Southern Blue Ridge endemic), *Rudbeckia laciniata* var. *humilis* (G5T3?)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (14-Dec-1998). This community occurs at moderate to high elevations of the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, southwestern Virginia, northern Georgia, and probably northwestern South Carolina. It occurs as a small patch community, embedded in a variety of regional forest types. While restricted in range and of small size, the community is relatively frequent within its range, many examples are protected, and threats are relatively few and minor.

RELATED CONCEPTS

Global Similar Types:
- *Caltha palustris - Impatiens capensis - Viola cucullata* Seepage Meadow (CEGL006258)
- *Carex gynandra - Platanthera clavellata - Drosera rotundifolia - Carex ruthii / Sphagnum* spp. Herbaceous Seep (CEGL007697)
- *Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis* Forested Herbaceous Seep (CEGL004296) typically occurs at lower elevations and is associated with cove forests.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: The four sampled sites are from the Nantahala Mountains in North Carolina.
Global Classification Comments: Four plots were classified as this association in the Appalachian Trail project (Fleming and Patterson 2009a). Three plots are in the vicinity of Standing Indian (Nantahala Mountains, North Carolina) and one is on the slopes of Whitetop (Jefferson National Forest, Virginia); both sites are above 1220 m (4000 feet) elevation. The plots sampled forested seeps that vary in their physiognomy and composition; most have significant cover by woody species and are likely shaded by the forest canopy. *Chelone glabra* and *Tiarella cordifolia* are present in all plots. Species with 75% constancy include *Aesculus flava, Athyrium filix-femina ssp. asplenioides, Betula alleghaniensis, Eurybia chlorolepis, Fraxinus americana, Houstonia serpyllifolia, Monarda didyma, Packera aurea, Veratrum viride*, and *Viola cucullata*.

Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis Forested Herbaceous Seep (CEGL004296), another high-elevation herbaceous seep association known from the Southern Appalachians, typically occurs at lower elevations and is associated with cove forests.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: The four sampled sites are from the Nantahala Mountains in North Carolina.
Global Range: This community occurs at moderate to high elevations in the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, southwestern Virginia, northern Georgia, and northwestern South Carolina. It is not found in West Virginia (E. Byers pers. comm.).
Nations: US
States/Provinces: GA, NC, SC, TN, VA:SU
TNC Ecoregions: 51:C, 59:P
USFS Ecoregions (1994/95): M221Ba:CCC, M221Bb:CCP, M221Bc:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 2 observation points): APPA.0152, APPA.0600, APPA.1081, APPA.1114.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A.S. Weakley
References: Allard 1990, CAP pers. comm. 1998, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Peet et al. unpubl. data, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data, Wichmann 2009, Wichmann et al. 2007, Wichmann et al. 2007*

A1688 *Diphylleia cymosa - Saxifraga micranthidifolia* Seep Alliance

Alliance Summary Description: This alliance consists of moderate- to high-elevation, forested (shaded) seeps in the Southern Blue Ridge. *Diphylleia cymosa, Laportea canadensis*, and *Saxifraga micranthidifolia* are characteristic and often dominant. Other characteristic species include *Boykinia aconitifolia, Cardamine clematitis, Chelone glabra, Chelone lyonii, Chrysosplenium americanum, Cicuta maculata, Geum geniculatum, Houstonia serpyllifolia, Laportea canadensis, Lilium grayi, Oxypolis rigidior, Parnassia asarifolia, Stellaria corei, Thalictrum clavatum, Tiarella cordifolia, Trautvetteria caroliniensis, Viola cucullata*, and *Viola macloskeyi ssp. pallens*. Occurrences are typically small, but can be extensive (to more than a hectare in size). Vegetation of this alliance has a strong component of species endemic to the Southern Blue Ridge.

[CEGL004296] *Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis* Forested Herbaceous Seep

Translated Name: **American Umbrella-leaf - Lettuceleaf Saxifrage - Canadian Woodnettle Forested Herbaceous Seep**
Common Name: **Rich Montane Seep (Cove Type)**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	*Diphylleia cymosa - Saxifraga micranthidifolia* Seep Alliance (A1688)

ELEMENT CONCEPT

Global Summary: This community occurs at moderate to high elevations of the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, southwestern Virginia, northern Georgia, and probably northwestern South Carolina. It is a characteristic association of shaded seeps of the southern Appalachian Mountains, usually with overhanging canopies, though trees are not rooted in the seep itself. They often are not large enough to be readily mappable, but they are a distinctive habitat for many plants, invertebrate and vertebrate animals. Stands typically contain *Diphylleia cymosa, Saxifraga micranthidifolia*, and *Laportea canadensis*. Other characteristic species include *Cardamine clematitis, Chelone lyonii, Chelone glabra, Chrysosplenium americanum, Boykinia aconitifolia, Cicuta maculata, Houstonia serpyllifolia, Viola cucullata, Viola macloskeyi ssp. pallens, Lilium grayi, Oxypolis rigidior, Parnassia asarifolia, Tiarella cordifolia, Thalictrum clavatum, Trautvetteria caroliniensis, Stellaria corei*, and *Geum geniculatum*. Occurrences associated with more acidic soil conditions often contain *Juncus gymnocarpus*. This association often occurs in cove forests, and the canopy species may include *Liriodendron tulipifera, Tilia americana, Fraxinus americana, Acer saccharum*, and *Aesculus flava*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This more-or-less forested seep association is found on mid and lower slopes and some flat areas and is best developed below 1,100 m (3,600 feet) elevation, although some apparent examples may occur at higher elevation. These seepages occur on

mid and lower slopes in a matrix of cove forests. They are perennial seeps coming from highly fractured gneissic rock. The unvegetated surface is a mix of exposed bedrock, large and small rocks, litter/duff, downed wood, standing water, and bare soil. Evidence of disturbance includes some impacts from hikers.
Global Environment: This association often occurs in cove forests. It is a characteristic association of shaded seeps of the southern Appalachian Mountains, usually with overhanging canopies though trees not rooted in the seep itself. Often not large enough to be readily mappable, but a distinctive habitat for many plants, invertebrate and vertebrate animals.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The canopy of this seep community is either partially or fully covered by cove forest trees from adjacent communities. Canopy species may include *Liriodendron tulipifera, Tilia americana, Fraxinus americana, Acer saccharum*, and *Aesculus flava*. Characteristic and dominant species within the seep include *Diphylleia cymosa, Saxifraga micranthidifolia, Laportea canadensis*, and *Impatiens pallida*. Additional herbs include *Actaea podocarpa (= Cimicifuga americana), Dryopteris intermedia, Dryopteris marginalis, Thalictrum clavatum, Chelone lyonii, Caulophyllum thalictroides*, and *Viola canadensis*, among others.
Global Vegetation: Stands typically contain *Diphylleia cymosa, Saxifraga micranthidifolia*, and *Laportea canadensis*. Other characteristic species include *Cardamine clematitis, Chelone lyonii, Chelone glabra, Chrysosplenium americanum, Boykinia aconitifolia, Cicuta maculata, Houstonia serpyllifolia, Viola cucullata, Viola macloskeyi ssp. pallens, Lilium grayi, Oxypolis rigidior, Parnassia asarifolia, Tiarella cordifolia, Thalictrum clavatum, Trautvetteria caroliniensis, Stellaria corei*, and *Geum geniculatum*. Occurrences associated with more acidic soil conditions often contain *Juncus gymnocarpus* (G. Kauffman pers. comm.). Canopy species may include *Liriodendron tulipifera, Tilia americana, Fraxinus americana, Acer saccharum*, and *Aesculus flava*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Diphylleia cymosa*, *Laportea canadensis*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Diphylleia cymosa*, *Micranthes micranthidifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Diphylleia cymosa*, *Laportea canadensis*, *Micranthes micranthidifolia*
Global: *Diphylleia cymosa*, *Micranthes micranthidifolia*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Aconitum reclinatum* (G3), *Cardamine clematitis* (G3), *Geum geniculatum* (G2), *Lilium grayi* (G3, Southern Blue Ridge endemic), *Rudbeckia laciniata* var. *humilis* (G5T3?)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (14-Dec-1998). This community occurs at moderate to high elevations of the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, southwestern Virginia, northern Georgia, and probably northwestern South Carolina. It occurs as a small patch community, embedded in a variety of regional forest types. While restricted in range and of small size, the community is relatively frequent within its range, many examples are protected, and threats are relatively few and minor.

RELATED CONCEPTS

Global Similar Types:
- *Caltha palustris - Impatiens capensis - Viola cucullata* Seepage Meadow (CEGL006258)
- *Carex gynandra - Platanthera clavellata - Drosera rotundifolia - Carex ruthii / Sphagnum* spp. Herbaceous Seep (CEGL007697)
- *Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata var. humilis* Herbaceous Seep (CEGL004293)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This type definitely occurs along and near the AT in the Mount Rogers - Whitetop massif, but has not been documented by plot samples there. *Diphylleia cymosa* may occur up to 1,585 m (5,200 feet) elevation.
Global Classification Comments: The nominal species *Diphylleia cymosa*, is a conspicuous component of this association, but may also be found in seeps of varying canopy closure at middle and high elevations. The associated nominal species, *Saxifraga micranthidifolia* and *Laportea canadensis*, are indicative of shaded seeps (G. Kauffman pers. comm.). Another high-elevation herbaceous seep association known from the Southern Appalachians, *Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata var. humilis* Herbaceous Seep (CEGL004293), often occurs on boulderfields or in northern hardwood forests, at higher elevations than the association defined here. Four plots (three from the Great Smoky Mountains National Park and one from Towns County, Georgia) were classified as this association in the Appalachian Trail analysis (Fleming and Patterson 2009a). *Diphylleia cymosa* and *Laportea canadensis* are present and abundant in all the plot samples, and *Saxifraga micranthidifolia* is present in two of the plots, but otherwise, the samples varied in species composition.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: One stand is located in Chattahoochee National Forest, Georgia and the other is in Yancey County, North Carolina.
Global Range: This community is found at moderate to high elevations of the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, southwestern Virginia, northern Georgia, and probably northwestern South Carolina.
Nations: US
States/Provinces: GA, NC, SC?, TN, VA:SU
TNC Ecoregions: 51:C, 59:C
USFS Ecoregions (1994/95): M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Nantahala, Pisgah, Sumter (Mountains)?, Sumter?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 plot; 1 observation point): APPA.0558, APPA.1084.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A.S. Weakley
References: Allard 1990, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Kauffman pers. comm., Nelson 1986, Peet et al. unpubl. data, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data, Wichmann 2009, Wichmann 2009*, Wichmann et al. 2007

G189. NORTH-CENTRAL & NORTHEASTERN SEEP

Group Summary Description: This group contains primarily herbaceous-dominated seep vegetation of the north-central and northeastern United States from Maryland and Pennsylvania north to Maine, Vermont, Wisconsin, and into adjacent Canada. This vegetation is primarily dominated by tall and short forbs, as well as by graminoids and *Sphagnum* mosses in some associations. These seepage-fed wetlands are found on gentle slopes. Examples are linear, non-peaty, non-sphagnous, often rocky, groundwater slope wetlands that are embedded in an upland forest setting. Some smaller examples may be nearly or fully shaded by overhanging trees rooted in the adjacent forest, but others are open. Stands of this group are dominated by a wetland flora, but with a lack of species characteristic of floodplains and true bogs (some bog-related species may occasionally be present). Trees may be present on the edges of stands, or often overhanging, but are not characteristic. Shrub species are typically sparse and most typically mesophytic, rather than obligate wetland species. They may form dense zones around the edge but are not characteristic. The herb layer is generally well-developed, and is usually dominated either by characteristic forbs such as *Chelone* spp., *Impatiens capensis, Impatiens pallida, Rudbeckia laciniata*, and *Symplocarpus foetidus*, and/or with presence of *Carex* spp. and other graminoids, including *Eriophorum virginicum* and *Glyceria striata*. In

addition, *Sphagnum* spp. may occur in a minority of examples, but it is more characteristic of vegetation in the other groups within this macrogroup.

A1685 *Carex scabrata - Chrysosplenium americanum* Seep Alliance

Alliance Summary Description: This alliance accommodates small herbaceous seepages with scattered cover of *Carex scabrata* and small forbs, including *Chrysosplenium americanum, Cardamine clematitis, Circaea alpina*, and usually also with the moss *Rhizomnium appalachianum*. Vegetation in this alliance is normally over-shaded by trees rooted in adjacent (non-wetland) communities. The spatial extent of this alliance is small, with individual occurrences normally much less than a hectare in size. Despite its small spatial scale, this alliance is an important component of the diversity of the landscapes in which it occurs. The alliance is distributed primarily in the Appalachian Mountains from New Hampshire and Vermont south to West Virginia, and possibly in adjacent Canada.

[CEGL006193] *Chrysosplenium americanum* Seepage Meadow

Translated Name: **American Golden-saxifrage Seepage Meadow**
Common Name: **Golden-saxifrage Forested Seep**

USNVC Classification

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	North-Central & Northeastern Seep (G189)
Alliance	*Carex scabrata - Chrysosplenium americanum* Seep Alliance (A1685)

Element Concept

Global Summary: This type includes small herbaceous seepage areas with scattered cover of forbs. Herbs are strongly dominant and tend to be relatively diverse, especially where there is greater enrichment. Characteristic species can include *Chrysosplenium americanum, Cardamine bulbosa, Circaea alpina, Viola cucullata, Chelone glabra, Glyceria melicaria, Glyceria striata, Cinna arundinacea, Impatiens capensis, Poa paludigena, Carex scabrata, Mimulus ringens, Symplocarpus foetidus, Pilea pumila, Galium triflorum, Saxifraga pensylvanica, Thelypteris noveboracensis, Veratrum viride, Hydrocotyle americana, Onoclea sensibilis, Laportea canadensis, Arisaema triphyllum, Tiarella cordifolia, Carex gynandra, Geum rivale*, and the mosses *Rhizomnium punctatum (= Mnium punctatum), Rhizomnium appalachianum, Brachythecium rivulare, Thuidium delicatulum, Steerecleus serrulatus (= Rhynchostegium serrulatum)*, and *Bryhnia novae-angliae*. Typically the community is over-topped by trees and shrubs from the surrounding forest, although large examples will be open.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: One forest seep occurring in a small basin along a seepage drainage was sampled in Vermont in the Lower New England project area. It is a small (1-6 acres) herbaceous seepage area with scattered cover of forbs. The community is over-topped by trees and shrubs from the surrounding forest. The seep lacks a defined channel and only irregularly has surface flow. There are a couple of patchy non-vegetated areas of exposed muck which appear to be the result of intermittent spring flow (surface groundwater).
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association occurs as small herbaceous seepage areas typically within the greater matrix forest.
Global Environment: This type includes small herbaceous seepage areas with scattered cover of forbs. Herbs are strongly dominant and tend to be relatively diverse, especially where there is greater enrichment.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The Vermont seep is dominated by *Chrysosplenium americanum, Impatiens capensis*, and *Glyceria melicaria*. Other common species include *Scutellaria lateriflora, Dryopteris intermedia, Thuidium delicatulum, Cinna latifolia, Osmunda cinnamomea*, and *Chelone glabra*. It is fully shaded by overhanging *Betula alleghaniensis*.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: Typically the community is over-topped by trees and shrubs from the surrounding forest, although large examples will be open. Characteristic species can include *Carex scabrata, Oclemena acuminata (= Aster acuminatus), Rubus pubescens, Thelypteris*

noveboracensis, Osmunda claytoniana, Chrysosplenium americanum, Viola cucullata, Glyceria striata, Cinna arundinacea, Impatiens capensis, Mimulus ringens, Symplocarpus foetidus, Pilea pumila, Galium triflorum, Veratrum viride, Hydrocotyle americana, Onoclea sensibilis, Laportea canadensis, Arisaema triphyllum, Tiarella cordifolia, Geum rivale, and the mosses *Rhizomnium punctatum (= Mnium punctatum), Rhizomnium appalachianum, Brachythecium rivulare, Thuidium delicatulum, Steerecleus serrulatus (= Rhynchostegium serrulatum)*, and *Bryhnia novae-angliae*.

Global Vegetation: Characteristic species can include *Chrysosplenium americanum, Cardamine bulbosa, Circaea alpina, Viola cucullata, Chelone glabra, Glyceria melicaria, Glyceria striata, Cinna arundinacea, Impatiens capensis, Poa paludigena, Carex scabrata, Mimulus ringens, Symplocarpus foetidus, Pilea pumila, Galium triflorum, Saxifraga pensylvanica, Thelypteris noveboracensis, Veratrum viride, Hydrocotyle americana, Onoclea sensibilis, Laportea canadensis, Arisaema triphyllum, Tiarella cordifolia, Carex gynandra, Geum rivale*, and the mosses *Rhizomnium punctatum (= Mnium punctatum), Rhizomnium appalachianum, Brachythecium rivulare, Thuidium delicatulum, Steerecleus serrulatus (= Rhynchostegium serrulatum)*, and *Bryhnia novae-angliae*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Chrysosplenium americanum*, *Impatiens capensis*
Herb (field)	Graminoid	*Glyceria melicaria*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Rubus pubescens*
Herb (field)	Flowering forb	*Oclemena acuminata*
Herb (field)	Graminoid	*Carex scabrata*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Chrysosplenium americanum*
Herb (field)	Graminoid	*Carex scabrata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Chrysosplenium americanum*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Carex scabrata*
Global: *Chrysosplenium americanum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Carex scabrata - Viola cucullata / Plagiomnium ciliare* Seepage Meadow (CEGL006597)
- *Symplocarpus foetidus - Impatiens capensis* Seepage Meadow (CEGL006567)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed at Harmon Hill in Bennington, Vermont. It is below the minimum map unit size.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: This association is broadly classified to include spring runs associated with seeps. Additional data and regional analysis are needed to further refine the classification of this vegetation. Related vegetation in the High Alleghenies of Virginia is treated as *Carex scabrata - Viola cucullata / Plagiomnium ciliare* Seepage Meadow (CEGL006597) and on the Blue Ridge as *Schoenoplectus acutus - Carex lasiocarpa* Marsh (CEGL006358).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed at Harmon Hill in Bennington, Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association was observed at Franconia Notch in New Hampshire.
Global Range: This association occurs throughout the northeastern United States and possibly adjacent Canada.
Nations: CA?, US
States/Provinces: CT, DE, MA, MD:S4, ME, NH, NJ, NY, PA, QC?, RI, VT:S4, WV:S3
TNC Ecoregions: 49:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ac:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Am:CCC, 221Ba:CCP, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Ea:CCC, 221Eb:CC?, 221Fa:CCC, 231Al:???, 231Ap:???, M212Ca:C??, M212Cd:C??, M212Ea:CCC, M212Eb:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CC?, M221Be:CC?, M221Bf:CCC, M221Ca:C??, M221Cb:C??, M221Cc:C??, M221Cd:C??, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFS (Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot): APPA.1749.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 plot): APPA.1780.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): E. Largay
References: Bowman 2000, Byers et al. 2007, CAP pers. comm. 1998, CDPNQ unpubl. data, Clancy 1996, Coxe 2009, DeMeo et al. 1998, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Harrison 2004, Harrison 2011, McPherson 2011b, Metzler and Barrett 2001, Metzler and Barrett 2006, Schafale 1998b, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2000, Swain and Kearsley 2001, Thompson and Sorenson 2000, Walz et al. 2008, Zimmerman et al. 2012

A3373 *Eriophorum virginicum - Dulichium arundinaceum - Carex echinata* Seep Alliance

Alliance Summary Description: This alliance accommodates acidic herbaceous fen or "bog" vegetation from the Allegheny Mountains region of Virginia, West Virginia and Maryland as well as related areas of New York and Pennsylvania. Typical components of this community type include *Carex echinata, Carex folliculata, Dulichium arundinaceum, Eriophorum virginicum, Juncus brevicaudatus, Juncus canadensis, Juncus subcaudatus*, and *Solidago uliginosa*. Other common herbs include *Carex gynandra, Carex trisperma, Doellingeria umbellata (= Aster umbellatus), Drosera rotundifolia var. rotundifolia, Epilobium leptophyllum, Galium tinctorium, Juncus effusus, Osmunda cinnamomea, Scirpus cyperinus, Sparganium erectum ssp. stoloniferum*, and *Viola cucullata*. *Sphagnum* spp. (*Sphagnum recurvum, Sphagnum magellanicum, Sphagnum fallax*, and others) may also be present. Patches of low shrubs and stunted trees are also present in some examples, particularly *Picea rubens* and *Acer rubrum*. Shrubs may include *Menziesia pilosa, Kalmia latifolia, Vaccinium angustifolium*, and *Vaccinium myrtilloides*. The dwarf-shrubs *Vaccinium oxycoccos, Vaccinium macrocarpon*, and *Rubus hispidus* may be present in some associations. This vegetation is found on flat to gently sloping topography of terraces, toeslopes, shallow headwater basins, swales, moats of bog mats, and pondshores. Some older stands typically occur over shallow bedrock, where they are kept open by high water tables. Some habitats typically have pronounced hummock-and-hollow microtopography. Groundwater discharge may be barely perceptible, or may appear as flowing seeps and braided streamlets. The underlying bedrock may consist of acidic sandstone, shale or limestone. The substrate is poorly to very poorly drained shallow peat or muck or sand.

[CEGL006552] *Dulichium arundinaceum - Carex folliculata - Juncus* spp. Seepage Meadow

Translated Name: **Threeway Sedge - Northern Long Sedge - Rush species Seepage Meadow**
Common Name: **Threeway Sedge Basin Marsh**

USNVC Classification

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	North-Central & Northeastern Seep (G189)
Alliance	*Eriophorum virginicum - Dulichium arundinaceum - Carex echinata* Seep Alliance (A3373)

Element Concept

Global Summary: This community occurs in shallow basins, swales, moats of bog mats, and pondshores, sometimes with a porous substrate, where the water level drops significantly during dry years. Substrate is variously peat, muck or sandy soil. The vegetation is dominated by a mix of low grasses, sedges, rushes, and scattered shrubs such as *Dulichium arundinaceum, Rubus hispidus, Carex folliculata, Juncus canadensis, Juncus brevicaudatus*, and *Juncus subcaudatus*. Other associates include *Leersia oryzoides, Scirpus cyperinus, Osmunda cinnamomea var. cinnamomea, Triadenum fraseri, Lycopodiella inundata (= Lycopodium inundatum), Eriophorum virginicum, Drosera* spp., *Rhynchospora alba*, and *Sphagnum* spp.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This herbaceous community occurs in shallow basins, swales, moats of bog mats, and pondshores in peat, muck or sandy soils. One site was sampled in the Central Appalachian project area in a semipermanently flooded depression with some surface water and very poorly drained muck soil. The pool is surrounded by white pine - dry oak / heath forest on all sides. The unvegetated surface is dominated by leaf litter with some downed wood and standing water. No evidence of disturbance was reported.

Global Environment: This community occurs in shallow basins with sometimes porous substrate, where the water level drops significantly during dry years. Substrate is variously peat, muck or sandy soil. In West Virginia, this herbaceous fen occurs on temporarily flooded, semipermanently flooded, or saturated peat in the Allegheny Mountains and Ridge and Valley regions at elevations between 620 and 1150 m. It is a small-patch type that occupies flat-lying land in headwater basins. Many stands occur in beaver-influenced wetlands, either on the margins of active beaver ponds, or on sites that are slowly drying above abandoned beaver dams. The type also occurs on the margins of alluvial wetland mosaics, where seepage is impounded behind natural stream levees. Snags are present and indicate that some sites were formerly forested wetlands, while others are temporarily invaded by woody species during dry years and periods of reduced beaver activity. Hummock-and-hollow microtopography is moderately well-developed, with hummocks ranging from 10-20 cm in height. Bedrock is typically acidic sandstone and, less commonly, shale. The substrate is poorly to very poorly drained peat, varying in depth from 25 cm to more than 120 cm, generally underlain by deposits of sand, silt, or clay loam. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, and depleted matrix. Mean soil pH is 4.2 (n=4), mean pore water pH is 4.6 (n=6), and electrical conductivity averages 35 micromhos/cm (n=6). Soil chemistry is characterized by high Fe; moderate Al, B, Cu, Mg, Na, exchangeable nitrogen, and total exchange capacity; and low Ca, K, Mn, S (n=4). Organic matter, phosphorus and zinc are variable, ranging from 3%-68%, 11-102 ppm, and 1-95 ppm respectively. The unvegetated surface is predominantly litter, with an average of 14% standing water and 1% downed wood (Byers et al. 2007).

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Dulichium arundinaceum, Sparganium americanum*, and *Scirpus cyperinus* dominate these naturally occurring marshes and seeps. Scattered trees and shrubs such as *Acer rubrum, Lyonia lucida* and *Vaccinium corymbosum* may overhang the pool.

Global Vegetation: Vegetation is dominated by a mix of low grasses, sedges, rushes, and scattered shrubs such as *Dulichium arundinaceum, Carex folliculata, Juncus canadensis, Juncus brevicaudatus*, and *Juncus subcaudatus*. Other associates include *Lycopodiella inundata (= Lycopodium inundatum), Eriophorum virginicum, Drosera* spp., *Rhynchospora alba*, and *Sphagnum* spp. In West Virginia, this type is an herbaceous peatland that typically has a few stunted trees and shrubs on hummock tops, including *Picea rubens, Hypericum densiflorum, Rhododendron maximum, Ilex verticillata, Alnus incana ssp. rugosa*, and *Kalmia latifolia*. *Rubus hispidus* has high constancy and moderate cover in this type. The herbaceous layer is dominated by *Dulichium arundinaceum*. Other common

herbaceous species include *Eriophorum virginicum, Leersia oryzoides, Scirpus cyperinus, Juncus brevicaudatus, Osmunda cinnamomea var. cinnamomea, Triadenum fraseri, Drosera rotundifolia var. rotundifolia, Juncus effusus, Carex canescens, Rhynchospora alba, Agrostis hyemalis, Carex atlantica, Sparganium* spp., and *Juncus subcaudatus var. subcaudatus*. Nonvascular plants are dominated by *Sphagnum* spp. (*Sphagnum fallax, Sphagnum recurvum, Sphagnum magellanicum, Sphagnum cuspidatum*, and *Sphagnum papillosum*) and generally include moderate cover by *Polytrichum* spp. (*Polytrichum commune, Polytrichum pallidisetum*). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 21 taxa per 400 square meters for 9 plots in West Virginia (Byers et al. 2007).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Sparganium americanum*
Herb (field)	Graminoid	*Dulichium arundinaceum*, *Scirpus cyperinus*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex folliculata*, *Dulichium arundinaceum*, *Juncus brevicaudatus*, *Juncus canadensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Dulichium arundinaceum*, *Scirpus cyperinus*, *Sparganium americanum*
Global: *Carex folliculata*, *Dulichium arundinaceum*, *Juncus brevicaudatus*, *Juncus canadensis*, *Juncus subcaudatus*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (8-Jul-1999).

RELATED CONCEPTS

Global Similar Types:
- *Carex canescens - Eriophorum virginicum / Sphagnum* spp. Fen (CEGL006549)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This is a small-patch wetland community that may occur on the landscape below the minimum map unit.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Nine plots (6 occurrences) represent this type in West Virginia, which was classified as part of a 2006 analysis of palustrine plots statewide. The West Virginia plots ordinate well together in species space, although in cluster analysis this group mixes with the slightly more acidic *Carex canescens - Eriophorum virginicum / Sphagnum* spp. Fen (CEGL006549) (Byers et al. 2007).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is known from New York, Pennsylvania, and West Virginia. It was sampled in Franklin County, Pennsylvania.
Global Range: This community is known from New York, Pennsylvania, and West Virginia. In West Virginia, it occurs in the Allegheny Mountains and Ridge and Valley regions at elevations between 620 and 1150 m.
Nations: US
States/Provinces: NY, PA, WV:S3
TNC Ecoregions: 59:C
USFS Ecoregions (1994/95): M221Aa:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians]); USFS (Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 1 accuracy assessment point): APPA.0659, APPA_AA_1096.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): E.A. Byers
References: Byers et al. 2007, Eastern Ecology Working Group n.d.*, Edens 1973, Edinger et al. 2002, Fike 1999, Hall 2005a, Walbridge 1982

A3374 *Impatiens capensis - Symplocarpus foetidus - Caltha palustris* Seep Alliance

Alliance Summary Description: These circumneutral or slightly calcareous groundwater seeps are typically dominated by forbs, including *Angelica atropurpurea, Caltha palustris, Impatiens capensis*, and *Symplocarpus foetidus*. Other species that may be found include *Carex lacustris, Carex stricta, Glyceria striata*, and *Thelypteris palustris*. This type is found throughout the Central Appalachian, northeastern and north-central United States and eastern temperate Canada. Stands are found on lower slopes of glacial moraines, ravines, and terraces around seepage areas, where circumneutral or slightly calcareous groundwater seeps to the surface. Peat sometimes accumulates to a depth of 1 m. Other sites have little organic material, with groundwater typically welling up through carbonate-encrusted gravel.

[CEGL006567] *Symplocarpus foetidus - Impatiens capensis* Seepage Meadow

Translated Name: **Skunk-cabbage - Jewelweed Seepage Meadow**
Common Name: **Skunk-cabbage - Jewelweed Seep**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	North-Central & Northeastern Seep (G189)
Alliance	*Impatiens capensis* - *Symplocarpus foetidus* - *Caltha palustris* Seep Alliance (A3374)

ELEMENT CONCEPT

Global Summary: This small seepage wetland vegetation occurs in low-lying areas such as streamheads, lower slope drainages, and the borders of small streams where groundwater emerges. The substrate is mucky, with rocks and boulders often visibly protruding above the surface. Little quantitative data exist for this vegetation, although it appears to be quite common in the northeastern United States. Typically, this vegetation is shaded by tree species of higher ground and surrounding edges of the community, but these species are not characteristic of the vegetation and vary widely among occurrences. *Lindera benzoin* may occur, particularly at the edges. Characteristic herbaceous species are *Symplocarpus foetidus, Impatiens capensis*, and *Arisaema triphyllum*. Other common associates are variable but may include *Veratrum viride, Pilea pumila, Cardamine pensylvanica, Saxifraga pensylvanica, Carex canescens, Caltha palustris*, and *Viola sororia*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This small seepage wetland vegetation occurs in low-lying areas such as streamheads, lower slope drainages, and the borders of small streams where groundwater emerges.
Global Environment: This small seepage wetland vegetation occurs in low-lying areas such as streamheads, lower slope drainages, and the borders of small streams where groundwater emerges. The substrate is mucky, with rocks and boulders often visibly protruding above the surface.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Symplocarpus foetidus* and/or *Impatiens capensis* are dominant. Typically, this vegetation is shaded by tree species of higher ground and surrounding edges of the community, but these species are not characteristic of the vegetation and vary widely among occurrences.

Global Vegetation: Characteristic herbaceous species are *Symplocarpus foetidus, Impatiens capensis*, and *Arisaema triphyllum*. Other common associates are variable but may include *Veratrum viride, Pilea pumila, Cardamine pensylvanica, Saxifraga pensylvanica, Carex canescens, Caltha palustris*, and *Viola sororia*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Impatiens capensis*, *Symplocarpus foetidus*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Impatiens capensis*, *Symplocarpus foetidus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Impatiens capensis*, *Symplocarpus foetidus*
Global: *Arisaema triphyllum*, *Impatiens capensis*, *Symplocarpus foetidus*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (8-Jul-1999).

RELATED CONCEPTS

Global Similar Types:
- *Chrysosplenium americanum* Seepage Meadow (CEGL006193)
- *Onoclea sensibilis - (Adiantum pedatum) - Impatiens capensis - Carex plantaginea* Seepage Meadow (CEGL006409)
- *Symplocarpus foetidus* - Mixed Forbs Seep (CEGL002385)
- *Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Seepage Meadow (CEGL006448)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Added to the Lower New England project area classification to cover more common seeps than Mid-Atlantic Rich Seep (CEGL006448) which is a G1 association restricted to Delaware Water Gap National Recreation Area.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: The UMESC mapping team observed this community in New York during map reconnaissance.
Global Range: This vegetation occurs in the northeastern United States.
Nations: US
States/Provinces: CT, DC, MA, MD?, ME, NH, NJ, NY, PA, RI, VT, WV
TNC Ecoregions: 59:C, 61:C, 62:C
USFS Ecoregions (1994/95): 221Aa:CCC, 221Ae:CCC, 221Bc:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Morristown, Saratoga, Saugus Iron Works)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: The UMESC mapping team observed this community in New York during map reconnaissance and accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 accuracy assessment points): APPA_AA_2113, APPA_AA_3302.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): L.A. Sneddon

References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Ehrenfeld 1977, Largay and Sneddon 2008, MNNHP 1993, McPherson 2011c, NRCS 2004a, Sneddon et al. 2008, Vanderhorst and Streets 2006, White and Madany 1978, Zimmerman et al. 2012

[CEGL006448] *Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Seepage Meadow

Translated Name: **New York Ironweed - Eastern Marsh Fern - Skunk-cabbage Seepage Meadow**
Common Name: **Mid-Atlantic Rich Seep**

USNVC Classification

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	North-Central & Northeastern Seep (G189)
Alliance	*Impatiens capensis - Symplocarpus foetidus - Caltha palustris* Seep Alliance (A3374)

Element Concept

Global Summary: These small wetlands (<1-6 acres) occur as patches within the forest matrix where calcareous groundwater discharge is present throughout the growing season. The substrate may vary from mineral soils to sapric peat (muck). Peat deposits, when present, are generally thin (<50 cm). This association is characterized by a highly variable species composition. *Juniperus virginiana* may be present, and tall shrubs may be present at low cover (<10%) and include *Salix* spp., *Lindera benzoin*, and *Toxicodendron vernix*. The short-shrub layer is also sparse and often dominated by willows. *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)* is not a typical associate, and if present, is at low cover. The shrub layers may contain invasive shrubs, especially *Rosa multiflora, Lonicera morrowii*, and *Berberis thunbergii*. Open sites with little or no woody plant cover often are dominated by graminoids, while more shaded sites have a higher cover of forb species. Herbaceous vegetation typically exceeds 90% and may reach 2 m in height in some forb species. Typical forb species include *Vernonia noveboracensis, Thelypteris palustris, Viola* spp., *Packera aurea (= Senecio aureus), Symplocarpus foetidus, Arisaema triphyllum, Hydrocotyle americana, Eupatorium* spp., *Impatiens* spp., *Pycnanthemum verticillatum, Amphicarpaea bracteata, Mitella diphylla*, *Solidago uliginosa, Drosera rotundifolia, Parnassia glauca,* and *Chelone glabra*. Typical graminoid species include *Carex leptalea, Carex granularis, Carex atlantica, Carex debilis, Leersia oryzoides*, *Muhlenbergia glomerata, Rhynchospora alba,* and *Poa palustris*. The invasive plants *Lythrum salicaria* and *Microstegium vimineum* may be present, the former particularly in more open seeps. Mosses are usually present but are typically <5% of total vegetation cover.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: These small wetlands occur as patches within the forest matrix where calcareous groundwater discharge is present throughout the growing season.
Global Environment: These small wetlands (<1-6 acres) occur where calcareous groundwater discharge is present throughout the growing season. The substrate may vary from mineral soils to sapric peat (muck). Peat deposits, when present, are generally thin (<50 cm).

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: Species composition is highly variable, but some typical species include *Vernonia noveboracensis, Thelypteris palustris, Viola* spp., *Packera aurea, Symplocarpus foetidus, Arisaema triphyllum, Hydrocotyle americana, Eupatorium* spp., *Impatiens* spp., *Pycnanthemum verticillatum, Amphicarpaea bracteata, Mitella diphylla, Chelone glabra, Carex debilis, Microstegium vimineum* (exotic), and *Leersia oryzoides*.
Global Vegetation: This association is characterized by a highly variable species composition. Tall shrubs may be present at low cover (<10%) and include *Salix* spp., *Lindera benzoin*, and *Toxicodendron vernix*. The short-shrub layer is also sparse and often dominated by willows. *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)* is not a typical associate, and if present, is at low cover. The shrub layers may contain invasive shrubs, especially *Rosa multiflora, Lonicera morrowii*, and *Berberis thunbergii*. Open sites with little or no woody plant cover often are dominated by graminoids, while more shaded sites have a higher cover of forb species. Herbaceous vegetation typically exceeds 90% and may reach 2 m in height in some forb species. Typical forb species include *Vernonia noveboracensis, Thelypteris palustris, Viola* spp., *Packera aurea (= Senecio aureus), Symplocarpus*

foetidus, Arisaema triphyllum, Hydrocotyle americana, Eupatorium spp., *Impatiens* spp., *Pycnanthemum verticillatum, Amphicarpaea bracteata, Mitella diphylla, Solidago uliginosa, Drosera rotundifolia, Parnassia glauca*, and *Chelone glabra*. Typical graminoid species include *Carex leptalea, Carex granularis, Carex atlantica, Carex debilis, Leersia oryzoides, Muhlenbergia glomerata, Rhynchospora alba*, and *Poa palustris*. The invasive plants *Lythrum salicaria* and *Microstegium vimineum* may be present, the former particularly in more open seeps. Mosses are usually present but are typically <5% of total vegetation cover.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Amphicarpaea bracteata*, *Hydrocotyle americana*, *Packera aurea*, *Symplocarpus foetidus*, *Vernonia noveboracensis*
Herb (field)	Graminoid	*Leersia oryzoides*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris palustris*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Salix* spp.
Herb (field)	Flowering forb	*Amphicarpaea bracteata*, *Hydrocotyle americana*, *Packera aurea*, *Symplocarpus foetidus*, *Vernonia noveboracensis*, *Viola* spp.
Herb (field)	Graminoid	*Leersia oryzoides*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris palustris*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Hydrocotyle americana*, *Leersia oryzoides*, *Packera aurea*, *Symplocarpus foetidus*, *Thelypteris palustris*, *Vernonia noveboracensis*
Global: *Carex debilis*, *Hydrocotyle americana*, *Leersia oryzoides*, *Lindera benzoin*, *Packera aurea*, *Salix* spp., *Symplocarpus foetidus*, *Thelypteris palustris*, *Toxicodendron vernix*, *Vernonia noveboracensis*, *Viola* spp.

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium), *Lonicera morrowii* (High/Medium), *Lythrum salicaria* (High), *Microstegium vimineum* (High/Medium), *Rosa multiflora* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (23-May-2011). This small-patch association is restricted to seepage areas in calcareous bedrock. It has a narrow range extent, occurring in only three states, and occurrences are only a few acres in size. This association is vulnerable to runoff from development and road construction, logging and other activities adjacent to the fen. This vegetation is prone to invasive species incursion, and is threatened by altered hydrology, both human-induced and that caused by beavers.

RELATED CONCEPTS

Global Similar Types:

- *Caltha palustris - Impatiens capensis - Viola cucullata* Seepage Meadow (CEGL006258) are woodland seeps that are less species-rich and with fewer calciphiles.
- *Juniperus virginiana / Dasiphora fruticosa ssp. floribunda / Carex flava - Carex tetanica* Fen (CEGL006357)
- *Symplocarpus foetidus - Impatiens capensis* Seepage Meadow (CEGL006567)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Occurs outside of the corridor in Delaware Water Gap National Recreation Area. Leaving in classification through accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: Delaware Water Gap north through New York.
Global Range: This community is currently known from New York, New Jersey and Pennsylvania and is possible over a larger area.
Nations: US
States/Provinces: NJ, NY, PA
TNC Ecoregions: 49:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Bd:CCC, 221Fa:CCC, 221Fb:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: Occurs outside of the corridor in Delaware Water Gap National Recreation Area.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: None.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler and L.A. Sneddon
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, McPherson 2011d, NYNHP 2009, Perles et al. 2007, Western Pennsylvania Conservancy 1995, Zimmerman et al. 2012

A3372 *Prunus virginiana - Acer spicatum - Cornus sericea* Seep Alliance

Alliance Summary Description: This alliance accommodates shrubby to herbaceous seepage swamps known only from high elevations (>915 m [3000 feet]) in Vermont. Characteristic tall shrubs include *Prunus virginiana, Acer spicatum*, and *Sambucus racemosa*. *Cornus sericea* may also be important. *Ribes triste* is a relatively constant short shrub. Other shrubs may include *Viburnum opulus var. americanum* and *Ribes lacustre*, along with saplings of upland species which are common in the surrounding forest. Herbaceous species may include *Ageratina altissima, Athyrium filix-femina, Chelone glabra, Dryopteris campyloptera, Glyceria striata, Laportea canadensis, Ranunculus recurvatus, Solidago rugosa*, and *Tiarella cordifolia*. These stands occupy small openings ranging from several hundred square meters to several hectares on moderate to somewhat steep slopes within a matrix of *Abies balsamea*-dominated forest. They are most likely maintained by groundwater seepage. The locations in Vermont include the Coolidge Range of the Green Mountains in central Vermont, as well as possibly from Mansfield Mountain, Bolton Mountain, Haystack Mountain in Lowell; Spruce Mountain in Plainfield; and Signal Mountain in Groton.

[CEGL006583] *Prunus virginiana - Acer spicatum - Ribes triste / Angelica atropurpurea - Heracleum maximum* Seepage Shrubland

Translated Name: **Chokecherry - Mountain Maple - Red Currant / Purple-stem Angelica - Common Cow-parsnip Seepage**
Shrubland
Common Name: **Northern Appalachian High-Elevation Seepage Shrubland**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	North-Central & Northeastern Seep (G189)
Alliance	*Prunus virginiana - Acer spicatum - Cornus sericea* Seep Alliance (A3372)

ELEMENT CONCEPT

Global Summary: These shrubby to herbaceous seepage swamps are currently known only from high elevations (>915 m [3000 feet]) in the northern Appalachian Mountains of Vermont, possibly New Hampshire and Maine. More specifically it occurs in the Coolidge Range of the Green Mountains in central Vermont. They occupy small openings ranging from several hundred square meters to several hectares on moderate to somewhat steep slopes within a matrix of *Abies balsamea*-dominated forest, i.e., *Abies balsamea - (Betula papyrifera var. cordifolia)* Forest

(CEGL006112). They are most likely maintained by groundwater seepage. The ground surface is mostly mineral soil, with little to no peat accumulation. The shrub- and herb-dominance and relatively high species richness contrast with the surrounding conifer-dominated forest. Many species are nutrient-demanding and are unusual at high elevations. The shrub layer is somewhat open to relatively dense and up to 5 m in height. *Prunus virginiana, Acer spicatum*, and *Sambucus racemosa* are relatively constant to codominant medium to tall shrubs. *Cornus sericea* is important in one sampled plot. *Ribes triste* is a relatively constant short shrub. Other shrubs may include *Viburnum opulus var. americanum* and *Ribes lacustre*, along with saplings of upland species which are common in the surrounding forest, such as *Abies balsamea* and *Betula papyrifera var. cordifolia*. The herb layer is moderately dense to dense under the shrubs or in openings. *Angelica atropurpurea, Heracleum maximum, Hydrophyllum virginianum, Impatiens capensis, Thalictrum pubescens, Tiarella cordifolia*, and *Veratrum viride* are constant to codominant herbs. Relatively constant herbs present at lower cover include *Laportea canadensis, Solidago macrophylla, Symphyotrichum puniceum, Dryopteris campyloptera, Milium effusum, Rubus pubescens, Trillium erectum, Actaea pachypoda, Carex leptonervia, Dicentra cucullaria, Erythronium americanum*, and *Phegopteris connectilis*. In addition to these species, *Cornus amomum, Amelanchier bartramiana, Sorbus americana, Sorbus decora, Chamerion angustifolium, Platanthera dilatata, Rubus idaeus*, and *Saxifraga pensylvanica* are characteristic of the largest known stand. Some of these seeps are enhanced by natural disturbance (blowdowns) and others by timber harvest.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: These shrubby to herbaceous seepage swamps or glades are known from high elevations (>776 m [2,545 feet]) in the Coolidge Range of the Green Mountains in central Vermont, occupying small openings on moderate to somewhat steep slopes within a matrix of balsam fir-dominated forest. Soils are mineral with little to no peat accumulation. Sites are saturated seeps located on gentle to moderate upper slopes with north, northwest and west aspects. Soils are poorly drained sandy loam or muck. The unvegetated surface consists of leaf litter, with small amounts of downed wood, large rocks, ledge, talus, bare soil and/or standing water. Heavy moose traffic and browse were reported at one site.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: These shrublands occur on moderately steep slopes near ridgetops within a matrix of balsam fir-dominated forest, at elevations from 1020 to 1230 m (3,300-4,000 feet). They appear to be maintained by groundwater seepage near or at the ground surface. The soil is damp at the surface in mid-June and small flowing rivulets occur within stands. The Vermont Nongame and Natural Heritage Program (VNNHP 1991) describe this vegetation as a "circumneutral seep."
Global Environment: These shrublands occur on moderately steep slopes near ridgetops within a matrix of balsam fir-dominated forest, at elevations from 1020 to 1230 m (3300-4000 feet). They appear to be maintained by groundwater seepage near or at the ground surface. The soil is damp at the surface in mid-June and small flowing rivulets occur within stands. The Vermont Nongame and Natural Heritage Program (VNNHP 1991) describe this vegetation as a "circumneutral seep."

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The open to dense shrub layer is up to 5 m in height and dominated by *Prunus virginiana, Acer spicatum*, and *Sambucus racemosa*. *Ribes triste* is a constant short shrub. The herb layer includes some combination of *Angelica atropurpurea, Heracleum maximum, Hydrophyllum virginianum, Impatiens capensis, Thalictrum pubescens, Tiarella cordifolia, Ageratina altissima, Glyceria striata, Solidago rugosa, Athyrium filix-femina, Chelone glabra, Dryopteris campyloptera, Ranunculus recurvatus, Tiarella cordifolia, Veratrum viride, Laportea canadensis, Solidago macrophylla, Symphyotrichum puniceum, Dryopteris campyloptera, Milium effusum, Rubus pubescens, Trillium erectum, Actaea pachypoda, Carex leptonervia, Dicentra cucullaria, Erythronium americanum*, and *Phegopteris connectilis*. In addition, this community supports VT state-critically imperiled *Blephilia hirsuta*.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: *Prunus virginiana, Acer spicatum*, and *Sambucus racemosa* are relatively constant to codominant medium to tall shrubs. *Cornus sericea* may also be important. *Ribes triste* is a relatively constant short shrub. Other shrubs may include *Viburnum opulus var. americanum* and *Ribes lacustre*, along with saplings of upland species which are common in the surrounding forest, such as *Abies balsamea* and *Betula papyrifera var. cordifolia*. The herb layer is moderately dense to dense under the shrubs or in openings. *Angelica atropurpurea, Heracleum maximum, Hydrophyllum virginianum, Impatiens capensis, Thalictrum pubescens, Tiarella cordifolia*, and *Veratrum viride* are constant to codominant herbs. Relatively constant herbs present at lower cover include *Laportea canadensis, Solidago macrophylla, Symphyotrichum puniceum, Dryopteris campyloptera, Milium effusum, Rubus pubescens, Trillium erectum, Actaea pachypoda, Carex leptonervia, Dicentra cucullaria, Erythronium americanum*, and *Phegopteris connectilis*. In

addition to these species recorded in plot-sampling, the Vermont Nongame and Natural Heritage Program (VNNHP 1991) reported *Cornus amomum, Amelanchier bartramiana, Sorbus americana, Sorbus decora, Chamerion angustifolium, Platanthera dilatata, Rubus idaeus*, and *Saxifraga pensylvanica* as being characteristic of the largest known stand.

Global Vegetation: *Prunus virginiana, Acer spicatum*, and *Sambucus racemosa* are relatively constant to codominant medium to tall shrubs. *Cornus sericea* may also be important. *Ribes triste* is a relatively constant short shrub. Other shrubs may include *Viburnum opulus var. americanum* and *Ribes lacustre*, along with saplings of upland species which are common in the surrounding forest, such as *Abies balsamea* and *Betula papyrifera var. cordifolia*. The herb layer is moderately dense to dense under the shrubs or in openings. *Angelica atropurpurea, Heracleum maximum, Hydrophyllum virginianum, Impatiens capensis, Thalictrum pubescens, Tiarella cordifolia*, and *Veratrum viride* are constant to codominant herbs. Relatively constant herbs present at lower cover include *Laportea canadensis, Solidago macrophylla, Symphyotrichum puniceum, Dryopteris campyloptera, Milium effusum, Rubus pubescens, Trillium erectum, Actaea pachypoda, Carex leptonervia, Dicentra cucullaria, Erythronium americanum*, and *Phegopteris connectilis*. In addition to these species recorded in plot-sampling, the Vermont Nongame and Natural Heritage Program (VNNHP 1991) reported *Cornus amomum, Amelanchier bartramiana, Sorbus americana, Sorbus decora, Chamerion angustifolium, Platanthera dilatata, Rubus idaeus*, and *Saxifraga pensylvanica* as being characteristic of the largest known stand.

Global Dynamics: The processes that maintain these shrublands of comparatively nutrient-demanding, typically low-elevation, and diverse species within a typical high-elevation balsam fir-dominated forest are uncertain and somewhat enigmatic. It is likely that periodic soil saturation at least inhibits conifer invasion; the wetland indicator status of many species and seepages within the stands support this. Stands occur too high on slopes and on too moderate slopes for avalanches to be a factor.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Acer spicatum*, *Prunus virginiana*
Herb (field)	Flowering forb	*Angelica atropurpurea*, *Heracleum maximum*, *Hydrophyllum virginianum*, *Laportea canadensis*, *Tiarella cordifolia*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Acer spicatum*, *Prunus virginiana*, *Sambucus racemosa*
Herb (field)	Flowering forb	*Angelica atropurpurea*, *Heracleum maximum*, *Hydrophyllum virginianum*, *Thalictrum pubescens*, *Tiarella cordifolia*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Acer spicatum*, *Prunus virginiana*, *Sambucus racemosa*
Herb (field)	Flowering forb	*Angelica atropurpurea*, *Heracleum maximum*, *Hydrophyllum virginianum*, *Thalictrum pubescens*, *Tiarella cordifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Angelica atropurpurea*, *Heracleum maximum*, *Hydrophyllum virginianum*, *Laportea canadensis*, *Prunus virginiana*, *Ribes triste*

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Angelica atropurpurea*, *Heracleum maximum*, *Hydrophyllum virginianum*, *Prunus virginiana*, *Ribes triste*, *Sambucus racemosa*, *Thalictrum pubescens*

Global: *Angelica atropurpurea*, *Heracleum maximum*, *Hydrophyllum virginianum*, *Prunus virginiana*, *Ribes triste*, *Sambucus racemosa*, *Thalictrum pubescens*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Blephilia hirsuta* (G5?, VT state-critically imperiled)

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (14-Aug-2013). About six stands, ranging from about 1/20 hectare to several hectares in size, occur along approximately 2 km of the Appalachian Trail on the ridge between Killington and Snowden peaks in the Coolidge Range (C. Lea pers. obs. 2009). The largest stand evidently was noted and briefly described by the Vermont Nongame and Natural Heritage Program (VNNHP 1991). Several more kilometers of ridge in the range have not been searched, and more stands are probably present farther from the trail and possibly at lower elevations in the range. The unusual setting (high-elevation, nutrient-rich seeps), the small-patch nature of stands, and the lack of observations of even somewhat similar vegetation elsewhere strongly suggest that this community type is quite rare and restricted, regardless of its distribution. However, due to its small size and high-elevation locations, it has likely been overlooked at other sites. It was originally thought to be endemic to the Coolidge Range, but Andy Cutko in Maine has confirmed it in Maine and the UMESC mapping team discovered it in southern New Hampshire during reconnaissance work.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Sites are all open seepage wetlands typically occurring on gentle slopes with shallow muck soils.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: No plots or observation points, but observed by the UMESC mapping team in southern New Hampshire and Andy Cutko of Maine Natural Heritage Program says this occurs in Maine.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Other Comments: None.
Global Classification Comments: From their unusual composition and setting, with no other similar types described in the USNVC, these stands seem to represent a distinct community type that seems not closely related to any previously recognized. Within this small range, it is an easily recognized, repeating, and very distinctive assemblage. Other stands in the Coolidge Range should be plot-sampled and described, more stands should be sought (using remote sensing, as needed), and similar vegetation might be sought elsewhere in the Green Mountains or in the Taconics or Berkshires, where nutrient-rich substrates occur at higher elevations. The current alliance assignment is a rather poor fit, but is probably the closest that can accommodate this vegetation at present. Brett Engstrom (pers. comm. 2012) has seen these in the northern Green Mountains, higher elevations in northeast Vermont, and above the 45th parallel in New Hampshire.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: These shrubby to herbaceous seepage swamps are currently known only from high elevations (>915 m [3000 feet]) in the Coolidge Range of the Green Mountains in central Vermont. It was sampled at Bridgewater Heights and Coolidge Range in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: No plots or observation points, but observed by the UMESC mapping team in southern New Hampshire.
Global Range: These shrubby to herbaceous seepage swamps are currently known only from high elevations (>915 m [3000 feet]) in the Coolidge Range of the Green Mountains in central Vermont.
Nations: US
States/Provinces: ME, NH?, VT
TNC Ecoregions: 61:C, 63:C
USFS Ecoregions (1994/95): M212Cb:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFS (Green Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SNAS
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: No plots or observation points, but it was observed by the UMESC mapping team in southern New Hampshire.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 plots; 3 observation points; 4 accuracy assessment points): APPA.0959, APPA.0960, APPA.1524, APPA.1570, APPA.1743, APPA.1746, APPA.1747, APPA_AA_2117, APPA_AA_2732, APPA_AA_2810, APPA_AA_2916.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: None.

Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall, mod. E. Largay
Global Description Author(s): C. Lea
References: Eastern Ecology Working Group n.d.*, VNNHP 1991

M069. Eastern North American Marsh, Wet Meadow & Shrubland

G125. Eastern North American Freshwater Marsh

Group Summary Description: These freshwater emergent marshes are dominated by herbaceous vegetation, primarily graminoids. *Schoenoplectus* spp., *Typha* spp., and *Zizania* spp. are common dominants though other species can be abundant or even form nearly monotypic stands. They are common throughout the northern half of the eastern United States and adjacent Canadian provinces. Freshwater marshes occur in closed or open basins that are generally flat and shallow and are always or nearly always flooded. Water depths range from a few centimeters to approximately 1 m. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. These marshes include those along the shores and estuaries of the Great Lakes. Dominant vegetation tends to be 1-2 m tall and cover varies from moderate to dense. Scattered shrubs may be present but total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil, though where waves or currents are stronger or in some low-nutrient sites, the mineral soil may be exposed.

A3669 *Peltandra virginica - Pontederia cordata - Sagittaria* spp. Marsh Alliance

Alliance Summary Description: This alliance includes very wet or partially submerged forb vegetation in the northeastern and midwestern United States and adjacent Canada. Dominants vary depending on water levels, recent disturbances, etc. A wide variety of forbs can dominate, including *Peltandra virginica, Polygonum amphibium, Polygonum hydropiper, Carex emoryi, Impatiens capensis, Pontederia cordata, Bidens cernua*, and *Verbena hastata*. Typical associates include *Nuphar* ssp., *Glyceria striata, Polygonum sagittatum, Schoenoplectus tabernaemontani (= Scirpus validus), Schoenoplectus americanus (= Scirpus americanus)*, and *Sagittaria latifolia*. Stands occur on the banks of rivers and lakes and sometimes of artificial ponds and impoundments.

[CEGL006446] *Bidens cernua - Verbena hastata - Polygonum* spp. Marsh

Translated Name: **Nodding Beggarticks - Swamp Verbena - Smartweed species Marsh**
Common Name: **Mixed Forb Marsh**

USNVC Classification

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Eastern North American Freshwater Marsh (G125)
Alliance	*Peltandra virginica - Pontederia cordata - Sagittaria* spp. Marsh Alliance (A3669)

Element Concept

Global Summary: This variable wetland type occurs in depressions, drainages, and basins that contain ponded water throughout the year. In general, waterflow out of the sites is restricted, either due to naturally occurring depressions or from beaver activity, roads, or berms. The vegetation is dominated by species that are tolerant of standing water, and species composition is extremely variable among sites. Common species may include *Eleocharis acicularis, Verbena hastata, Bidens cernua, Eupatorium maculatum, Leersia oryzoides, Polygonum hydropiper, Polygonum sagittatum, Equisetum arvense, Symphyotrichum novae-angliae, Schoenoplectus americanus, Carex stipata, Carex vulpinoidea, Eupatorium perfoliatum, Poa trivialis, Ludwigia palustris*, and/ or *Toxicodendron radicans*.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This mixed forb marsh occurs in depressions, drainages, and basins that contain ponded water throughout the year. In general, waterflow out of the sites is restricted, either due to naturally occurring depressions or from beaver activity, roads or berms. The vegetation is often restricted to the edges of the basins, with open water remaining in the center. These wetlands typically occur on very poorly drained soils such as mucky silt loam, shallow mucky peat, and, less occasionally, on ponded gravelly sand.
Global Environment: This variable wetland type occurs in depressions, drainages, and basins that contain ponded water throughout the year. Waterflow out of the sites is typically restricted, either due to naturally occurring depressions or from beaver activity, roads, or berms. The vegetation is often restricted to the edges of the basins,

with open water remaining in the center. These wetlands typically occur on very poorly drained soils such as mucky silt loam, shallow mucky peat, and, less occasionally, on ponded gravelly sand.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The vegetation is dominated by species that are tolerant of standing water, and species composition is extremely variable among sites. Common species include *Eleocharis acicularis, Verbena hastata, Bidens cernua, Eupatorium maculatum, Leersia oryzoides, Polygonum hydropiper, Polygonum sagittatum, Equisetum arvense, Symphyotrichum novae-angliae, Schoenoplectus americanus, Carex stipata, Carex vulpinoidea, Eupatorium perfoliatum, Poa trivialis, Ludwigia palustris*, and/or *Toxicodendron radicans*.
Global Vegetation: This herbaceous-dominated association contains standing water for most or all of the year and is often associated with impounded drainages, ponded areas near streams, or saturated areas surrounding drainages. The vegetation is dominated by species that are tolerant of standing water, and species composition is extremely variable among sites. Common species include *Eleocharis acicularis, Verbena hastata, Bidens cernua, Eupatorium maculatum, Leersia oryzoides, Polygonum hydropiper, Polygonum sagittatum, Equisetum arvense, Symphyotrichum novae-angliae, Schoenoplectus americanus, Carex stipata, Carex vulpinoidea, Eupatorium perfoliatum, Poa trivialis, Ludwigia palustris*, and/ or *Toxicodendron radicans*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Bidens cernua*, *Polygonum hydropiper*, *Verbena hastata*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Bidens cernua*, *Polygonum hydropiper*, *Verbena hastata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Bidens cernua*, *Eupatorium maculatum*, *Polygonum hydropiper*, *Verbena hastata*
Global: *Bidens cernua*, *Eupatorium maculatum*, *Polygonum hydropiper*, *Toxicodendron radicans*, *Verbena hastata*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Polygonum hydropiper*
Global: Invasive/Exotic Plants: *Polygonum hydropiper*; **Other Plants**: *Polygonum sagittatum* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (7-Feb-2006). Better data on this community are needed in order to assign a conservation rank to it.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed at the Connecticut - New York border by the mapping reconnaissance team in the summer of 2012.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community is documented in Pennsylvania, New York and New Jersey. It was observed on the Connecticut - New York border on the trail.
Global Range: This community is described from Pennsylvania and New Jersey and probably ranges northward.
Nations: US
States/Provinces: CT?, MA?, NJ, NY, PA, RI?, VT?
TNC Ecoregions: 48:C, 60:C, 61:C, 62:C

USFS Ecoregions (1994/95): 212Fc:CCC, 221Ae:CCC, 221Bc:CCC, 221Bd:CCC, 222Ib:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap, Gateway, Saratoga, Upper Delaware); USFWS (Iroquois)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HGFM, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed at the Connecticut - New York border by the mapping reconnaissance team in the summer of 2012 and during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 accuracy assessment points): APPA_AA_2423, APPA_AA_2699.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.C. Gawler and E. Largay
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Edinger et al. 2008a, FNA Editorial Committee 2006, Fike 1999, NRCS 2001b, NRCS 2004a, Perles et al. 2007, Perles et al. 2008, Walz et al. 2008

[CEGL006191] *Pontederia cordata - Peltandra virginica - Sagittaria latifolia* Marsh

Translated Name: **Pickerelweed - Green Arrow-arum - Broadleaf Arrowhead Marsh**
Common Name: **Northeastern Leafy Forb Marsh**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Eastern North American Freshwater Marsh (G125)
Alliance	*Peltandra virginica - Pontederia cordata - Sagittaria* spp. Marsh Alliance (A3669)

ELEMENT CONCEPT

Global Summary: Emergent marsh dominated by broad-leaved, aerenchymatous plants along pondshores, lakeshores, impoundments, and quiet riverbanks in the northeastern United States and elsewhere. This marsh occurs in shallow to deep standing water usually on muck soils. Common species include *Pontederia cordata, Sagittaria latifolia, Peltandra virginica*, and *Sparganium* spp. Additional emergent species include *Eleocharis palustris, Schoenoplectus tabernaemontani (= Scirpus validus), Acorus calamus, Nuphar variegata (= Nuphar lutea ssp. variegata), Nymphaea odorata, Sium suave*, and submerged species including *Ceratophyllum demersum* and *Utricularia macrorhiza (= Utricularia vulgaris)*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This leafy forb marsh occurs along pondshores, lakeshores, and impoundments in shallow to deep standing water usually on muck soils.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is only known from one location in the Northern Appalachian project area on a pond margin at 660 m (2,165 feet) elevation. Soils are mucky organic deposits and permanently flooded.
Global Environment: This association occurs along pondshores, lakeshores, impoundments, and quiet riverbanks in shallow to deep standing water usually on muck soils.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: Common species include *Pontederia cordata, Sagittaria latifolia, Peltandra virginica*, and *Sparganium* spp. Additional emergent species include *Eleocharis palustris, Schoenoplectus tabernaemontani (= Scirpus validus), Acorus calamus, Nuphar variegata (= Nuphar lutea ssp. variegata), Nymphaea odorata, Sium suave*, and submerged species including *Ceratophyllum demersum* and *Utricularia macrorhiza (= Utricularia vulgaris)*.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only known occurrence of this association in the Northern Appalachian project area is a sparsely vegetated emergent marsh dominated by *Eriocaulon aquaticum* in association with *Brasenia schreberi* and *Potamogeton* sp. Total vegetation cover does not exceed 5%.

Global Vegetation: Common species include *Pontederia cordata, Sagittaria latifolia, Peltandra virginica*, and *Sparganium* spp. Additional emergent species include *Eleocharis palustris, Schoenoplectus tabernaemontani (= Scirpus validus), Acorus calamus, Nuphar variegata (= Nuphar lutea ssp. variegata), Nymphaea odorata, Sium suave*, and submerged species including *Ceratophyllum demersum* and *Utricularia macrorhiza (= Utricularia vulgaris)*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Peltandra virginica*, *Sagittaria latifolia*
Submerged aquatic	Aquatic herb	*Pontederia cordata*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Eriocaulon aquaticum*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Peltandra virginica*, *Pontederia cordata*, *Sagittaria latifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Peltandra virginica*, *Pontederia cordata*, *Sagittaria latifolia*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Eriocaulon aquaticum*
Global: *Peltandra virginica*, *Pontederia cordata*, *Sagittaria latifolia*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (19-Jan-2006).

RELATED CONCEPTS

Global Similar Types:
- *Peltandra virginica* - *Pontederia cordata* Tidal Marsh (CEGL004706)
- *Pontederia cordata* - *Peltandra virginica* Marsh (CEGL004291)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed on the New York - New Jersey border by the UMESC mapping reconnaissance team in the summer of 2012.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed by UMESC on the New York - New Jersey border.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from South Pond in Maine.
Global Range: This association occurs in the northeastern United States.
Nations: CA, US
States/Provinces: CT, MA, ME, NH, NJ:S4, NY, ON?, PA:S4, QC?, RI, VT:S4
TNC Ecoregions: 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 221Ab:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Am:CCC, 221Ba:CCP, 221Bb:CCP, 221Bc:CCC, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Ec:CCC, 221Ed:CCC, 232Ab:CCC, M212Bb:CCC, M212Cb:CCC, M212Ea:CCP, M212Eb:CCP
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Cape Cod, Saratoga); USFWS (E.B. Forsythe, Great Meadows, Great Swamp?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HGFM, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed by UMESC on the New York - New Jersey border.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 accuracy assessment point): APPA_AA_3288.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 plot): APPA.0974.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.L. Neid
References: CDPNQ unpubl. data, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Edinger et al. 2007, Eichelberger 2011q, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Metzler and Barrett 2001, Metzler and Barrett 2001*, Metzler and Barrett 2006, NRCS 2004a, NatureServe 2009, Rawinski 1984a, Sneddon et al. 2010, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2000, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zimmerman et al. 2012

A1436 *Typha angustifolia - Typha latifolia - Schoenoplectus* spp. Deep Marsh Alliance

Alliance Summary Description: This alliance, found across the eastern half of the United States and southern Canada, contains stands dominated or codominated by *Typha angustifolia* and/or *Typha latifolia*, either alone or in combination with other tall emergent marsh species. *Typha* often occurs in pure stands, and can colonize areas recently exposed by either natural or human causes. *Lythrum salicaria*, an exotic species from Europe, has become a common associate of many eastern *Typha* marshes. In the Southeast, this alliance is widespread and currently representative of a wide variety of mixed marshes with no clear dominants. Vegetation in this alliance may be natural or semi-natural and includes mixed stands of the nominal species, as well as essentially monospecific stands of *Typha latifolia*. Occurrences may display areas of open water, but emergent vegetation dominates. Vegetative diversity and density are highly variable in response to water depth, water chemistry, and natural forces. Associated species vary widely; in the Midwest they include many sedges such as *Carex aquatilis, Carex pellita (= Carex lanuginosa), Carex rostrata*, bulrushes such as *Schoenoplectus acutus (= Scirpus acutus), Schoenoplectus americanus (= Scirpus americanus)*, and *Schoenoplectus heterochaetus (= Scirpus heterochaetus)*, and broad-leaved herbs such as *Asclepias incarnata, Hibiscus moscheutos, Impatiens capensis, Sagittaria latifolia, Scutellaria lateriflora, Sparganium eurycarpum, Thelypteris palustris*, and *Verbena hastata*. Floating aquatics such as *Lemna minor* may predominate in deeper zones. This alliance is found most commonly along lake margins and in shallow basins, and occasionally in river backwaters. Lacustrine cattail marshes typically have a muck-bottom zone bordering the shoreline, where cattails are rooted in the bottom substrate, and a floating mat zone, where the roots grow suspended in a buoyant peaty mat. These marshes have hydric soils and are flooded with water levels ranging from several centimeters to more than 1 m for a significant part of the growing season. Soils which support this community can be mineral or organic but are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

[CEGL006153] *Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Eastern Marsh

Translated Name: **(Narrowleaf Cattail, Broadleaf Cattail) - (Bulrush species) Eastern Marsh**
Common Name: **Eastern Cattail Marsh**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Eastern North American Freshwater Marsh (G125)
Alliance	*Typha angustifolia - Typha latifolia - Schoenoplectus* spp. Deep Marsh Alliance (A1436)

ELEMENT CONCEPT

Global Summary: These tall emergent marshes are common throughout the northeastern United States and adjacent Canadian provinces. They occur in permanently flooded basins, often as part of a larger wetland mosaic and associated with lakes, ponds, or slow-moving streams. The substrate is muck over mineral soil. Lacustrine cattail marshes typically have a muck-bottom zone bordering the shoreline, where cattails are rooted in the bottom substrate, and a floating mat zone, where the roots grow suspended in a buoyant peaty mat. Tall graminoids dominate the vegetation; scattered shrubs are often present (usually totaling less than 25% cover) and are frequently shorter than the graminoids. Trees are absent. Bryophyte cover varies and is rarely extensive; bryophytes are mostly confined to the hummocks. *Typha angustifolia, Typha latifolia*, or their hybrid *Typha x glauca* dominate, either alone or in combination with other tall emergent marsh species. Associated species vary widely; sedges, such as *Carex aquatilis, Carex lurida, Carex pellita (= Carex lanuginosa), Carex rostrata, Carex stricta, Scirpus cyperinus*, and bulrushes, such as *Schoenoplectus americanus (= Scirpus americanus)* and *Schoenoplectus acutus (= Scirpus acutus)*, occur along with patchy grasses, such as *Calamagrostis canadensis*. Broad-leaved herbs include *Asclepias incarnata, Calla palustris, Impatiens capensis, Onoclea sensibilis, Sagittaria latifolia, Scutellaria lateriflora, Sparganium eurycarpum, Symplocarpus foetidus, Thelypteris palustris*, and *Verbena hastata*. Floating aquatics, such as *Lemna minor*, may be common in deeper zones. Shrub species vary across the geographic range of this type; in the northern part of its range, *Myrica gale, Ilex verticillata*, and *Spiraea alba* are common. The invasive exotic plants *Lythrum salicaria* and *Phragmites australis* may be abundant in parts of some occurrences. This association is distinguished from other northeastern freshwater marshes by the strong dominance of *Typha* spp.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: One example was sampled in Cumberland County, Pennsylvania, where the Hogestown Run intersects the Appalachian Trail in the Central Appalachian project area. This marsh is situated on limestone bedrock. The drainage is surrounded by farmland, residential areas and highly modified shrubland and forest along the edge of the creek.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This cattail marsh occurs in permanently flooded basins, often as part of a larger wetland mosaic and associated with lakes, ponds, or slow-moving streams. It is very common throughout the Northeast. Sites are saturated to semipermanently flooded basins and flats with very poorly drained muck soils. The unvegetated surface consists of standing water. Evidence of disturbance includes alterations to hydrology (man-made and beaver dams) and the presence of exotic plants.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This herbaceous wetland is only known from one location in New Hampshire in a basin floor at 250 m (820 feet) elevation. Soil is saturated muck.

Global Environment: These tall emergent marshes are common throughout the northeastern United States and adjacent Canadian provinces. They occur in permanently flooded basins, often as part of a larger wetland mosaic and associated with lakes, ponds, or slow-moving streams. The substrate is muck over mineral soil. Lacustrine cattail marshes typically have a muck-bottom zone bordering the shoreline, where cattails are rooted in the bottom substrate, and a floating mat zone, where the roots grow suspended in a buoyant peaty mat. This association is often found in impounded waters.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Phalaris arundinacea* is the dominant along the creek berm and slightly drier areas of the marsh while *Typha latifolia* dominates the wetter center.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This tall emergent marsh is dominated by *Typha angustifolia* or *Typha latifolia*. Other common and/or abundant species may include *Dulichium arundinaceum, Impatiens capensis, Iris versicolor, Juncus canadensis, Ludwigia palustris, Pilea pumila, Sparganium americanum*, and *Thelypteris palustris*. These marshes have become heavily invaded by the exotic *Lythrum salicaria*. In addition, this community supports NJ state-critically imperiled *Acorus americanus* and MA state-imperiled *Lobelia kalmii*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only known occurrence of this association is an herbaceous wetland dominated by *Typha angustifolia* and *Lysimachia terrestris*. Total herbaceous cover is 80% and shrubs are absent. Other herbaceous associates include *Carex canescens, Carex scoparia, Cicuta bulbifera, Frangula alnus, Glyceria canadensis, Scirpus cyperinus, Spiraea tomentosa*, and *Triadenum fraseri*. Nonvascular cover is >80% and dominated by *Sphagnum* spp.

Global Vegetation: Tall graminoids dominate the vegetation; scattered shrubs are often present (usually totaling less than 25% cover) and are frequently shorter than the graminoids. Trees are absent. Bryophyte cover varies and is

rarely extensive; bryophytes are mostly confined to the hummocks. *Typha angustifolia, Typha latifolia*, or their hybrid *Typha x glauca* dominate, either alone or in combination with other tall emergent marsh species. Associated species vary widely; sedges, such as *Carex aquatilis, Carex lurida, Carex pellita (= Carex lanuginosa), Carex rostrata, Carex stricta, Scirpus cyperinus*, and bulrushes, such as *Schoenoplectus americanus (= Scirpus americanus)* and *Schoenoplectus acutus (= Scirpus acutus)*, occur along with patchy grasses, such as *Calamagrostis canadensis*. Broad-leaved herbs include *Asclepias incarnata, Calla palustris, Impatiens capensis, Onoclea sensibilis, Sagittaria latifolia, Scutellaria lateriflora, Sparganium eurycarpum, Symplocarpus foetidus, Thelypteris palustris*, and *Verbena hastata*. Floating aquatics, such as *Lemna minor*, may be common in deeper zones. Shrub species vary across the geographic range of this type; in the northern part of its range, *Myrica gale, Ilex verticillata*, and *Spiraea alba* are common. The invasive plants *Lythrum salicaria* and *Phragmites australis* may be abundant in parts of some occurrences.

Global Dynamics: This association is often found in impounded waters.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phalaris arundinacea*, *Typha latifolia*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Typha angustifolia*, *Typha latifolia*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Lysimachia terrestris*
Herb (field)	Graminoid	*Typha angustifolia*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Typha angustifolia*, *Typha latifolia*, *Typha* x *glauca*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Phalaris arundinacea*, *Typha latifolia*
Appalachian National Scenic Trail (Lower New England Project Area): *Impatiens capensis*, *Thelypteris palustris*, *Typha angustifolia*, *Typha latifolia*
Appalachian National Scenic Trail (Northern Appalachian Project Area):
Global: *Carex* spp., *Equisetum* spp., *Onoclea sensibilis*, *Polygonum* spp., *Schoenoplectus acutus*, *Schoenoplectus americanus*, *Typha angustifolia*, *Typha latifolia*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Acorus americanus* (G5, NJ state-critically imperiled), *Lobelia kalmii* (G5, MA state-imperiled); **Invasive/Exotic Plants**: *Lythrum salicaria* (High), *Typha angustifolia* (High/Medium)
Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Frangula alnus* (High/Medium, exotic/invasive), *Typha angustifolia* (High/Medium)
Global: Invasive/Exotic Plants: *Lythrum salicaria* (High), *Phragmites australis* (High), *Typha angustifolia* (High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Typha latifolia* Southern Ruderal Marsh (CEGL004150)
- *Typha* spp. - *Schoenoplectus acutus* - Mixed Herbs Midwest Marsh (CEGL002229)
- *Typha* spp. - *Schoenoplectus tabernaemontani* - Mixed Herbs Southern Great Lakes Shore Marsh (CEGL005112)
- *Typha* spp. Midwest Marsh (CEGL002233)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community is interdigitated with Eastern Ruderal Reed Canarygrass Marsh (CEGL006044) in the example sampled at Hogestown Run in Pennsylvania.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: In the Unionville West site in New Jersey, the cattail marsh is a bit more diverse than just cattails. It is surrounded by a shrub swamp and Red Maple / Upright Sedge Wet Woodland (CEGL006119).
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: *Typha angustifolia* can grow in deeper water compared to *Typha latifolia*, although both species reach maximum growth at a water depth of 50 cm (Grace and Wetzel 1981). *Typha* often occurs in pure stands and can colonize areas recently exposed by either natural or human causes.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: One example was sampled in Cumberland County, Pennsylvania, where the Hogestown Run intersects the Appalachian Trail in the Central Appalachian project area.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Lake Buel Road Wetlands Natural Heritage Site in Massachusetts, Parker Lake and Unionville West in New Jersey, and at Lottery Road Swamp in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from one location southeast of Balch Hill in New Hampshire.
Global Range: This association occurs throughout the northeastern U.S. from Maine to Virginia and possibly North Carolina.
Nations: US
States/Provinces: CT, DC?, DE:S4, MA, MD, ME:S5, NC?, NH:S4?, NJ:S5, NY, PA:S5, RI, VA, VT, WV?
TNC Ecoregions: 48:C, 49:C, 51:C, 52:C, 58:P, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Aa:CCP, 221Ab:CCC, 221Ae:CCC, 221Ai:CCC, 221Al:CCC, 221Ba:CCP, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Fa:CCC, 222Ib:CCC, 222Ic:CCC, 231:C, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, M212A:CP, M212Bb:CCC, M212C:CP, M212D:CC, M212Ea:CCC, M212Eb:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Da:CCC, M221Db:CCP, M221Dc:CCP, M221Dd:CCP
Federal Lands: NPS (Acadia, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Blue Ridge Parkway?, Boston Harbor Islands, C&O Canal, Cape Cod, Delaware Water Gap, Harpers Ferry, Johnstown Flood, Manassas, Minute Man, National Capital-East, Saint-Gaudens, Saratoga, Upper Delaware); USFS (Nantahala?, Pisgah?); USFWS (Aroostook, Assabet River, Carlton Pond?, E.B. Forsythe, Erie, Great Meadows, Great Swamp, Iroquois, Monomoy, Montezuma, Moosehorn, Nulhegan Basin, Oxbow, Patuxent, Pondicherry?, Prime Hook, Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HECM, XBMV
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: This community was observed in the Central Appalachian project area by Pennsylvania Natural Heritage ecologist Tony Davis during the summer of 2011.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 observation point): APPA.1335.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 2 observation points; 14 accuracy assessment points): APPA.0045, APPA.0951, APPA.1360, APPA.1373, APPA_AA_1645, APPA_AA_1667, APPA_AA_1957, APPA_AA_1978, APPA_AA_2072, APPA_AA_2173, APPA_AA_2205, APPA_AA_2386, APPA_AA_2444, APPA_AA_2472, APPA_AA_2739, APPA_AA_2858, APPA_AA_3147, APPA_AA_3340.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 observation point; 2 accuracy assessment points): APPA.1528, APPA_AA_3032, APPA_AA_3285.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Clancy 1996, Cowardin et al. 1979, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Eichelberger 2011d, Fike 1999, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Gawler et al. 2005, Grace and Wetzel 1981, Harrison 2004, Harrison 2011, Largay and Sneddon 2010, Lubinski et al. 2003, Metzler and Barrett 2001, Metzler and Barrett 2006, NRCS 2004a, NatureServe 2009, Northern Appalachian Ecology Working Group 2000, Perles et al. 2006e, Perles et al. 2007, Perles et al. 2008, Rawinski 1984a, Schafale 2012, Sneddon et al. 2010, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zimmerman et al. 2012

G167. EASTERN NORTH AMERICAN SHRUB SWAMP

Group Summary Description: This group encompasses mineral-soil wetlands dominated by tall shrubs in the northeastern and north-central United States and adjacent Canada. It is best developed in glaciated territory but extends southward in the mountains to West Virginia. These shrublands develop in poorly drained basins and along smaller low-gradient streams, on mineral soils with or without a well-decomposed muck layer. The classic physiognomy is a dense cover of shrubs over 1 m tall, and often over 2 m tall. Trees may be scattered but form less than 25% cover. Herb cover varies depending on how much light reaches the ground. The most common dominant is *Alnus*, either *Alnus incana ssp. rugosa* or *Alnus serrulata*. Other important species include *Cornus sericea* and *Spiraea alba*. Associates include *Ilex verticillata, Viburnum nudum var. cassinoides*, and *Salix* spp. This group also includes wetlands where the above species may be only incidental, if present at all, with dominance by *Cephalanthus occidentalis* or, less commonly, *Vaccinium corymbosum*. Typical herbs of these swamps include *Calamagrostis canadensis, Thelypteris palustris, Eupatorium maculatum, Lycopus uniflorus, Impatiens capensis, Chelone glabra*, and *Onoclea sensibilis*. This group includes wetlands that are more-or-less stable shrub swamps, as well as shrub swamps on formerly cleared lands that may be developing into wooded swamps.

A3684 *Alnus incana - Cornus amomum* Alluvial & Tidal Shrub Swamp Alliance

Alliance Summary Description: This alliance comprises tall alluvial and freshwater tidal shrublands in the northeastern and north-central United States and temperate regions of eastern Canada. These tall shrublands are dominated or characterized by *Alnus serrulata, Alnus incana*, or *Alnus maritima ssp. maritima* and *Cornus amomum* or *Cornus sericea*. The substrate can be muck overlying mineral soils or cobble, gravel and sandy silt to silt mixes. The soils tend to dry out over the course of the year.

[CEGL006062] *Alnus incana - Cornus (amomum, sericea) / Clematis virginiana* Shrub Swamp

Translated Name: **Gray Alder - (Silky Dogwood, Red-osier Dogwood) / Devil's Darning-needles Shrub Swamp**
Common Name: **Alluvial Alder Thicket**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Eastern North American Shrub Swamp (G167)
Alliance	*Alnus incana - Cornus amomum* Alluvial & Tidal Shrub Swamp Alliance (A3684)

ELEMENT CONCEPT

Global Summary: These shrublands occur along large streams and rivers in New England, northern New York and western Pennsylvania. They are found on river-margin alluvial deposits of moderate-energy reaches, where the flooding regime prevents forests from developing. The setting can range from flats to moderately steep banks; soils are usually sandy or silty and have little organic matter. Most are temporarily flooded, and the soils may not remain saturated through the entire growing season. Tall shrubs (1.5-3 m in height) dominate the vegetation, usually forming at least 50% cover and often creating a dense thicket. The amount of lower shrub and herb vegetation varies inversely with the tall-shrub canopy. Bryophytes are usually sparse but may be locally abundant in some settings.

Alnus incana is a constant and usually dominant shrub. In some cases, *Alnus serrulata* (in more temperate settings) or *Alnus viridis* (in more boreal settings) may occur with or in place of *Alnus incana*. The ability of alders to bend under strong currents and their nitrogen-fixing root nodules may give alders a competitive advantage over other shrubs in this setting. *Cornus sericea* or *Cornus amomum*, along with *Salix* spp., are frequent associates and may dominate in some areas. *Viburnum nudum var. cassinoides* is occasional but not abundant. *Acer rubrum, Prunus serotina, Ulmus americana*, and/or *Acer saccharinum* may be present, as sparse individuals; in more southerly examples of this type, *Acer negundo* and *Salix nigra* may occur. *Spiraea alba* is usually present and may be abundant as a lower shrub. *Clematis virginiana* is a typical vine, often clambering in tangles on the shrubs. This type is distinguished from other northeastern *Alnus*-dominated associations by its alluvial setting. Although common, this association is little studied and comprehensive surveys have yet to be undertaken.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This riparian shrubland occurs on river-margin alluvial deposits of moderate- to high-energy river reaches, where the flooding regime prevents forests from developing. The sampled site is a temporarily alluvial flat with very poorly drained soil. The unvegetated surface is entirely standing water. Evidence of disturbance includes a minor presence of exotic plants.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This shrubland association occurs locally throughout the Northern Appalachian project area in intermittently to seasonally flooded low level positions at elevations ranging from 500 to 1,600 m (1,640-5,250 feet). Positions are typically flat, but may occasionally have gentle slopes. Soils are poorly drained silt loam and silty clay loam.
Global Environment: These shrublands occur along large streams and rivers in New England, northern New York and western Pennsylvania. They are found on river-margin alluvial deposits of moderate-energy reaches, where the flooding regime prevents forests from developing. The setting can range from flats to moderately steep banks; soils are usually sandy or silty. Most are temporarily flooded, and the soils may not remain saturated through the entire growing season.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The tall-shrub layer is dominated by *Alnus incana, Crataegus* sp., and *Salix sericea*; *Spiraea alba* is present as a short shrub. The herb layer is dominated by *Onoclea sensibilis, Lysimachia nummularia* (exotic), and *Solidago* sp.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by open to dense shrub thickets dominated by *Alnus incana*. *Rubus idaeus* is codominant at some sites. Total shrub cover ranges from 50-80%. Other shrub associates include *Cornus sericea, Corylus cornuta, Sambucus nigra*, and *Viburnum nudum*. Herbaceous cover is variable, may be open to very dense and typically is dominated by the graminoid *Calamagrostis canadensis*. Other herbaceous associates include *Eupatorium maculatum, Galium asprellum, Oclemena acuminata, Onoclea sensibilis, Solidago rugosa*, and *Thalictrum pubescens*. *Clematis virginiana, Boehmeria cylindrica, Matteuccia struthiopteris, Elymus virginicus*, and *Osmunda claytoniana* are characteristic. Floodplain trees such as *Ulmus americana* may be occasional.
Global Vegetation: Tall shrubs (1.5-3 m in height) dominate the vegetation, usually forming at least 50% cover and often creating a dense thicket. The amount of lower shrub and herb vegetation varies inversely with the tall-shrub canopy. Bryophytes are usually sparse but may be locally abundant in some settings. *Alnus incana* is a constant and usually dominant shrub. In some cases, *Alnus serrulata* (in more temperate settings) or *Alnus viridis* (in more boreal settings) may occur with or in place of *Alnus incana*. The ability of alders to bend under strong currents and their nitrogen-fixing root nodules may give alders a competitive advantage over other shrubs in this setting. *Cornus sericea* or *Cornus amomum*, along with *Salix* spp., are frequent associates and may dominate in some areas. *Viburnum nudum var. cassinoides* is occasional but not abundant. *Acer rubrum, Prunus serotina, Ulmus americana*, and/or *Acer saccharinum* may be present as sparse individuals; in more southerly examples of this type, *Acer negundo* and *Salix nigra* may occur. *Spiraea alba* is usually present and may be abundant as a lower shrub. *Clematis virginiana* is a typical vine, often clambering in tangles on the shrubs. Common herbs include *Doellingeria umbellata (= Aster umbellatus), Calamagrostis canadensis, Boehmeria cylindrica, Elymus riparius, Elymus virginicus, Eupatorium maculatum, Iris versicolor, Lycopus uniflorus, Lysimachia ciliata, Lysimachia terrestris, Osmunda claytoniana, Matteuccia struthiopteris, Muhlenbergia glomerata, Onoclea sensibilis*, and *Thalictrum pubescens*.
Global Dynamics: On river reaches subject to ice-scour, the shrubs may be regularly killed back almost to their roots and may be shorter than 1.5 m in at least the first year of regrowth.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus incana*, *Salix sericea*
Short shrub/sapling	Broad-leaved deciduous shrub	*Spiraea alba*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus incana*, *Rubus idaeus*
Herb (field)	Graminoid	*Calamagrostis canadensis*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Liana	*Clematis virginiana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus incana*, *Cornus amomum*, *Cornus sericea*
Short shrub/sapling	Broad-leaved deciduous shrub	*Spiraea alba*
Herb (field)	Flowering forb	*Boehmeria cylindrica*
Herb (field)	Graminoid	*Calamagrostis canadensis*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Alnus incana*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Alnus incana*, *Calamagrostis canadensis*
Global: *Alnus incana*, *Clematis virginiana*, *Cornus amomum*, *Cornus sericea*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Lysimachia nummularia* (Medium/Low)
Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Galeopsis tetrahit* (exotic/invasive), *Rubus idaeus*, *Vicia cracca* (exotic/invasive)
Global: Vulnerable Plants: *Pedicularis furbishiae* (G1G2)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- *Alnus (incana ssp. rugosa, serrulata)* - *Cornus amomum* Tidal Shrub Swamp (CEGL006337) freshwater tidal settings.
- *Alnus incana* - *Viburnum recognitum / Calamagrostis canadensis* Shrub Swamp (CEGL006546)
- *Alnus incana* Shrub Swamp (CEGL002381) saturated basin swamp settings.
- *Alnus incana ssp. rugosa* - *Nemopanthus mucronatus / Sphagnum* spp. Acidic Peatland (CEGL006158) peatland settings.
- *Cornus (amomum, sericea)* - *Viburnum dentatum* - *Rosa multiflora* Ruderal Shrub Swamp (CEGL006576)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This is an alluvial community associated with moderate- to high-velocity rivers. Alder swamps of saturated basins, beaver-impacted wetlands and small, low-velocity streams dominated by *Alnus incana* are classified as Gray Alder Shrub Swamp (CEGL002381).
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type is currently broadly defined, as detailed studies of riparian shrublands in the Northeast are few. Stands dominated by *Alnus* versus those dominated by *Salix* and *Cornus* appear different and may be separable as distinct types with additional survey data. Likewise, higher-energy *Alnus* thickets close to the channel may be distinct from lower-energy thickets in alluvium that is further removed from the channel, but additional data are needed.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Upper Ottauquechee Shrub Meadows in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from Caratunk, Baxter State Park, Jones Pond, Crawford Notch and Black Brook in Maine.
Global Range: This shrub swamp of moderate- to high-energy floodplains occurs in New England and south to Pennsylvania.
Nations: US
States/Provinces: CT, MA, ME:S2, NH, NY, PA, RI, VT
TNC Ecoregions: 49:C, 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212A:CP, 212B:CP, 212C:CP, 212D:CP, 212E:CP, 221Fa:CCC, M212Ae:CCC, M212Bb:CCC, M212C:CP, M212D:CP
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Saint-Gaudens); USFWS (Aroostook, Erie, Great Meadows, Nulhegan Basin)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SAST, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 observation point; 5 accuracy assessment points): APPA.1510, APPA_AA_1671, APPA_AA_1934, APPA_AA_1966, APPA_AA_2021, APPA_AA_2863.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 4 observation points; 9 accuracy assessment points): APPA.0467, APPA.0984, APPA.1553, APPA.1621, APPA.1637, APPA.1681, APPA_AA_2119, APPA_AA_2138, APPA_AA_2198, APPA_AA_2574, APPA_AA_2658, APPA_AA_2885, APPA_AA_3028, APPA_AA_3096, APPA_AA_3210.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Cowardin et al. 1979, Eastern Ecology Working Group n.d.*, Enser 1999, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Lubinski et al. 2003, Metzler and Barrett 2001, Metzler and Barrett 2006, Nichols et al. 2001, Sperduto and Nichols 2004, Swain and Kearsley 2000, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

A3685 *Alnus* spp. - *Salix* spp. Lakeshore & Depression Shrub Swamp Alliance

Alliance Summary Description: This alliance contains tall-shrub swamps in the northeastern and north-central United States and eastern temperate Canada in a variety of non-alluvial topographic depressions. The vegetation is dominated by *Alnus incana, Alnus serrulata, Salix sericea*, or *Hypericum densiflorum*. Associates may include *Cornus sericea, Rosa palustris, Spiraea alba var. alba, Spiraea alba var. latifolia (= Spiraea latifolia), Viburnum nudum var. cassinoides*, and others. These wetlands are often successional following disturbance. They are found in beaver meadows, lakeshores, headwater wetlands, and basin wetlands, as well as backwater floodplains of streams and rivers. Soils vary from deep organic mucks to mineral soils with high organic content (muck), and are saturated for much of the year.

[CEGL002381] *Alnus incana* Shrub Swamp

Translated Name: **Gray Alder Shrub Swamp**
Common Name: **Gray Alder Shrub Swamp**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Eastern North American Shrub Swamp (G167)
Alliance	*Alnus* spp. - *Salix* spp. Lakeshore & Depression Shrub Swamp Alliance (A3685)

ELEMENT CONCEPT

Global Summary: This alder swamp community is widespread in the midwestern and northeastern United States and southern Canada. Stands occur on shores, edges of beaver meadows in stream floodplains, swales associated with small streams in peatlands, or upland forests. Soils are well-decomposed peat, muck or mineral soils. The hydrology is typically seasonally flooded, with most sites remaining saturated. The vegetation is dominated by tall shrubs, 2-8 m in height, with a moderately open to dense shrub canopy. There is an understory of shorter shrubs and herbaceous species. The density of the understory varies inversely with the tall-shrub canopy. The overstory is usually overwhelmingly dominated by *Alnus incana*, but in the more southeastern portions of this type's range, *Alnus serrulata* can occur with *Alnus incana*. Where alder is not as dominant, other shrubs, such as *Cornus sericea, Ilex verticillata, Rubus idaeus, Salix* spp., *Spiraea alba, Spiraea tomentosa*, and *Viburnum* spp., can be found. At the southern range limit of this type in West Virginia, shrub layers may by be dominated or codominated by the Central Appalachian endemic *Ilex collina*. The herbaceous layer contains species such as *Symphyotrichum lanceolatum var. lanceolatum (= Aster simplex), Symphyotrichum puniceum (= Aster puniceus), Calamagrostis canadensis, Caltha palustris, Carex lacustris, Carex prairea, Carex trisperma, Doellingeria umbellata (= Aster umbellatus), Eupatorium maculatum, Glyceria melicaria, Glyceria striata, Impatiens capensis, Lycopus uniflorus, Onoclea sensibilis, Osmunda cinnamomea, Rubus pubescens, Scirpus atrovirens, Symplocarpus foetidus, Thelypteris palustris, Typha* spp., and *Viola* spp. Mosses include *Climacium dendroides* and *Sphagnum* spp. Where the tall-shrub canopy is open, graminoids can become dense. Scattered trees are found in many stands, including *Acer rubrum, Fraxinus nigra*, and *Thuja occidentalis*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: These alder swamps occur in saturated basins, beaver-impacted wetlands and along small, low-velocity streams. It commonly occurs in the Northern Appalachian project area. Sites are saturated to intermittently flooded basins with very poorly drained muck soils. The unvegetated surface consists of leaf litter. Evidence of disturbance includes alterations to hydrology (beaver activity), past clearing and a minor presence of exotic plants.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This shrubland association occurs occasionally throughout the Northern Appalachian project area in intermittently and seasonally flooded basin floors and channel beds at elevations ranging from 250 to 1,200 m (820-3,940 feet). Positions are typically flat but may be gently sloping. Soils are variable and may consist of silt loam, clay loam, muck or organic material. The hydrologic regime may be heavily influenced by beaver activity.

Global Environment: Sites are typically along streams, lakeshores, edges of beaver meadows, swales associated with small streams in peatlands or upland forests, or near seeps. Most have little to no slope, but some sites are on moderate slopes. Hydrologic conditions can range from temporarily flooded to seasonally flooded, or even saturated, but are typically seasonally flooded/saturated. The water ranges from non-stagnant, nutrient-rich, and often slightly calcareous (Curtis 1959) to rather stagnant and nutrient-poor where over acidic bedrock or till. Soils are wet, often mucks or peats (Anderson 1982, Chapman et al. 1989). In the upper Midwest, this community is found on Precambrian Shield bedrock that is overlaid with sandy loam soils, which are moderately well-drained and deep (>60 cm). In northeastern Minnesota stands can occur on northeast- and south-facing slopes that are moderate to steep, with slopes ranging from 4 to 45% (Ohmann and Ream 1971). The climate is highly variable, with temperature extremes between -46° and 38°C and 58-91 cm precipitation.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These swamps are dominated by *Alnus incana ssp. rugosa*. Northern species such as *Nemopanthus mucronatus* and *Myrica gale* differentiate this type. Other shrubs, such as *Cornus sericea, Rubus idaeus, Salix* spp., *Spiraea alba, Spiraea tomentosa*, and *Viburnum* spp., are may occur. Common and/or abundant herbs may include *Calamagrostis canadensis, Carex lurida, Eupatorium maculatum, Impatiens capensis, Juncus effusus, Leersia oryzoides*, and *Onoclea sensibilis*. Mosses, including *Sphagnum centrale* and *Sphagnum girgensohnii*, may carpet the ground. In addition, this community supports MA state-critically imperiled *Agrimonia parviflora* and *Carex lupuliformis*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by open to dense thickets of *Alnus incana* with cover typically exceeding 50%. Other shrub associates include *Ilex verticillata, Salix sericea, Spiraea alba, Viburnum dentatum, Viburnum nudum*, and *Viburnum recognitum*. The herbaceous layer may be open to very dense and may be dominated by graminoids or ferns. The most consistent dominant species include *Calamagrostis canadensis, Carex stricta*, and *Onoclea sensibilis*. Other herbaceous associates include *Arisaema triphyllum, Carex echinata, Carex intumescens, Carex leptalea, Carex*

stipata, Dryopteris cristata, Galium asprellum, Impatiens capensis, Lysimachia terrestris, Osmunda cinnamomea, Solidago rugosa, Thalictrum pubescens, and *Triadenum virginicum*.

Global Vegetation: The vegetation is dominated by tall shrubs, 2-8 m in height, with a moderately open to dense shrub canopy. There is an understory of shorter shrubs and herbaceous species. The density of the understory varies inversely with the tall-shrub canopy. The overstory is usually overwhelmingly dominated by *Alnus incana*, but in the more southeastern portions of this type's range, *Alnus serrulata* can occur with *Alnus incana*. Where alder is not as dominant, other shrubs, such as *Cornus sericea, Ilex verticillata, Rubus idaeus, Salix* spp., *Spiraea alba, Spiraea tomentosa*, and *Viburnum* spp., can be found. The herbaceous layer contains species such as *Symphyotrichum lanceolatum var. lanceolatum (= Aster simplex), Symphyotrichum puniceum (= Aster puniceus), Calamagrostis canadensis, Caltha palustris, Carex lacustris, Carex prairea, Carex trisperma, Doellingeria umbellata (= Aster umbellatus), Eupatorium maculatum, Impatiens capensis, Lycopus uniflorus, Onoclea sensibilis, Osmunda cinnamomea, Rubus pubescens, Scirpus atrovirens, Symplocarpus foetidus, Thelypteris palustris, Typha* spp., and *Viola* spp. Mosses include *Climacium dendroides* and *Sphagnum* spp. Where the tall-shrub canopy is open, the graminoids can become dense. Scattered trees are found in many stands, including *Acer rubrum, Fraxinus nigra*, and *Thuja occidentalis* (Curtis 1959, Anderson 1982, MNNHP 1993, Harris et al. 1996, Sperduto 2000b, Thompson and Sorenson 2000, Gawler 2002). Where stands border on saturated conditions with peaty soils, peatland species such as *Chamaedaphne calyculata, Rhododendron canadense*, and *Sphagnum* spp. may be present.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus incana* ssp. *rugosa*
Herb (field)	Flowering forb	*Eupatorium maculatum*
Nonvascular	Moss	*Sphagnum centrale*, *Sphagnum girgensohnii*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus incana*
Herb (field)	Graminoid	*Calamagrostis canadensis*, *Carex stricta*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus incana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Alnus incana* ssp. *rugosa*, *Eupatorium maculatum*, *Impatiens capensis*, *Onoclea sensibilis*, *Sphagnum centrale*, *Sphagnum girgensohnii*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Alnus incana*, *Onoclea sensibilis*
Global: *Alnus incana*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Agrimonia parviflora* (G5, MA state-critically imperiled), *Carex lupuliformis* (G4, MA state-critically imperiled);
Invasive/Exotic Plants: *Lonicera morrowii* (High/Medium)
Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Frangula alnus* (High/Medium, exotic/invasive)
Global: Vulnerable Plants: *Ilex collina* (G3, Southern Blue Ridge endemic), *Polemonium vanbruntiae* (G3G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (23-Jun-2006). This association is widely distributed and considered secure in many states.

RELATED CONCEPTS

Global Similar Types:
- *Alnus incana - Cornus (amomum, sericea) / Clematis virginiana* Shrub Swamp (CEGL006062)
- *Alnus incana ssp. rugosa - Nemopanthus mucronatus / Sphagnum* spp. Acidic Peatland (CEGL006158)
- *Alnus serrulata / Calamagrostis canadensis* Shrub Swamp (CEGL005082)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This is an alder swamp of saturated basins, beaver-impacted wetlands, and small, low-velocity streams. Alluvial alder swamps associated with moderate- to high-velocity rivers are classified as Alluvial Alder Thicket (CEGL006062).
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Type has a very broad distribution, and there may be a need to separate a northern (more boreal) type from a southern (more temperate) type, or perhaps an enriched versus lower-nutrient type, based on floristic differences. Hydrology may be quite variable, ranging from temporarily flooded to semipermanently flooded. In Ohio, this association sometimes merges with *Alnus serrulata* stands in *Alnus serrulata / Calamagrostis canadensis* Shrub Swamp (CEGL005082); that association is distinguished by somewhat more southern associates, including *Rhododendron viscosum, Lindera benzoin, Peltandra virginica*, etc.. With increasing tree canopy cover, this association can be similar to *Larix laricina* forest types, *Thuja occidentalis* saturated forest types, and *Fraxinus nigra - Acer rubrum* saturated forest types.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Hubbard Brook Natural Heritage Site in Massachusetts and at Mt. Tabor South in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from southeast of Balch Hill in New Hampshire and Caratunk, West Branch Penobscot River, Nahmakanta Lake, North Pond, east of Upper Baker Pond, Bog Brook and Joe's Hole in Maine.
Global Range: This alder swamp shrubland is widespread in the midwestern and northeastern United States and southern Canada, ranging from Maine west to Manitoba, south to Iowa, and east to New York and perhaps northern New Jersey.
Nations: CA, US
States/Provinces: IA:S3?, IL, IN?, MA, MB?, ME, MI:S5, MN:S5, ND:S2?, NH:S3S4, NY, OH, ON, PA, QC:S4S5, VT, WI:S4, WV:S3
TNC Ecoregions: 34:C, 35:C, 46:C, 47:C, 48:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, 212Fc:CCC, 212Ha:CCP, 212Hb:CCP, 212He:CCP, 212Hh:CCP, 212Hi:CCC, 212Hj:CCP, 212Hk:CCP, 212Hl:CCC, 212Hm:CCP, 212Hn:CCP, 212Ho:CCC, 212Hp:CCP, 212Hq:CCC, 212Hr:CCP, 212Hs:CCP, 212Ht:CCC, 212Hv:CCP, 212Hw:CCC, 212Hy:CCP, 212Ia:CCC, 212Ib:CCC, 212Ja:CCP, 212Jb:CCP, 212Jc:CCP, 212Je:CCP, 212Jf:CCC, 212Jj:CCP, 212Jk:CCP, 212Jl:CCP, 212Jm:CCP, 212Jn:CCP, 212Jo:CCP, 212Jr:CCC, 212Ka:CCP, 212Kb:CCC, 212La:CCC, 212Lb:CCC, 212Mb:CPP, 212Na:CCC, 212Nb:CCP, 212Nc:CCC, 221Ae:CCC, 221Ak:CCP, 221Al:CCP, 221Bc:CCC, 222Je:CCC, 222Lb:CCC, 222Lc:CCC, 222Mc:CCC, 222Md:CCC, 222Na:CCC, 251Aa:CCC, 251Ab:CCC, M212Aa:CCC, M212Ac:CCC, M212Ae:CCC, M212Af:CCC, M212B:CC, M212C:CC, M212D:CP
Federal Lands: NPS (Acadia, Apostle Islands, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Cuyahoga Valley, Grand Portage, Indiana Dunes, Isle Royale, Mississippi, Pictured Rocks, Saint Croix, Saratoga, Sleeping Bear Dunes, Upper Delaware, Voyageurs); USFS (Chequamegon, Chequamegon-Nicolet, Chippewa, Huron, Huron-Manistee, Manistee, Monongahela, Nicolet, Ottawa, Superior); USFWS (Aroostook, Assabet River, Canaan Valley, Carlton Pond, Moosehorn?, Nulhegan Basin, Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SAST, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 7 accuracy assessment points): APPA.0047, APPA.0816, APPA_AA_1730, APPA_AA_2202, APPA_AA_2307, APPA_AA_2348, APPA_AA_2352, APPA_AA_2482, APPA_AA_3054.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (5 plots; 5 observation points; 17 accuracy assessment points): APPA.0723, APPA.0733, APPA.0773, APPA.0881, APPA.0884, APPA.1529, APPA.1639, APPA.1646, APPA.1647, APPA.1673, APPA_AA_1647, APPA_AA_1657, APPA_AA_1701, APPA_AA_1787, APPA_AA_2097, APPA_AA_2271, APPA_AA_2323, APPA_AA_2686, APPA_AA_2734, APPA_AA_2755, APPA_AA_2830, APPA_AA_2836, APPA_AA_2933, APPA_AA_2944, APPA_AA_2974, APPA_AA_3178, APPA_AA_3243.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay

Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): D. Faber-Langendoen and S.C. Gawler
References: Anderson 1982, Anderson and Schwegman 1991, Breden et al. 2001, Byers et al. 2007, CDPNQ unpubl. data, Chapman et al. 1989, Curtis 1959, Darlington 1943, DeMeo et al. 1998, Edinger et al. 2002, Edinger et al. 2007, Faber-Langendoen 2001, Fike 1999, Fortney 1975, Fortney et al. 2005, Gawler 2002, Gawler and Cutko 2010, Greenall 1996, Harris et al. 1996, Homoya et al. 1988, Hop et al. 1999, Hop et al. 2010a, Hop et al. 2010b, Hop et al. 2010c, INAI n.d., Kost et al. 2007, Lee et al. 1998, Lubinski et al. 2003, MNNHP 1993, Midwestern Ecology Working Group n.d.*, Minnesota DNR 2003, Minnesota DNR 2005a, NDNHI unpubl. data, NRCS 2004a, ONHD unpubl. data, Ohmann and Ream 1971, Perles et al. 2008, Rentch 2003, Robinette 1966, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2001, TNC 1999b, Thompson and Sorenson 2000, WNDD unpubl. data, WNHI 2011, WNHI unpubl. data, Walbridge 1982, Walbridge and Lang 1982, White and Madany 1978

A3670 *Cephalanthus occidentalis - Decodon verticillatus* Shrub Swamp Alliance

Alliance Summary Description: The alliance is wide-ranging, throughout glaciated regions of the midwestern and northeastern United States and adjacent Canada. The vegetation is characterized by *Cephalanthus occidentalis* or *Decodon verticillatus* and occurs in depressions, oxbow ponds, and backwater sloughs of stream and river floodplains in waters 1-2 m deep. Occasional shrub associates include any number of *Salix* spp. or *Cornus* spp., as well as *Ilex verticillata, Rosa palustris, Vaccinium corymbosum*, and *Viburnum dentatum*. Floating aquatics, such as *Lemna* spp., can be common in deepwater habitats, whereas a variety of forbs and graminoids are associates under less flooded conditions. These include *Bidens tripartita, Boehmeria cylindrica, Glyceria* spp., *Leersia oryzoides, Polygonum* spp., *Scutellaria lateriflora, Sium suave*, and a wide variety of *Carex* spp. Inundation is usually continuous throughout the year, but these sites can become dry in mid or late summer or during periods of prolonged drought.

[CEGL006069] *Cephalanthus occidentalis - Decodon verticillatus* Shrub Swamp

Translated Name: **Common Buttonbush - Swamp-loosestrife Shrub Swamp**
Common Name: **Northeastern Buttonbush Shrub Swamp**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Eastern North American Shrub Swamp (G167)
Alliance	*Cephalanthus occidentalis - Decodon verticillatus* Shrub Swamp Alliance (A3670)

ELEMENT CONCEPT

Global Summary: This buttonbush swamp occurs in the northeastern United States. These swamps experience prolonged or semipermanent flooding for much of the growing season, with water tables receding below the soil surface only during drought or very late in the growing season. They occur in a variety of environmental settings, including backwater sloughs or oxbow ponds, wet swales in floodplains, pond and lake borders, and small, isolated depressions where water levels recede very slowly, such as those with perched water tables. The substrate is typically loose muck. *Cephalanthus occidentalis* is dominant and often monotypic. Occasional associates depend on the environmental setting and most often occur in drier areas. They include *Vaccinium corymbosum, Rhododendron viscosum, Acer rubrum, Cornus* spp. closer to upland borders, or *Acer saccharinum, Fraxinus pennsylvanica*, and *Viburnum dentatum* where adjacent to floodplains, or *Decodon verticillatus, Chamaedaphne calyculata*, and *Spiraea alba var. latifolia* in more stagnant basins. Herbaceous species tend to be sparse but can include *Glyceria canadensis, Dulichium arundinaceum, Carex stricta, Scirpus cyperinus, Thelypteris palustris, Leersia oryzoides, Acorus calamus, Alisma plantago-aquatica, Polygonum* spp., *Sparganium* spp., and floating or submerged aquatic species such as *Lemna minor, Potamogeton natans*, and *Nuphar variegata (= Nuphar lutea ssp. variegata)*. Bryophytes, if present, cling to shrub bases and include *Warnstorfia fluitans (= Drepanocladus fluitans), Drepanocladus aduncus*, or *Sphagnum fallax*. In disturbed areas, these wetland may be invaded by *Lythrum salicaria*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This buttonbush swamp occurs in a variety of environmental settings, including backwater sloughs or oxbow ponds, wet swales in floodplains, pond and lake borders, and small, isolated depressions throughout the northeastern United States. Sites are seasonally to permanently flooded depressions with very poorly drained organic/muck or silt loam soils. The unvegetated surface is made up of various combinations of leaf litter, downed wood, and/or standing water. One site may be an old quarry pit. Evidence of disturbance includes a minor presence of exotic plants.
Global Environment: This association includes buttonbush swamps that experience prolonged or semipermanent flooding for much of the growing season with water tables receding below the soil surface only during drought or very late in the growing season. They occur in a variety of environmental settings including backwater sloughs or oxbow ponds, wet swales in floodplains, pond and lake borders, and small, isolated depressions where water levels recede very slowly, such as those with perched water tables. Soils are often organic mucks or silt loams.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This shrub swamp is dominated by *Cephalanthus occidentalis*. *Rhododendron* spp. and *Vaccinium corymbosum* may be present at much lower cover. Common and/or abundant herbs include *Bidens connata, Boehmeria cylindrica, Carex comosa, Carex stricta, Lycopus uniflorus*, and *Sium suave*. In addition, this community supports PA state-imperiled *Galium trifidum*.
Global Vegetation: This association includes buttonbush swamps of the eastern and northeastern United States. These swamps experience prolonged or semipermanent flooding for much of the growing season with water tables receding below the soil surface only during drought or very late in the growing season. They occur in a variety of environmental settings including backwater sloughs or oxbow ponds, wet swales in floodplains, pond and lake borders, and small isolated depressions where water levels recede very slowly, such as those with perched water tables. *Cephalanthus occidentalis* is dominant and often monotypic. Scattered *Acer rubrum* trees may be present in the wetland. Occasional associates depend on the environmental setting, and some only occur in drier areas. They include *Vaccinium corymbosum, Rhododendron viscosum, Acer rubrum, Salix* spp., *Cornus amomum* or *Cornus sericea* closer to upland borders, or *Acer saccharinum, Fraxinus pennsylvanica*, or *Viburnum dentatum* where adjacent to floodplains, or *Decodon verticillatus, Chamaedaphne calyculata*, and *Spiraea alba var. latifolia* in more stagnant basins. Herbaceous species tend to be sparse but can include *Glyceria canadensis, Dulichium arundinaceum, Carex stricta, Scirpus cyperinus, Osmunda regalis, Thelypteris palustris, Bidens* spp., *Sium suave, Scutellaria lateriflora, Alisma plantago-aquatica, Polygonum* spp., *Sparganium* spp., and floating or submerged aquatic species such as *Lemna minor, Potamogeton natans*, and *Nuphar variegata (= Nuphar lutea ssp. variegata)*. Bryophytes, if present, cling to shrub bases and include *Warnstorfia fluitans (= Drepanocladus fluitans), Drepanocladus aduncus*, or *Sphagnum fallax*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Cephalanthus occidentalis*
Herb (field)	Flowering forb	*Bidens connata*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Cephalanthus occidentalis*
Herb (field)	Graminoid	*Dulichium arundinaceum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Bidens connata*, *Carex comosa*, *Cephalanthus occidentalis*, *Sium suave*, *Vaccinium corymbosum*
Global: *Cephalanthus occidentalis*, *Dulichium arundinaceum*, *Osmunda regalis*, *Sparganium americanum*, *Vaccinium corymbosum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Galium trifidum* (G5, PA state-imperiled); **Invasive/Exotic Plants**: *Solanum dulcamara* (Low)
Global: Invasive/Exotic Plants: *Lythrum salicaria* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (31-Jan-2007). This association is widely distributed in the northeastern U.S. and relatively common in its small-patch setting. It is vulnerable to groundwater disruption, agricultural runoff, and adjacent forest clearing.

RELATED CONCEPTS

Global Similar Types:
- *Cephalanthus occidentalis - (Leucothoe racemosa) / Carex joorii* Shrub Swamp (CEGL004075)
- *Cephalanthus occidentalis / Carex* spp. - *Lemna* spp. Southern Shrub Swamp (CEGL002191)
- *Cephalanthus occidentalis / Carex* spp. Northern Shrub Swamp (CEGL002190)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type may be synonymous with *Cephalanthus occidentalis / Carex* spp. Northern Shrub Swamp (CEGL002190), although it also ranges south of the glaciation boundary in the east. CEGL002190 is distributed from the Western Allegheny Plateau (TNC Ecoregion 49) and Great Lakes (TNC Ecoregion 48) west to the Central Tallgrass Prairie (TNC Ecoregion 36), while this type occurs from the Central Appalachian Forest (TNC Ecoregion 59) and High Allegheny Plateau (TNC Ecoregion 60) east.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Pennsylvania.
Global Range: This association is found throughout the northeastern United States (an estimated 450,000 square km based on subsection attribution).
Nations: CA, US
States/Provinces: CT, DC, DE:S2, MA, MD, ME, NH, NJ, NY, PA:S4, QC, RI, VA:SU, VT
TNC Ecoregions: 49:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212Dc:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Aa:CCP, 221Ab:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Ea:CCC, 221Fa:CCC, 231:C, 232Ad:CCC, 232Bt:CCC, 232C:CC, 234:C, M212A:CP, M212Bb:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212De:CCC, M212Ea:CCC, M212Eb:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCP, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Boston Harbor Islands, C&O Canal, Cape Cod, Delaware Water Gap, Minute Man, National Capital-East, Saratoga, Weir Farm); USFWS (Assabet River?, Chesapeake Marshlands, Great Meadows, Great Swamp, Monomoy, Nomans Land Island, Oxbow, Patuxent)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SLBS, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 1 accuracy assessment point): APPA.0077, APPA.0653, APPA_AA_3152.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo
Global Description Author(s): S.L. Neid, E. Southgate, L.A. Sneddon, S.C. Gawler, E. Largay
References: Bowman 2000, Breden et al. 2001, CAP pers. comm. 1998, Clancy 1996, Cowardin et al. 1979, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Eichelberger and Zimmerman 2011b, Elliman 2003, Enser 1999, Fike 1999, Fleming and Patterson 2011a, Fleming et al. 2001, Gawler 2002, Gawler and Cutko 2010, Gawler et al. 2005, Harrison 2004, Harrison 2011, Harrison, J. pers. comm., Hopping 2000, Karanaukas 2001, Largay and Sneddon 2010, Metzler and Barrett 2001, Metzler and Barrett 2006, Metzler et al. 2009, NRCS 2004a, Nichols et al. 2001, Perles et al. 2007, Sneddon et al. 2010, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zimmerman et al. 2012

[CEGL005089] *Decodon verticillatus* Shrub Swamp

Translated Name: **Swamp-loosestrife Shrub Swamp**
Common Name: **Swamp-loosestrife Shrub Swamp**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Eastern North American Shrub Swamp (G167)
Alliance	*Cephalanthus occidentalis* - *Decodon verticillatus* Shrub Swamp Alliance (A3670)

ELEMENT CONCEPT

Global Summary: This shrub border occurs as a fringe along aquatic edges of lakes and streams in the northeastern states. *Decodon verticillatus* forms a dense, often monotypic, tangle. *Cephalanthus occidentalis* can occur, but with less abundance than *Decodon verticillatus*. Herbaceous species vary widely, but may include *Nuphar variegata (= Nuphar lutea ssp. variegata), Nymphaea odorata, Peltandra virginica, Pontederia cordata, Utricularia* spp., and *Potamogeton* spp. Where *Decodon*-dominated vegetation occurs adjacent to bog mats, it is considered a part of *Chamaedaphne calyculata - (Gaylussacia dumosa) - Decodon verticillatus / Woodwardia virginica* Acidic Peatland (CEGL006008).

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This community forms a shrub border that occurs as a fringe along aquatic edges of lakes and streams. The sampled site is a saturated depression with very poorly drained soil. No evidence of disturbance was reported.
Global Environment: Vegetation forms as a fringe along aquatic edges of lakes and streams.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Decodon verticillatus* forms a dense, often monotypic tangle. *Cephalanthus occidentalis* can occur, but with less abundance than *Decodon verticillatus*. Other shrubs include *Chamaedaphne calyculata, Clethra alnifolia, Spiraea tomentosa*, and *Vaccinium corymbosum*. Herbs include *Hypericum canadense, Peltandra virginica*, and *Thelypteris palustris*.
Global Vegetation: *Decodon verticillatus* forms a dense, often monotypic, tangle. *Cephalanthus occidentalis* can occur, but with less abundance than *Decodon verticillatus*. Herbaceous species vary widely, but may include *Nuphar variegata (= Nuphar lutea ssp. variegata), Nymphaea odorata, Peltandra virginica, Pontederia cordata, Utricularia* spp., and *Potamogeton* spp.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Clethra alnifolia*, *Decodon verticillatus*, *Vaccinium corymbosum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*
Herb (field)	Flowering forb	*Hypericum canadense*, *Peltandra virginica*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Decodon verticillatus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Decodon verticillatus*
Global: *Decodon verticillatus*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (15-Dec-1994).

RELATED CONCEPTS

Global Similar Types:
- *Decodon verticillatus* Southeastern Shrub Swamp (CEGL003905)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The site in New York is dominated by *Decodon verticillatus*, but other areas are more heavily dominated by shrubs and more *Spiraea tomentosa*.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Harriman State Park in New York.
Global Range: This shrub border occurs as a fringe along aquatic edges of lakes and streams in the northeastern United States and adjacent Canada.
Nations: CA, US
States/Provinces: CT, DE:S3, MA, MD:S5, NH, NJ:S4, NY, ON:S4, PA:S3, QC:S3?, WV?
TNC Ecoregions: 49:C, 58:?, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 221Ab:CCC, 221Ai:CCC, 221Al:CCC, 221Ea:CCC, 221Fa:CCC, 232Ab:CCC, 232Ac:CCC, M221Ac:CCC, M221Ad:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Cape Cod); USFWS (Cape May, E.B. Forsythe, Patuxent, Prime Hook)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SLBS, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot): APPA.0570.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo
Global Description Author(s): S.L. Neid
References: Bowman 2000, Breden et al. 2001, CDPNQ unpubl. data, Clancy 1996, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eichelberger 2011m, Fike 1999, Harrison 2004, Harrison 2011, Lee et al. 1998, Metzler and Barrett 2001, Metzler and Barrett 2006, NatureServe 2009, Sneddon et al. 2010, Swain and Kearsley 2001, WVNHP unpubl. data b, Zimmerman et al. 2012

A3656 *Cornus sericea - Salix* spp. Shrub Swamp Alliance

Alliance Summary Description: This alliance, which is widespread in the midwestern and northeastern United States and eastern temperate Canada, is a wet shrub swamp with organic or mineral soils. Stands are dominated by deciduous shrubs 1-2 m tall with a moderate to nearly continuous shrub canopy. Dominant shrubs are *Cornus sericea, Salix bebbiana, Salix discolor*, and *Salix exigua*. *Vaccinium corymbosum* is codominant in some stands. Other common shrubs include *Alnus incana, Alnus serrulata, Cornus racemosa, Cornus amomum, Sambucus canadensis*, and *Spiraea alba*. Herbaceous and woody vines may be abundant. Typical ground layer species include *Asclepias incarnata, Calamagrostis* spp., *Carex* spp., *Clematis virginiana, Parthenocissus vitacea, Toxicodendron radicans*, and *Typha latifolia*. Scattered trees, such as *Acer* spp., *Fraxinus pennsylvanica*, and *Ulmus americana*, can occasionally be found in this alliance. It is usually found on organic soils, either consolidated peats or mucks. Some stands are on mineral substrates. These sites are usually inundated for part of the growing season and remain wet for most of the year, except in drought years.

[CEGL006576] *Cornus (amomum, sericea) - Viburnum dentatum - Rosa multiflora* Ruderal Shrub Swamp

Translated Name: **(Silky Dogwood, Red-osier Dogwood) - Southern Arrow-wood - Multiflora Rose Ruderal Shrub Swamp**
Common Name: **Ruderal Dogwood - Arrow-wood Shrub Swamp**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Eastern North American Shrub Swamp (G167)
Alliance	*Cornus sericea - Salix* spp. Shrub Swamp Alliance (A3656)

ELEMENT CONCEPT

Global Summary: This tall successional shrub community typically floods early in the growing season and may be saturated to near the surface for some of the growing season, but it is generally dry for much of the year. It typically occurs in low-lying areas of old fields or pastures, or the edges of beaver-impacted wetlands or impoundments. The vegetation is dominated by tall shrubs, usually 2-4 m in height. This is a successional community in transition between a successional old field and a modified successional forest. Vegetation can be highly variable, and no one species is dominant. *Cornus amomum, Cornus sericea, Viburnum dentatum, Spiraea alba var. latifolia, Rosa multiflora, Rubus allegheniensis*, and *Rubus hispidus* are all typically present and abundant. *Salix* spp. may also be present but are less common. Scattered individuals of *Acer rubrum* or *Fraxinus pennsylvanica* may also occur within the shrubland. Herbaceous species are inversely proportional to shrub cover; they can be dense where the shrub canopy is open. Species can include *Solidago rugosa, Solidago gigantea, Eupatorium maculatum, Phragmites australis, Phalaris arundinacea, Apocynum cannabinum, Vernonia* sp., and *Onoclea sensibilis*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This wet successional shrubland occurs in low-lying areas of old fields or pastures that typically flood early in the growing season and may be saturated to near the surface for some of the growing season, but are generally dry for much of the year. One example was sampled in Cumberland County, Pennsylvania, where the Hogestown Run intersects the Appalachian Trail in the Central Appalachian project area.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This tall successional shrub swamp (2-4 m) occurs in low-lying areas of old fields or pastures, or the edges of beaver-impacted wetlands or impoundments.

Global Environment: This tall, modified, wet successional shrubland occurs in low-lying areas of old fields or pastures, or the edges of beaver-impacted wetlands and impoundments. It typically floods early in the growing season and may be saturated to near the surface for some of the growing season, but it is generally dry for much of the year.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: At Hogestown Run in Pennsylvania, this shrub swamp has almost 100% cover of *Cornus amomum* roughly 2 m tall along with scattered seedlings of *Lonicera morrowii, Geum* sp., *Carex* sp., and other graminoids.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The vegetation in this tall successional shrub swamp (2-4 m) is highly variable with *Cornus amomum, Cornus sericea, Viburnum dentatum, Spiraea alba var. latifolia, Rosa multiflora* (exotic), *Rubus allegheniensis*, and *Rubus hispidus* typically present and abundant. *Salix* spp. may also be present but are less common.

Global Vegetation: The structure of this association varies from abandoned wet fields with tall and short shrubs (>25% cover) with herbaceous vegetation in the interstices (<25% cover), to dense "closed-canopy" tall shrublands with sparse ground-layer vegetation. Vegetation can be highly variable, and no one species is dominant. *Cornus amomum, Cornus sericea, Viburnum dentatum, Spiraea alba var. latifolia, Rosa multiflora, Rubus allegheniensis*, and *Rubus hispidus* are all typically present and abundant. *Salix* spp. may also be present but are less common. Scattered individuals of *Acer rubrum* or *Fraxinus pennsylvanica* may also occur within the shrubland but form less than 25% cover. Herbaceous species are inversely proportional to shrub cover; they can be dense where the shrub canopy is open. Species can include *Solidago rugosa, Solidago gigantea, Eupatorium maculatum, Phragmites australis, Phalaris arundinacea, Apocynum cannabinum, Vernonia* sp., and *Onoclea sensibilis*.

Global Dynamics: This community is in transition between a wet successional old field and a modified wet successional forest.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Cornus amomum*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Cornus amomum*, *Cornus sericea*, *Spiraea alba* var. *latifolia*, *Viburnum dentatum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus allegheniensis*, *Rubus hispidus*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Cornus amomum*, *Cornus sericea*, *Spiraea alba* var. *latifolia*, *Viburnum dentatum*
Tall shrub/sapling	Liana	*Rosa multiflora*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus allegheniensis*, *Rubus hispidus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Cornus amomum*
Appalachian National Scenic Trail (Lower New England Project Area): *Cornus amomum*, *Cornus sericea*, *Rubus allegheniensis*, *Spiraea alba* var. *latifolia*, *Viburnum dentatum*
Global: *Cornus amomum*, *Cornus sericea*, *Rosa multiflora*, *Rubus allegheniensis*, *Spiraea alba* var. *latifolia*, *Viburnum dentatum*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Rosa multiflora* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (12-Feb-2007). This association is a successional community occurring on abandoned old fields and pastures and, therefore, does not receive a conservation status rank.

RELATED CONCEPTS

Global Similar Types:

- *Alnus incana* - *Cornus (amomum, sericea) / Clematis virginiana* Shrub Swamp (CEGL006062) is an alluvial shrub swamp type with a prominent alder component.
- *Cornus amomum* - *Salix* spp. - *Toxicodendron vernix* - *Rhamnus lanceolata* Fen (CEGL005087) is a tall shrub fen.
- *Cornus sericea* - *Cornus amomum* - *Photinia melanocarpa* - *Viburnum lentago* Fen (CEGL005088) is a tall shrub fen.
- *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrub Swamp (CEGL002186) is a midwestern circumneutral shrub swamp type that does not contain alder and is dominated by *Salix* spp. and *Cornus sericea*.
- *Elaeagnus umbellata* - *Cornus racemosa* - *Rosa multiflora* - *Juniperus virginiana* Ruderal Shrubland (CEGL006451) is an upland successional shrubland occurring on abandoned old fields and pastures.
- *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland (CEGL006571) is a successional wet meadow that has shrub-dominated and herb-dominated expressions, but because the shrubs are usually only about 1 m tall, this gives the impression of a wet meadow type rather than a shrubland. *Cornus* can occur in both types but is not dominant in the *Spiraea* - *Rubus* type.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This type (CEGL006576) differs from Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571) by the dominance of wetland shrubs that are 2+ m in height. CEGL006571 is successional wet meadow that has shrub-dominated and herb-dominated expressions, but because the shrubs are usually only about 1 m tall, this gives the impression of a wet meadow type rather than a shrubland. *Cornus* spp. can occur in both associations but is not dominant in CEGL006571.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: One observation point was sampled in Rutland, Vermont. Not very common, but observed in New Jersey, New York, Connecticut, and Massachusetts by the UMESC mapping team in summer 2012.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: One example was sampled in Cumberland County, Pennsylvania, where the Hogestown Run intersects the Appalachian Trail in the Central Appalachian project area.

Appalachian National Scenic Trail (Lower New England Project Area) Range: One observation point was sampled in Rutland, Vermont. Additional examples were observed in New Jersey, New York, Connecticut, and Massachusetts by the UMESC mapping team in summer 2012.
Global Range: This successional shrubland occurs throughout the northeastern United States.
Nations: US
States/Provinces: CT, MA, NJ, NY, PA, VT
TNC Ecoregions: 48:C, 49:C, 60:C, 61:C
USFS Ecoregions (1994/95): 221Ai:CCC, 221Bb:CCC, 221Fa:CCC, 222Ib:CCC, 222Ic:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Minute Man, Roosevelt-Vanderbilt); USFWS (E.B. Forsythe, Erie, Great Swamp?, Iroquois, Montezuma)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SXMW
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: Observed in New Jersey, New York, Connecticut, and Massachusetts by the mapping team in summer 2012 and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 observation point; 1 accuracy assessment point): APPA.1336, APPA_AA_1144.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 observation point; 7 accuracy assessment points): APPA.1720, APPA_AA_1866, APPA_AA_2055, APPA_AA_2132, APPA_AA_2266, APPA_AA_2623, APPA_AA_2877, APPA_AA_2972.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): E. Largay and S. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler et al. 2005, NatureServe 2009

G771. LAURENTIAN-NORTHEASTERN WET MEADOW

Group Summary Description: This group is found in the Laurentian region of the Great Lakes and the northeastern United States and adjacent Canada north from West Virginia. It is characterized by wet-mesic to wet sites and can be dominated by a variety of graminoids and forbs. Common abundant species include the graminoids *Calamagrostis canadensis, Carex lacustris, Carex stricta, Carex vesicaria, Carex utriculata, Glyceria striata, Leersia oryzoides*, and *Scirpus cyperinus*. Forbs that may be common or dominant include *Boltonia asteroides var. asteroides, Eupatorium fistulosum, Eupatorium perfoliatum, Impatiens capensis, Impatiens pallida, Mentha arvensis, Sagittaria latifolia, Solidago canadensis, Solidago rugosa, Symphyotrichum racemosum*, and *Verbesina alternifolia*. Sites are found in basins or along slow-moving rivers and streams and are flooded or saturated for at least some of the growing season but rarely more than 0.3 m deep.

A4107 *Carex* spp. - *Calamagrostis canadensis* Eastern Wet Meadow Alliance

Alliance Summary Description: This wet meadow alliance is found in the northeastern United States and Great Lakes region and adjacent Canada. It is dominated by medium to medium-tall graminoids, usually with moderate to dense cover. Dominant species are *Calamagrostis canadensis* and *Carex* spp., usually *Carex lacustris, Carex stricta, Carex vesicaria*, and *Carex utriculata*, but sometimes others. Sites are flooded or saturated for at least part of the growing season but surface water may be gone later in the growing season. Soils tend to be fine-textured and often have muck or sedge peat accumulated from decaying organic matter.

[CEGL005448] *Calamagrostis canadensis - Carex* spp. Laurentian & Northeast Wet Meadow

Translated Name: **Bluejoint - Sedge species Laurentian & Northeast Wet Meadow**
Common Name: **Laurentian & Northeast Bluejoint Wet Meadow**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Laurentian-Northeastern Wet Meadow (G771)
Alliance	*Carex* spp. - *Calamagrostis canadensis* Eastern Wet Meadow Alliance (A4107)

ELEMENT CONCEPT

Global Summary: This wet meadow vegetation is widespread in the Laurentian-Acadian and northeast regions of Canada and the United States. Stands occur on the floodplains of small streams, in poorly drained depressions, beaver meadows, levees and lakeshores. Soils are typically mineral soil or well-decomposed peat, with a thick root mat. Water regime varies between temporarily and seasonally flooded. Graminoid cover is typically dense and can form hummocky microtopography. *Calamagrostis canadensis* is dominant, often occurring in almost pure stands or with tall sedges, such as *Carex aquatilis, Carex lacustris, Carex utriculata*, and *Carex stricta*. In fen transitions, *Carex lasiocarpa* can be present. *Agrostis gigantea (= Agrostis alba), Glyceria grandis, Poa palustris, Poa compressa, Scirpus cyperinus*, and *Typha latifolia* are sometimes abundant. Forbs include *Campanula aparinoides, Epilobium leptophyllum, Eupatorium maculatum, Eupatorium perfoliatum, Impatiens capensis, Iris versicolor, Polygonum amphibium*, and *Comarum palustre (= Potentilla palustris)*. Scattered shrubs, such as *Viburnum nudum, Viburnum dentatum, Spiraea alba, Cornus amomum, Alnus incana*, or *Alnus serrulata*, may be present. *Phalaris arundinacea* and/or *Lythrum salicaria* may be present, especially in disturbed examples.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: No data are available.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This community occurs in alluvial settings.
Global Environment: Stands occur on the floodplains of small streams, in poorly drained depressions, beaver meadows, levees and lakeshores. Soils are typically mineral soil or well-decomposed peat or peat silt loam with a thick root mat. Water regime varies between temporarily and seasonally flooded.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Calamagrostis canadensis* is dominant.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: *Calamagrostis canadensis* is the sole dominant.
Global Vegetation: Graminoid cover is typically dense and can form hummocky microtopography. *Calamagrostis canadensis* is dominant, often occurring in almost pure stands or with tall sedges, such as *Carex aquatilis, Carex lacustris, Carex rostrata*, and *Carex stricta*. In fen transitions, *Carex lasiocarpa* can be present. *Agrostis gigantea (= Agrostis alba), Glyceria grandis, Poa palustris, Poa compressa, Scirpus cyperinus*, and *Typha latifolia* are sometimes abundant. Forbs include *Campanula aparinoides, Epilobium leptophyllum, Eupatorium maculatum, Eupatorium perfoliatum, Iris versicolor, Polygonum amphibium*, and *Comarum palustre (= Potentilla palustris)*. Scattered shrubs, such as *Viburnum nudum, Viburnum dentatum, Spiraea alba, Cornus amomum, Alnus incana*, or *Alnus serrulata*, may be present. *Lythrum salicaria* may be present, especially in disturbed examples.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Calamagrostis canadensis*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Calamagrostis canadensis*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Calamagrostis canadensis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Calamagrostis canadensis*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Calamagrostis canadensis*
Global: *Calamagrostis canadensis*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (4-Jul-2013).

RELATED CONCEPTS

Global Similar Types:
- *Calamagrostis canadensis - Doellingeria umbellata - Spartina pectinata* Riverscour Wet Meadow (CEGL006427)
- *Calamagrostis canadensis - Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow (CEGL006519)
- *Calamagrostis canadensis* North-Central Wet Meadow (CEGL005449)
- *Carex stricta - Carex* spp. Wet Meadow (CEGL002258)
- *Carex utriculata - Carex lacustris - (Carex vesicaria, Carex stricta)* Wet Meadow (CEGL002257)
- *Phalaris arundinacea* Eastern Ruderal Marsh (CEGL006044)
- *Phalaris arundinacea* Western Marsh (CEGL001474)
- *Phleum pratense - (Calamagrostis canadensis)* Ruderal Meadow (CEGL005249)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: This type can grade into sedge meadows. A guideline of <50% sedges may be suggested as a criterion for the definition of this type compared to sedge meadow types. Harris et al. (1996) suggest that the bluejoint meadow type is drier than sedge meadows and less peaty than shore fens.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: No data are available.
Global Range: This wet meadow vegetation is widely distributed in the Laurentian-Acadian and northeast regions of northeastern and midwestern U.S. and adjacent Canada.
Nations: CA, US
States/Provinces: CT, DE, MA, MD:S5, ME, MI, MN, NH, NJ, NY, PA, QC, RI, VT, WI, WV:S2
TNC Ecoregions: 47:C, 48:C, 51:P, 59:C, 60:C, 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Cb:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212Hi:CCC, 212Hj:CCC, 212Ho:CCC, 212Hs:CCC, 212Hw:CCC, 212Hx:CCC, 212Ia:CCC, 212Ib:CCC, 212La:CCP, 212Lb:CCC, 212Na:CPP, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Ea:CCC, M212Eb:CCC
Federal Lands: NPS (Apostle Islands, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Grand Portage, Isle Royale, Minute Man, Pictured Rocks, Saint Croix, Saint-Gaudens, Sleeping Bear Dunes, Valley Forge, Voyageurs); USFS (Monongahela); USFWS (Assabet River?, Canaan Valley, Great Meadows?, Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HGFM, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Plots: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: None.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay and M. Russo
Global Description Author(s): D. Faber-Langendoen
References: Breden et al. 2001, Byers et al. 2007, CAP pers. comm. 1998, CDPNQ unpubl. data, Cowardin et al. 1979, Coxe 2009, Edinger et al. 2002, Eichelberger 2011b, Faber-Langendoen 2001, Fike 1999, Fortney 1975, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Gawler et al. 2005, Harris et al. 1996, Harrison 2004, Harrison 2011, Hop et al. 1999, Hop et al. 2010a, Hop et al. 2010b, Hop et al. 2010c, Kost et al. 2007, MNNHP 1993, Midwestern Ecology Working Group n.d.*, Minnesota DNR 2005a, Podniesinski et al. 2005b, Rawinski 1984a, Sperduto and Nichols 2004, Swain and Kearsley 2001, TNC 1999b, Thompson 1996, Thompson and Sorenson 2000, WNHI 2011, WNHI unpubl. data, Walbridge 1982, Walbridge and Lang 1982, Zimmerman et al. 2012

[CEGL006519] *Calamagrostis canadensis - Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow

Translated Name: **Bluejoint - Bulrush species - Threeway Sedge Wet Meadow**
Common Name: **Mixed Graminoid Wet Meadow**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Laurentian-Northeastern Wet Meadow (G771)
Alliance	*Carex* spp. - *Calamagrostis canadensis* Eastern Wet Meadow Alliance (A4107)

ELEMENT CONCEPT

Global Summary: These are seasonally flooded, mixed-composition wetland meadows of the northeastern United States. They occur on flats, floodplains of small streams, beaver meadows, and lakeshores. The substrate is muck or well-decomposed peat overlying mineral soil, usually slightly acidic (pH 5.0-6.0). After spring flooding, many sites will dry to exposed soil during the summer; others remain well saturated. The vegetation is dominated by robust graminoids or graminoids mixed with shrubs. Shrub cover can range up to 50%, but graminoid cover typically exceeds woody cover, and in some cases, shrubs are absent. The herbaceous layer is well-developed, often over 40% cover and up to nearly 100% cover. Bryophyte cover is usually little to none but may occasionally be extensive. The herbaceous layer is often dominated by some combination of *Calamagrostis canadensis, Scirpus* spp. (including *Scirpus cyperinus, Scirpus expansus*, and *Scirpus atrovirens*), and *Dulichium arundinaceum*. Other locally common species may include *Acorus calamus, Agrostis gigantea (= Agrostis alba), Carex lacustris, Carex lupulina, Carex lupuliformis, Carex lurida, Carex stricta, Carex utriculata, Glyceria canadensis, Glyceria grandis, Iris versicolor, Hypericum ellipticum, Juncus canadensis, Leersia oryzoides, Leersia virginica, Lysimachia terrestris, Onoclea sensibilis, Osmunda regalis, Phalaris arundinacea, Poa palustris*, and *Triadenum fraseri*. *Typha latifolia* may occasionally be present, but these wetlands are usually slightly higher (relative to the water table) than typical cattail marsh. *Lythrum salicaria* may be locally invasive. Shrub species typically include *Spiraea alba* and *Salix* spp. Other shrub constituents vary from site to site and may include *Alnus incana, Alnus serrulata, Cephalanthus occidentalis, Cornus sericea, Ilex verticillata, Myrica gale, Salix pedicellaris, Spiraea tomentosa, Vaccinium corymbosum*, or *Viburnum dentatum*. This association is related to other regional wet meadow types but differs in not being almost monotypically dominated by *Carex stricta, Calamagrostis canadensis*, or *Phalaris arundinacea*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This mixed graminoid vegetation occurs in seasonally flooded wet meadows. Sites are saturated to intermittently flooded basins with very poorly drained muck soil, sometimes with hummock-and-hollow microtopography. The unvegetated surface is made up of various combinations of leaf litter, downed wood, bare soil, and/or standing water. Evidence of disturbance includes alterations to hydrology (both presence and removal of beaver activity), fire, browsing, and the presence of exotic plants.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association occurs occasionally throughout the Northern Appalachian project area in basin floors and pond margins at elevations ranging from 370 to 1,000 m (1,215-3,280 feet) in elevation. Sites are saturated to semipermanently flooded with poorly drained soils composed of muck, silt loam, silty clay loam and peat. The hydrologic regime of some sites may be heavily influenced by beaver activity.

Global Environment: These are seasonally flooded, mixed-composition wetland meadows of the northeastern United States. They occur on flats, floodplains of small streams, beaver meadows, and lakeshores. The substrate is muck or well-decomposed peat overlying mineral soil, usually slightly acidic (pH 5.0-6.0). After spring flooding, many sites will dry to exposed soil during the summer.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These wet meadows contain some combination of *Calamagrostis canadensis, Scirpus cyperinus*, and/or *Schoenoplectus* spp., as well as *Leersia oryzoides, Carex stricta, Juncus* spp., *Lysimachia terrestris, Dulichium arundinaceum, Lycopus uniflorus, Glyceria canadensis*, and *Carex echinata*. In addition, this community supports MA state-critically imperiled *Carex tuckermanii* and VT state-critically imperiled *Stellaria alsine*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by herbaceous vegetation dominated by graminoids. The most dominant is *Calamagrostis canadensis*; however, *Carex utriculata, Carex stricta*, and *Glyceria canadensis* may be codominant to dominant at some sites. Total herbaceous cover ranges from 40-80%. Shrubs such as *Alnus incana, Spiraea tomentosa*, and *Chamaedaphne calyculata* are common at low cover. Other herbaceous species include *Carex echinata, Lysimachia terrestris,*

Onoclea sensibilis, Thelypteris palustris, and *Triadenum virginicum*. *Sphagnum* spp. dominate the nonvascular layer and may exceed 90% cover.

Global Vegetation: The vegetation is dominated by robust graminoids or graminoids mixed with shrubs. Shrub cover can range up to 50%, but graminoid cover typically exceeds woody cover, and in some cases, shrubs are absent. The herbaceous layer is well-developed, often over 40% cover and up to nearly 100% cover. Bryophyte cover is usually little to none but may occasionally be extensive. The herbaceous layer is often dominated by some combination of *Calamagrostis canadensis, Scirpus* spp. (including *Scirpus cyperinus, Scirpus expansus*, and *Scirpus atrovirens*), and *Dulichium arundinaceum*. Other locally common species may include *Acorus calamus, Agrostis gigantea (= Agrostis alba), Carex lacustris, Carex lupulina, Carex lupuliformis, Carex lurida, Carex stricta, Carex utriculata, Glyceria canadensis, Glyceria grandis, Iris versicolor, Hypericum ellipticum, Juncus canadensis, Leersia oryzoides, Leersia virginica, Lysimachia terrestris, Onoclea sensibilis, Osmunda regalis, Phalaris arundinacea, Poa palustris*, and *Triadenum fraseri*. *Typha latifolia* may occasionally be present, but these wetlands are usually slightly higher (relative to the water table) than typical cattail marsh. *Lythrum salicaria* may be locally invasive. Shrub species typically include *Spiraea alba* and *Salix* spp. Other shrub constituents vary from site to site, and may include *Alnus incana, Alnus serrulata, Cephalanthus occidentalis, Cornus sericea, Ilex verticillata, Myrica gale, Salix pedicellaris, Spiraea tomentosa, Vaccinium corymbosum*, or *Viburnum dentatum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Calamagrostis canadensis*, *Carex stricta*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Calamagrostis canadensis*, *Carex utriculata*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Calamagrostis canadensis*, *Dulichium arundinaceum*, *Scirpus atrovirens*, *Scirpus cyperinus*, *Scirpus expansus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Calamagrostis canadensis*, *Carex stricta*, *Lysimachia terrestris*, *Sphagnum* spp.
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Calamagrostis canadensis*
Global: *Calamagrostis canadensis*, *Dulichium arundinaceum*, *Scirpus atrovirens*, *Scirpus cyperinus*, *Scirpus expansus*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Carex tuckermanii* (G5, MA state-critically imperiled), *Stellaria alsine* (G5, VT state-critically imperiled); **Invasive/Exotic Plants**: *Polygonum hydropiper*, *Solanum dulcamara* (Low)
Global: Vulnerable Plants: *Scirpus ancistrochaetus* (G3); **Invasive/Exotic Plants**: *Agrostis gigantea* (Medium/Low), *Lythrum salicaria* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Jul-1999).

RELATED CONCEPTS

Global Similar Types:
- *Calamagrostis canadensis* - *Carex* spp. Laurentian & Northeast Wet Meadow (CEGL005448)
- *Calamagrostis canadensis* North-Central Wet Meadow (CEGL005449)
- *Carex stricta* - *Carex vesicaria* Wet Meadow (CEGL006412)
- *Scirpus cyperinus* Wet Meadow (CEGL006349)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Sites have a wide variation in species composition and structure. Many sites have beaver activity.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Cooper Brook, Hop Brook at Main Road Natural Heritage Site, and October Mountain State Forest in Massachusetts and at Spring Lake-Shrewsbury, Stamford, and Sunderland in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from Carter Notch and Big Pong in New Hampshire and Big Boardman Mountain in Maine.
Global Range: These wetland meadows occur in the northeastern United States and possibly adjacent Canada.
Nations: CA, US
States/Provinces: MA, NH:S4S5, NY, PA, QC, VT
TNC Ecoregions: 59:P, 61:C, 63:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, 221Ai:CCC, 221Al:CCC, 221Bc:CCC, 221Da:CCC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCP, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Bb:CCC, M221Bb:PPP
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Eisenhower, Gettysburg, Saint-Gaudens, Saratoga); USFWS (Aroostook?, Assabet River?, Great Meadows?, Moosehorn, Nulhegan Basin, Oxbow, Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HGFM, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (5 plots; 2 observation points; 25 accuracy assessment points): APPA.0032, APPA.0052, APPA.0803, APPA.0805, APPA.0833, APPA.1473, APPA.1480, APPA_AA_1670, APPA_AA_1744, APPA_AA_1786, APPA_AA_1870, APPA_AA_1891, APPA_AA_1895, APPA_AA_2074, APPA_AA_2106, APPA_AA_2123, APPA_AA_2328, APPA_AA_2491, APPA_AA_2520, APPA_AA_2592, APPA_AA_2672, APPA_AA_2707, APPA_AA_2723, APPA_AA_2891, APPA_AA_2976, APPA_AA_3002, APPA_AA_3004, APPA_AA_3024, APPA_AA_3051, APPA_AA_3060, APPA_AA_3275, APPA_AA_3293.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (3 plots; 10 accuracy assessment points): APPA.0462, APPA.0474, APPA.0858, APPA_AA_1675, APPA_AA_1808, APPA_AA_1887, APPA_AA_2391, APPA_AA_2447, APPA_AA_2541, APPA_AA_3106, APPA_AA_3226, APPA_AA_3244, APPA_AA_3319.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Calhoun et al. 1994, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Edinger et al. 2007, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Lubinski et al. 2003, NRCS 2004a, Northern Appalachian Ecology Working Group 2000, Perles et al. 2006c, Sperduto 2000b, Sperduto and Nichols 2004, Thompson and Sorenson 2000, Zimmerman 2011o, Zimmerman 2011y, Zimmerman et al. 2012

[CEGL006412] *Carex stricta - Carex vesicaria* Wet Meadow

Translated Name: **Upright Sedge - Blister Sedge Wet Meadow**
Common Name: **Eastern Upright Sedge Wet Meadow**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Laurentian-Northeastern Wet Meadow (G771)
Alliance	*Carex* spp. - *Calamagrostis canadensis* Eastern Wet Meadow Alliance (A4107)

ELEMENT CONCEPT

Global Summary: These tussock sedge meadows are distributed across the northeastern United States. They occur in seasonally flooded basins or on stream or lake margins. The substrate is peat or muck of variable depth overlying mineral soil. Standing water may be present only at the beginning of, or through much of, the growing season depending on the site and the year's precipitation; even when the water drops, the soils remain saturated. Microtopography is characterized by large tussocks, particularly when the hydroperiod is extended. The physiognomy is strongly herbaceous or, in some cases, herbs mixed with shrubs (up to 25% shrub cover); trees are absent. Bryophyte cover is usually sparse but may occasionally reach over 50%. *Carex stricta*, in its tussock form, is the usual dominant. *Carex vesicaria, Carex utriculata*, and *Calamagrostis canadensis* may also be locally abundant. Associated graminoids include *Carex atlantica, Carex canescens, Carex comosa, Carex folliculata, Carex scoparia, Carex stipata, Carex vulpinoidea, Glyceria canadensis, Dulichium arundinaceum, Juncus effusus, Leersia oryzoides*, and *Scirpus cyperinus*; forbs and ferns include *Asclepias incarnata, Thelypteris palustris, Eupatorium maculatum, Campanula aparinoides, Osmunda regalis, Comarum palustre (= Potentilla palustris), Lysimachia terrestris, Angelica atropurpurea, Eupatorium perfoliatum, Lycopus americanus, Polygonum hydropiperoides, Galium obtusum, Polygonum sagittatum, Galium tinctorium*, and others. *Lythrum salicaria* may be invasive in some settings. Shrub associates vary with geography. In the northern part of the range, *Alnus incana, Myrica gale, Ilex verticillata, Chamaedaphne calyculata*, and *Spiraea alba* are often present. Bryophytes, where present, include *Sphagnum magellanicum, Sphagnum girgensohnii, Sphagnum palustre, Drepanocladus aduncus*, and others. This association is differentiated from other wet meadows by the strong dominance of *Carex stricta*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This sedge meadow occurs in seasonally flooded basins or on stream or lake margins. Substrates are muck or peat of variable depth overlying mineral soil. Sites are saturated basins with very poorly drained muck or peat soils. The unvegetated surface consists of various combinations of leaf litter, downed wood, bare soil, and/or standing water. Evidence of disturbance includes the presence of exotic plants.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This herbaceous association occurs occasionally throughout the Northern Appalachian project area in gently sloping fens, basins and floodplains at elevations ranging from 150 to 750 m (490-2,460 feet). Soils are saturated and poorly drained. The hydrologic regime of some sites may be heavily influenced by beaver activity.

Global Environment: These tussock sedge meadows are distributed across the northeastern United States. They occur in seasonally flooded basins or on stream or lake margins. The substrate is peat or muck of variable depth overlying mineral soil. Standing water may be present only at the beginning of, or through much of, the growing season depending on the site and the year's precipitation; even when the water drops, the soils remain saturated. Microtopography is characterized by large tussocks, particularly when the hydroperiod is extended.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These marshes are dominated by *Carex stricta* (>15% coverage). Other common herbaceous species include *Scirpus cyperinus, Carex canescens, Galium palustre, Triadenum virginicum*, and *Sparganium americanum*. Scattered *Vaccinium corymbosum, Lyonia ligustrina*, and other wetland shrubs are possible. *Sphagnum* spp. may carpet much of the ground.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This herbaceous association is dominated by dense stands of *Carex stricta* and/or *Carex vesicaria*. An assortment of other herbaceous species may occur, including *Agrostis gigantea, Calamagrostis canadensis, Carex lasiocarpa, Carex stricta, Carex vesicaria, Dulichium arundinaceum, Fragaria virginiana, Juncus brevicaudatus, Lysimachia terrestris, Osmunda regalis, Polygonum amphibium, Scirpus atrocinctus, Scirpus cyperinus, Scirpus microcarpus, Scirpus pedicellatus, Solidago rugosa, Spiraea alba*, and *Thelypteris palustris*.

Global Vegetation: The physiognomy is strongly herbaceous, or in some cases herbs mixed with shrubs (up to 25% shrub cover); trees are absent. Bryophyte cover is usually sparse but may occasionally reach over 50%. *Carex stricta*, in its tussock form, is the usual dominant. *Carex vesicaria, Carex utriculata*, and *Calamagrostis canadensis* may also be locally abundant. Associated graminoids include *Carex atlantica, Carex canescens, Carex comosa, Carex folliculata, Carex scoparia, Carex stipata, Carex vulpinoidea, Glyceria canadensis, Dulichium arundinaceum, Juncus effusus, Leersia oryzoides*, and *Scirpus cyperinus*; forbs and ferns include *Asclepias incarnata, Thelypteris palustris, Eupatorium maculatum, Campanula aparinoides, Osmunda regalis, Comarum palustre (= Potentilla palustris), Lysimachia terrestris, Angelica atropurpurea, Eupatorium perfoliatum, Lycopus americanus, Galium obtusum, Polygonum sagittatum, Galium tinctorium*, and others. *Lythrum salicaria* may be

invasive in some settings. Shrub associates vary with geography. In the northern part of the range, *Alnus incana, Myrica gale, Ilex verticillata, Chamaedaphne calyculata*, and *Spiraea alba* are often present. Bryophytes, where present, include *Sphagnum magellanicum, Sphagnum girgensohnii, Sphagnum palustre, Sphagnum affine, Drepanocladus aduncus*, and others.
Global Dynamics: Some of these sedge meadows may be associated with beaver impoundments.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Galium palustre*
Herb (field)	Graminoid	*Carex stricta*, *Scirpus cyperinus*
Nonvascular	Moss	*Sphagnum* spp.

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex stricta*, *Carex vesicaria*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Calamagrostis canadensis*, *Carex stricta*, *Carex utriculata*, *Carex vesicaria*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Carex stricta*, *Galium palustre*, *Scirpus cyperinus*, *Sphagnum* spp.
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Carex stricta*, *Carex vesicaria*
Global: *Carex stricta*, *Leersia oryzoides*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Galium mollugo*, *Rosa multiflora* (Medium/Low)
Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Agrostis gigantea* (Medium/Low, exotic/invasive)
Global: Vulnerable Plants: *Scirpus ancistrochaetus* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (31-Jan-2007). This association is widely distributed throughout New England and northern New York in its small-patch setting and extends sporadically southward.

RELATED CONCEPTS

Global Similar Types:
- *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow (CEGL006519)
- *Carex stricta* - *Carex* spp. Wet Meadow (CEGL002258)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The site at Fahnestock State Park in New York has a firm sedge mat with no *Sphagnum* spp. One site at Culvers Gap in New Jersey has Highbush Blueberry Bog Thicket (CEGL006190) and Eastern Ruderal Common Reed Marsh (CEGL004141) adjacent to this sedge meadow.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Culvers Gap North and High Point South in New Jersey and at Nuclear Lake and Sunken Mine Road North/Fahnestock State Park in New York.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from near Black Brook Notch, West Branch of the Penobscot River, Pinkham Notch and the Kennebec River.
Global Range: This tussock sedge meadow is found in New England, the Adirondack Mountains, and parts of the Appalachians (over an estimated 356,000 square km based on acreage of subsections).

Nations: CA, US
States/Provinces: CT, DE?, MA, MD, ME:S3, NH, NJ, NY:S4, PA, QC:S4, RI, VT:S4, WV:S3
TNC Ecoregions: 59:C, 60:C, 61:C, 62:?, 63:C
USFS Ecoregions (1994/95): 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 212Fc:CCC, 221Aa:CCP, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Bd:CCC, 221Da:CCC, 232Aa:???, M212Ac:CCC, M212Ae:CCC, M212B:CP, M212C:CP, M212D:CC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCP
Federal Lands: NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Delaware Water Gap, Fort Necessity, Minute Man); USFS (Monongahela); USFWS (Aroostook?, Assabet River?, Carlton Pond?, Great Meadows?, Great Swamp, Moosehorn?, Oxbow, Parker River?, Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HMSM, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 3 observation points; 9 accuracy assessment points): APPA.0688, APPA.1345, APPA.1355, APPA.1409, APPA_AA_1656, APPA_AA_2221, APPA_AA_2366, APPA_AA_2476, APPA_AA_2729, APPA_AA_2856, APPA_AA_3018, APPA_AA_3042, APPA_AA_3237.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 plot; 3 observation points; 6 accuracy assessment points): APPA.0882, APPA.1552, APPA.1640, APPA.1762, APPA_AA_1842, APPA_AA_1926, APPA_AA_1927, APPA_AA_2038, APPA_AA_2181, APPA_AA_2763.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler and E.A. Byers
References: Bartgis 1983, Breden 1989, Breden et al. 2001, Byers et al. 2007, CAP pers. comm. 1998, CDPNQ unpubl. data, Clancy 1996, Cowardin et al. 1979, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eichelberger 2011l, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Gawler et al. 2005, Hall 2005a, Harrison 2004, Harrison 2011, Lubinski et al. 2003, Metzler and Barrett 2001, Metzler and Barrett 2006, NAP pers. comm. 1998, Northern Appalachian Ecology Working Group 2000, Perles et al. 2006a, Perles et al. 2007, Putnam 1995, Rawinski 1984a, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Jenkins 1992, Thompson and Sorenson 2000, Walbridge 1982, Walbridge and Lang 1982, Zimmerman et al. 2012

[CEGL002257] *Carex utriculata - Carex lacustris - (Carex vesicaria, Carex stricta)* Wet Meadow

Translated Name: **Northwest Territory Sedge - Lake Sedge - (Blister Sedge, Upright Sedge) Wet Meadow**
Common Name: **Northern Sedge Wet Meadow**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Laurentian-Northeastern Wet Meadow (G771)
Alliance	*Carex* spp. - *Calamagrostis canadensis* Eastern Wet Meadow Alliance (A4107)

ELEMENT CONCEPT

Global Summary: This northern tall sedge community is found in the mixed conifer - hardwood zone of the Great Lakes region and north into the boreal regions of eastern Canada. Sites are found on floodplains, shallow bays of lakes and streams, beaver meadows, ditches, and occasionally in isolated basins, or on semi-floating mats. Hydrology is seasonally to semipermanently flooded. Substrate is mineral soil or well-decomposed peat. Tall coarse-leaved sedges dominate the vegetation layer, often creating a tussocky hummock microtopography. Shrubs can cover up to 25% of the area. Pools with submergents may also be present. Dominant graminoids include a number of Carices, including *Carex aquatilis, Carex lacustris, Carex lasiocarpa, Carex rostrata, Carex utriculata, Carex vesicaria*, and locally *Carex stricta*. Other graminoids include *Calamagrostis canadensis, Scirpus atrovirens, Scirpus cyperinus*, and in wetter areas, *Eleocharis palustris (= Eleocharis smallii)* and *Equisetum fluviatile*. Forbs include *Acorus calamus, Symphyotrichum lanceolatum var. lanceolatum (= Aster simplex), Campanula aparinoides, Eupatorium maculatum, Iris virginica var. shrevei (= Iris shrevei), Lycopus uniflorus, Poa palustris, Polygonum*

amphibium, Comarum palustre (= Potentilla palustris), and others. Diagnostic features include the general dominance by coarse-leaved sedges, wet, somewhat peaty soil conditions, and the mix of sub-boreal herbs with more temperate herbs.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This seasonally flooded, poorly drained, mixed graminoid wet meadow occurs in a saddle bottom with muck soils. One observation point was sampled at Harmon Hill in Bennington, VT.

Global Environment: Sites are found on floodplains, shallow bays of lakes and streams, beaver meadows, ditches, and occasionally in isolated basins, or on semi-floating mats. Hydrology is seasonally to semipermanently flooded. Substrate is mineral soil or well-decomposed peat (Curtis 1959, Harris et al. 1996).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This community is dominated by *Carex utriculata*. *Glyceria canadensis* and *Triadenum virginicum (= Hypericum virginicum)* are also common. *Spiraea tomentosa* and *Ilex verticillata* are scattered shrubs. All of the graminoids and shrubs grow on a *Sphagnum* spp. mat. Other areas of the meadow include *Scirpus microcarpus, Carex gynandra, Carex stricta, Calamagrostis canadensis*, and *Carex echinata*.

Global Vegetation: Dominant graminoids include a number of Carices, including *Carex aquatilis, Carex lacustris, Carex lasiocarpa, Carex utriculata, Carex vesicaria*, and locally *Carex stricta*. Other graminoids include *Calamagrostis canadensis, Carex rostrata, Scirpus atrovirens, Scirpus cyperinus*, and in wetter areas, *Eleocharis palustris (= Eleocharis smallii)* and *Equisetum fluviatile*. Forbs include *Acorus calamus, Symphyotrichum lanceolatum var. lanceolatum (= Aster simplex), Campanula aparinoides, Eupatorium maculatum, Iris virginica var. shrevei (= Iris shrevei), Lycopus uniflorus, Poa palustris, Polygonum amphibium, Comarum palustre (= Potentilla palustris)*, and others (Curtis 1959, Harris et al. 1996).

Global Dynamics: Stands often have a fluctuating hydrology, leading in some years to fairly deep (>1 m) flooding and in other years to little or no flooding. Beavers can also increase flooding in these stands.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex utriculata*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex aquatilis*, *Carex lacustris*, *Carex lasiocarpa*, *Carex rostrata*, *Carex stricta*, *Carex vesicaria*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Carex utriculata*
Global: *Carex lacustris*, *Carex stricta*, *Carex utriculata*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (17-Jun-1999).

RELATED CONCEPTS

Global Similar Types:

- *Calamagrostis canadensis* - *Carex* spp. Laurentian & Northeast Wet Meadow (CEGL005448)
- *Calamagrostis canadensis* North-Central Wet Meadow (CEGL005449)
- *Carex aquatilis* - *Carex utriculata* Wet Meadow (CEGL001803)
- *Carex lacustris* Wet Meadow (CEGL002256)
- *Carex stricta* - *Carex* spp. Wet Meadow (CEGL002258)
- *Chamaedaphne calyculata / Carex oligosperma / Sphagnum* spp. Acidic Peatland (CEGL005091)
- *Cornus sericea* - *Salix (bebbiana, discolor, petiolaris) / Calamagrostis stricta* Shrub Swamp (CEGL002187)
- *Eriophorum virginicum* - *(Carex folliculata) / Sphagnum* spp. - *Polytrichum* spp. Fen (CEGL006570)
- *Myrica gale* - *Chamaedaphne calyculata / Carex (lasiocarpa, utriculata)* - *Utricularia* spp. Fen (CEGL006302)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The example at Harmon Hill in Bennington, VT, has 100% sphagnum cover and was referred to as a "boggy beaver meadow" with old conifer snags scattered throughout the meadow and two possible outlets.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Expansion of the range of this type eastward to Massachusetts and West Virginia is based on the presence of *Carex utriculata*. Taxonomy and distribution of *Carex utriculata* versus *Carex rostrata* has been confused in the past. Gleason and Cronquist (1991), BONAP (2010), and FNA Editorial Committee (2002b) all treat *Carex rostrata* as circumboreal and extending southward to northern Michigan, Wisconsin and northern Minnesota (e.g., in Wisconsin *Carex rostrata* has been reported from extreme northern Wisconsin, on the Apostle Islands (E. Judziewicz pers. comm. 1999)). By contrast, *Carex utriculata* is boreal but extends south to Delaware, Indiana, Nebraska, New Mexico and California. (*Carex vesicaria* has a similar distribution to *Carex utriculata*). However, older atlases and floras in the Midwest (Voss 1972, Mohlenbrock and Ladd 1978, Ownbey and Morley 1991) only use *Carex rostrata*. Curtis (1959) suggested that differential species for northern sedge meadows in Wisconsin may be *Symphyotrichum puniceum (= Aster puniceus), Campanula aparinoides, Glyceria canadensis, Scirpus atrovirens*, and *Solidago uliginosa*, among others, but this list needs further study. *Carex stricta* is restricted to eastern North American temperate and boreal regions.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: One observation point was sampled at Harmon Hill in Bennington, VT.
Global Range: This northern tall sedge community is found in the mixed conifer - hardwood zone of the Great Lakes and northeastern region of the United States and north into Canada, extending from Maine to Manitoba, south to Michigan.
Nations: CA, US
States/Provinces: MB:SU, ME, MI, MN, ND:S2S3, ON, QC?, SD, WI:S3
TNC Ecoregions: 26:C, 34:C, 35:C, 46:C, 47:C, 48:C, 59:C
USFS Ecoregions (1994/95): 212Ha:CCP, 212Hb:CCP, 212He:CCP, 212Hh:CCP, 212Hi:CCC, 212Hj:CCC, 212Hk:CCP, 212Hn:CCP, 212Ho:CCC, 212Hq:CCP, 212Hr:CCP, 212Hs:CCP, 212Ht:CCP, 212Hv:CCC, 212Hw:CCC, 212Hx:CCP, 212Hy:CCP, 212Ia:CCC, 212Ib:CCP, 212Ja:CCP, 212Jb:CCP, 212Jc:CCP, 212Jd:CCC, 212Je:CC?, 212Jf:CCP, 212Jj:CCP, 212Jk:CCP, 212Jl:CCP, 212Jm:CCP, 212Jn:CCP, 212Jo:CCP, 212Jr:CCP, 212Ka:CCC, 212La:CCP, 212Lb:CCC, 212Lc:CCP, 212Ld:CCP, 212Mb:CPP, 212Na:CPP, 212Nb:CPP, 212Nc:CPP, 222Lb:CCC, 251Ab:CCC, 251B:CC
Federal Lands: NPS (Apostle Islands, Appalachian Trail [Lower New England], Grand Portage, Isle Royale, Pictured Rocks, Saint Croix, Sleeping Bear Dunes, Voyageurs); USFS (Chequamegon, Chequamegon-Nicolet, Chippewa, Hiawatha, Huron, Huron-Manistee, Manistee, Monongahela, Nicolet, Ottawa?, Superior?); USFWS (Canaan Valley)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HGFM, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 observation point; 2 accuracy assessment points): APPA.1694, APPA_AA_2563, APPA_AA_2760.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): D. Faber-Langendoen and E.A. Byers
References: BONAP 2010, Byers et al. 2007, CDPNQ unpubl. data, Curtis 1959, Damman and French 1987, Darlington 1943, Edens 1973, FNA Editorial Committee 2002b, Faber-Langendoen 2001, Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming et al. 2001, Fortney 1975, Fortney and Rentch 2003, Francl et al. 2004, Gawler 2002, Gawler and Cutko 2010, Gleason and Cronquist 1991, Greenall 1996, Harris et al. 1996, Hop et al. 1999, Hop et al. 2010a, Hop et al. 2010b, Hop et al. 2010c, Kost et al. 2007, Lee et al. 1998, MNNHP 1993, Midwestern Ecology Working Group n.d.*, Minnesota DNR 2005a, Minnesota DNR 2005c, Mohlenbrock and Ladd 1978, NDNHI unpubl. data, Ownbey and Morley 1991, Robinette 1966, TNC 1999b, Voss 1972, WNDD unpubl. data, WNHI 2011, WNHI unpubl. Data

M881. Eastern North American Riverscour Vegetation

G792. Laurentian-Acadian Riverscour Vegetation

Group Summary Description: This rivershore group occurs in the northeastern United States, adjacent southeastern Canada, and the western Great Lakes along rivers where flooding and ice-scour affect the vegetation. Vegetation is often patchy and can be dominated by shrubs, graminoids, or forbs. A wide variety of species can be common, including *Alnus incana, Alnus viridis, Cornus sericea, Dasiphora fruticosa ssp. floribunda, Argentina anserina, Apocynum cannabinum, Carex stricta, Deschampsia caespitosa, Desmodium canadense, Iris versicolor, Parnassia glauca, Rhynchospora capillacea, Rhynchospora capitellata, Spartina pectinata*, and *Thalictrum pubescens*. Sites occur on sand, gravel, cobble, or bedrock and may be calcareous.

A3830 *Alnus incana / Dasiphora fruticosa ssp. floribunda* Riverscour Alliance

Alliance Summary Description: This alliance comprises riparian vegetation occurring on rocky, sandy, or cobbly substrates. High base status caused by groundwater seepage or calcareous parent materials, is typical. Graminoids and forbs are common, and shrubs are often present. Characteristic species include some combination of *Alnus incana, Alnus viridis, Cornus sericea, Dasiphora fruticosa ssp. floribunda, Triantha glutinosa, Doellingeria umbellata*, multiple species of *Carex* (often *Carex stricta*), *Thalictrum pubescens*, and *Deschampsia caespitosa*. Species richness is relatively high, with the presence of a number of calciphilic plants. This vegetation occurs in New England, New York and northern New Jersey, with disjunct locations in West Virginia and possibly Pennsylvania.

[CEGL006142] *Triantha glutinosa - Carex garberi* Riverscour Wet Meadow

Translated Name: **Sticky Bog-asphodel - Elk Sedge Riverscour Wet Meadow**
Common Name: **Boreal Circumneutral Riverside Seep**

USNVC Classification

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Riverscour Vegetation (M881)
Group	Laurentian-Acadian Riverscour Vegetation (G792)
Alliance	*Alnus incana / Dasiphora fruticosa ssp. floribunda* Riverscour Alliance (A3830)

Element Concept

Global Summary: This is a herb-dominated seepage community that develops on discharge areas of the shores of larger rivers in the glaciated northeastern United States and adjacent Canada. Semi-open conditions are maintained by ice-scouring and floodwaters. The circumneutral groundwater discharge supports a fen-like aspect, but on mineral rather than peat soils. The periodic disturbance and enriched nutrient conditions contribute to the high species richness of these seeps. The shore substrate may be sandy, gravelly, sometimes interspersed with bedrock. In some areas, the substrate is unconsolidated glacial material; in others, the substrate is sand and cobble held together by a tightly woven root mass. The vegetation is dominated by low to medium-height herbs, with cover usually 60-90%. Shrubs are usually present, but are often reduced to sprouts only one or a few years old due to the annual disturbance. The bryophyte layer may be locally well-developed, although not extensive overall. Characteristic herbaceous species include *Lobelia kalmii, Parnassia glauca, Platanthera dilatata, Packera paupercula (= Senecio pauperculus), Triantha glutinosa (= Tofieldia glutinosa), Spiranthes lucida, Spiranthes romanzoffiana, Carex garberi, Carex viridula, Carex flava, Carex buxbaumii, Rhynchospora capillacea, Rhynchospora capitellata, Mentha arvensis, Equisetum arvense, Calamagrostis canadensis, Rubus pubescens, Doellingeria umbellata (= Aster umbellatus), Thalictrum pubescens*, and *Glyceria septentrionalis*. Common shrubs include *Alnus incana, Alnus viridis, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Myrica gale, Spiraea alba, Salix eriocephala* and other *Salix* species, and *Cornus sericea*. Bryophytes have not been well sampled across this type's range; known bryophytes include many non-sphagnous species typical of fen conditions, including *Bryum pseudotriquetrum, Campylium stellatum, Philonotis fontana*, and *Drepanocladus* spp. The invasive exotics *Tussilago farfara* and *Lythrum salicaria* may occur in these seeps.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This herb-dominated seepage community develops on discharge areas of the shores of larger rivers in the glaciated northeastern United States. Circumneutral groundwater discharge supports a fen-like aspect, but on mineral rather than peat soils. Semi-open conditions are maintained by ice-scouring and floodwaters.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: These are herb-dominated seepage communities that develop on discharge areas of the shores of larger rivers in the glaciated northeastern United States and adjacent Canada. Semi-open conditions are maintained by ice-scouring and floodwaters. The circumneutral groundwater discharge supports a fen-like aspect, but on mineral rather than peat soils. The periodic disturbance and enriched nutrient conditions contribute to the high species richness of these seeps. The shore substrate may be sandy, gravelly, and sometimes interspersed with bedrock. In some areas, the substrate is unconsolidated glacial material; in others, the substrate is sand and cobble held together by a tightly woven root mass.

Global Environment: These are herb-dominated seepage communities that develop on discharge areas of the shores of larger rivers in the glaciated northeastern United States and adjacent Canada. Semi-open conditions are maintained by ice scouring and floodwaters. The circumneutral groundwater discharge supports a fen-like aspect, but on mineral rather than peat soils. The periodic disturbance and enriched nutrient conditions contribute to the high species richness of these seeps. The shore substrate may be sandy, gravelly, sometimes interspersed with bedrock. In some areas, the substrate is unconsolidated glacial material; in others, the substrate is sand and cobble held together by a tightly woven root mass.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: Herbaceous species include *Juncus dudleyi, Eleocharis tenuis, Andropogon gerardii, Agrostis stolonifera, Carex garberi, Carex granularis, Carex pellita*, and others. This community contains VT state-imperiled *Carex garberi*.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The vegetation is dominated by low to medium-height herbs, with cover usually 60-90%. Shrubs are usually present, but are often reduced to sprouts only one or a few years old due to the annual disturbance. The bryophyte layer may be locally well-developed, although not extensive overall. Characteristic herbaceous species include *Lobelia kalmii, Parnassia glauca, Platanthera dilatata, Packera paupercula (= Senecio pauperculus), Triantha glutinosa (= Tofieldia glutinosa), Spiranthes lucida, Spiranthes romanzoffiana, Carex garberi, Carex viridula, Carex flava, Rhynchospora capillacea, Rhynchospora capitellata, Mentha arvensis, Equisetum arvense, Calamagrostis canadensis, Rubus pubescens, Doellingeria umbellata (= Aster umbellatus), Thalictrum pubescens*, and *Glyceria septentrionalis*. Common shrubs include *Alnus incana, Alnus viridis, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Myrica gale, Spiraea alba, Salix eriocephala* and other *Salix* species, and *Cornus sericea*. Bryophytes have not been well-sampled across this type's range; known bryophytes include many non-sphagnous species typical of fen conditions, including *Bryum pseudotriquetrum, Campylium stellatum, Philonotis fontana*, and *Drepanocladus* spp. The invasive exotics *Tussilago farfara* and *Lythrum salicaria* may occur in these seeps.

Global Vegetation: The vegetation is dominated by low to medium-height herbs, with cover usually 60-90%. Shrubs are usually present, but are often reduced to sprouts only one or a few years old due to the annual disturbance. The bryophyte layer may be locally well-developed, although not extensive overall. Characteristic herbaceous species include *Lobelia kalmii, Parnassia glauca, Platanthera dilatata, Packera paupercula (= Senecio pauperculus), Triantha glutinosa (= Tofieldia glutinosa), Spiranthes lucida, Spiranthes romanzoffiana, Carex garberi, Carex viridula, Carex flava, Rhynchospora capillacea, Rhynchospora capitellata, Mentha arvensis, Equisetum arvense, Calamagrostis canadensis, Rubus pubescens, Doellingeria umbellata (= Aster umbellatus), Thalictrum pubescens*, and *Glyceria septentrionalis*. Common shrubs include *Alnus incana, Alnus viridis, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Myrica gale, Spiraea alba, Salix eriocephala* and other *Salix* species, and *Cornus sericea*. Bryophytes have not been well sampled across this type's range; known bryophytes include many non-sphagnous species typical of fen conditions, including *Bryum pseudotriquetrum, Campylium stellatum, Philonotis fontana*, and *Drepanocladus* spp. The invasive exotics *Tussilago farfara* and *Lythrum salicaria* may occur in these seeps.

Global Dynamics: Periodic natural disturbance from flooding and ice scouring is required.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Triantha glutinosa*
Herb (field)	Graminoid	*Andropogon gerardii*, *Eleocharis tenuis*, *Juncus dudleyi*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Triantha glutinosa*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Triantha glutinosa*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Agrostis stolonifera*, *Andropogon gerardii*, *Carex garberi*, *Carex granularis*, *Carex pellita*, *Eleocharis tenuis*, *Juncus dudleyi*, *Triantha glutinosa*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Calamagrostis canadensis*, *Carex flava*, *Carex garberi*, *Carex viridula*, *Doellingeria umbellata*, *Equisetum arvense*, *Glyceria septentrionalis*, *Lobelia kalmii*, *Mentha arvensis*, *Parnassia glauca*, *Rhynchospora capillacea*, *Rhynchospora capitellata*, *Rubus pubescens*, *Spiranthes romanzoffiana*, *Thalictrum pubescens*, *Triantha glutinosa*
Global: *Calamagrostis canadensis*, *Carex flava*, *Carex garberi*, *Carex viridula*, *Doellingeria umbellata*, *Equisetum arvense*, *Glyceria septentrionalis*, *Lobelia kalmii*, *Mentha arvensis*, *Parnassia glauca*, *Rhynchospora capillacea*, *Rhynchospora capitellata*, *Rubus pubescens*, *Spiranthes romanzoffiana*, *Thalictrum pubescens*, *Triantha glutinosa*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Carex garberi* (G5, VT state-critically imperiled); **Invasive/Exotic Plants**: *Agrostis stolonifera* (Medium/Low)
Global: Vulnerable Plants: *Pedicularis furbishiae* (G1G2); **Invasive/Exotic Plants**: *Lythrum salicaria* (High), *Tussilago farfara* (Insignificant)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (31-Dec-1997).

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Seen along the White River in Vermont near Northern Riverscour Rock Outcrop (CEGL006284). Many riverside seeps in Vermont were scoured by floods including Tropical Storm Irene in 2011.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community occurs where the White River crosses the AT in Windsor County, Vermont. It was also observed in Connecticut by the mapping reconnaissance team in 2012.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is listed as potentially occurring in the Northern Appalachian project area, but no plot or observation points have been collected.
Global Range: This herb-dominated seepage develops along larger rivers in the glaciated northeastern United States and adjacent Canada.
Nations: US
States/Provinces: CT, MA:S2, ME:S2, NH:S1, NY, VT:S1
TNC Ecoregions: 48:C, 60:P, 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ab:CCC, 212D:CP, 212E:CP, 221Bd:CCP, M212Aa:CCC, M212Ab:CCC, M212Ba:CCP, M212Bb:CCC, M212C:CC, M212D:CC

Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians]); USFWS (Assabet River)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HRGS
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed in Connecticut by the mapping reconnaissance team in 2012 and sampled along the White River in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: This association is listed as potentially occurring in the Northern Appalachian project area, but no plot or observation points have been collected.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 observation point): APPA.1744.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: None.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Cowardin et al. 1979, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fernald and Wiegand 1910, Gawler 2002, Gawler and Cutko 2010, Nichols et al. 2001, Rawinski 1984a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

G754. NORTHEASTERN RIVERSCOUR BARRENS & PRAIRIE

Group Summary Description: This group consists of sparsely vegetated barren riverscour. Character species (variously differential with other groups) might include *Calamagrostis canadensis, Campanula rotundifolia, Deschampsia caespitosa, Doellingeria umbellata, Hypericum prolificum, Packera paupercula, Prunus pumila, Solidago simplex, Spartina pectinata*, and/or *Triantha glutinosa*. It is found in northeastern North America from Pennsylvania to Quebec, Canada.

A3826 *Andropogon gerardii - Anemone virginiana var. alba* Riverscour Alliance

Alliance Summary Description: This alliance includes scoured riverbank "prairies" in the northeastern United States, which may be called "riverside prairies," "linear prairies," "rivershore grasslands," or "scoured riverine bluff prairie." Vegetation occurs on bedrock outcrops or sandy point bars or receiving flood-scour. The vegetation is highly variable in substrate, cover, and composition, but is characterized by *Andropogon gerardii, Anemone virginiana var. alba, Prunus pumila, Solidago simplex, Arabis lyrata*, and *Solidago simplex*. This vegetation ranges from Pennsylvania and New Jersey to northern New England and southern Quebec.

[CEGL006284] *Andropogon gerardii - Campanula rotundifolia - Solidago simplex* Riverscour Sparse Vegetation

Translated Name: **Big Bluestem - Bluebell Bellflower - Sticky Goldenrod Riverscour Sparse Vegetation**
Common Name: **Northern Riverscour Rock Outcrop**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Riverscour Vegetation (M881)
Group	Northeastern Riverscour Barrens & Prairie (G754)
Alliance	*Andropogon gerardii - Anemone virginiana var. alba* Riverscour Alliance (A3826)

ELEMENT CONCEPT

Global Summary: This riverside rock outcrop community of the northeastern U.S. occurs on open flood-scoured bedrock exposures of major rivers, typically along river narrows. Emergent seepage is absent. Typically a gradient from dry acidic conditions higher on the bank to moist, fairly enriched conditions lower down may exist at any one site. This community is prone to flooding in the upper regions and deposition in the topographically lower areas. It is also prone to severe drought periods that may stress or kill some vegetation. Within the community, the species are

distributed patchily, probably due to microsite conditions. The variability in species composition has not been measured, but it shows substantial variation from site to site and from year to year. Vegetation is typically sparse and occurs in the cracks and crevices of the bedrock. Typical vegetation is a mixture of riparian species, xeric-loving crevice plants, and calciphiles. Characteristic species include *Andropogon gerardii, Schizachyrium scoparium, Campanula rotundifolia, Solidago simplex, Toxicodendron radicans, Ionactis linariifolius, Sisyrinchium montanum, Packera paupercula (= Senecio pauperculus)*, and *Prunus pumila*. Other associates include *Anemone virginiana var. alba (= Anemone virginiana var. riparia), Symphyotrichum lateriflorum, Carex crawei, Carex crawfordii, Potentilla arguta, Campanula rotundifolia, Arabis lyrata, Aquilegia canadensis, Cornus amomum, Euthamia graminifolia, Juncus debilis*, and *Eupatorium perfoliatum*, among others. *Astragalus robbinsii var. jesupii* occurs in limited areas along the upper Connecticut River. These sites are susceptible to invasion by *Lythrum salicaria* and *Melilotus officinalis (= Melilotus alba)*. This association is more temperate than the related *Campanula rotundifolia - Packera paupercula - (Aquilegia canadensis)* Riverscour Sparse Vegetation (CEGL006532), which occurs on near-boreal rivers and lacks prairie elements such as *Andropogon gerardii*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This vegetation is found on open flood-scoured bedrock exposures of major rivers, typically along river narrows. This community was sampled at West Hartford Bridge along the White River in Vermont.

Global Environment: This sparse vegetation occurs on open flood-scoured bedrock exposures of major rivers, typically along river narrows. Emergent seepage is absent. Typically a gradient from dry acidic conditions higher on the bank to moist, fairly enriched conditions lower down may exist at any one site. This community is prone to flooding in the upper regions and deposition in the topographically lower areas. It is also prone to severe drought periods that may stress or kill some vegetation.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: Patchy vegetation includes *Andropogon gerardii, Schizachyrium scoparium, Solidago juncea, Packera paupercula, Solidago nemoralis, Dichanthelium acuminatum, Campanula rotundifolia, Houstonia caerulea, Fragaria virginiana*, and others. Scattered tree seedlings include *Populus deltoides* and *Ulmus americana*. *Vaccinium* spp. are absent.

Global Vegetation: This community is essentially a rock outcrop with a bit of soil development in the lower reaches. Within the community, the species are distributed patchily, probably due to microsite conditions. The variability in species composition has not been measured but shows substantial variation both spatially and temporally. Vegetation is typically sparse and occurs in the cracks and crevices of the bedrock. Typical vegetation is a mixture of riparian species, xeric-loving crevice plants, and calciphiles. Characteristic species include *Andropogon gerardii, Schizachyrium scoparium, Campanula rotundifolia, Solidago simplex, Toxicodendron radicans, Ionactis linariifolius, Sisyrinchium montanum, Packera paupercula (= Senecio pauperculus)*, and *Prunus pumila*. Other associates include *Anemone virginiana var. alba (= Anemone virginiana var. riparia), Symphyotrichum lateriflorum, Carex crawei, Carex crawfordii, Potentilla arguta, Campanula rotundifolia, Arabis lyrata, Aquilegia canadensis, Cornus amomum, Euthamia graminifolia, Juncus debilis*, and *Eupatorium perfoliatum*, among others. *Astragalus robbinsii var. jesupii* occurs in limited areas along the upper Connecticut River. These sites are susceptible to invasion by *Lythrum salicaria* and *Melilotus officinalis (= Melilotus alba)*.

Global Dynamics: Winter ice-scour that removes tall vegetation and woody plants maintains predominantly herbaceous vegetation. The early-successional floristic assemblages include species able to regenerate from buried rootstocks or from seeds dispersed along the shoreline. Seasonal and annual variation in water levels is also an important process affecting the vegetation.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Solidago juncea*, *Solidago nemoralis*
Herb (field)	Graminoid	*Andropogon gerardii*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Solidago simplex*
Herb (field)	Graminoid	*Andropogon gerardii*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Andropogon gerardii*, *Campanula rotundifolia*, *Packera paupercula*, *Schizachyrium scoparium*, *Solidago juncea*, *Solidago nemoralis*
Global: *Allium schoenoprasum* var. *sibiricum*, *Andropogon gerardii*, *Astragalus robbinsii* var. *jesupii*, *Campanula rotundifolia*, *Ionactis linariifolius*, *Packera paupercula*, *Prunus pumila*, *Schizachyrium scoparium*, *Solidago simplex*, *Toxicodendron radicans*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Astragalus robbinsii* var. *jesupii* (G5T1)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (17-Nov-1997). There are probably fewer than 20 occurrences of this community rangewide. Individual occurrences tend to be small, so there are probably fewer than 500 acres rangewide. Currently five occurrences are documented in New Hampshire, with a total acreage of less than 20 acres. Similar vegetation is reported from Vermont, Maine, and New York, but these still need confirmation. This community is restricted to calcareous or basic bedrock outcrops along ice-scoured upper reaches of major rivers such as the Connecticut River in New Hampshire and Vermont, the Kennebec River in Maine, the Hudson River in New York, and the Delaware River in New Jersey.

RELATED CONCEPTS

Global Similar Types:
- *(Hypericum prolificum, Leucothoe racemosa) / Schizachyrium scoparium - Solidago simplex var. racemosa - Ionactis linariifolius* Riverscour Sparse Vegetation (CEGL006491)
- *Campanula rotundifolia - Packera paupercula - (Aquilegia canadensis)* Riverscour Sparse Vegetation (CEGL006532)
- *Deschampsia caespitosa - Carex viridula* Riverscour Wet Meadow (CEGL006969)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The Vermont example was intensely scoured by Tropical Storm Irene in 2011.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This community may occur in conjunction with seep communities. However, emergent seepage is absent as are the corresponding seepage and wetland plants found in riverside seeps. Sedges are notably lacking. This community differs from rock outcrop/rocky summit communities by the paucity of lichen and woody species intolerant of flooding and the presence of flood-tolerant species on lower, somewhat enriched reaches of the community, where regular erosion and deposition of silty sediments occur.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at West Hartford Bridge along the White River in Vermont.
Global Range: This community is reported from Vermont, New Hampshire, Maine, Connecticut, New Jersey, Pennsylvania, and New York. It may also occur in Massachusetts.
Nations: US
States/Provinces: CT, MA, ME, NH, NJ, NY, PA, VT
TNC Ecoregions: 49:C, 59:C, 60:C, 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Da:CCC, 212Fc:CCC, 221Ae:CCC, 221Ba:CCC, 221Bd:CCC, M212Bb:CCC, M212Cc:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap, Roosevelt-Vanderbilt, Upper Delaware)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: VNRR
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 plot; 3 accuracy assessment points): APPA.1748, APPA_AA_1909, APPA_AA_1923, APPA_AA_2667.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): M. Anderson, S.L. Neid, S.C. Gawler and E. Largay

References: Breden 1989, Cowardin et al. 1979, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Grossman et al. 1994, Metzler and Barrett 2001, Metzler and Barrett 2006, Perles et al. 2007, Perles et al. 2008, Rawinski 1984a, Shank and Shreiner 1999, Sperduto 1992, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zimmerman 2011u, Zimmerman et al. 2012

[CEGL006518] *Prunus pumila / Andropogon gerardii - Sorghastrum nutans* Riverscour Wet Meadow

Translated Name: **Sandcherry / Big Bluestem - Indiangrass Riverscour Wet Meadow**
Common Name: **Riverside Prairie Grassland**

USNVC Classification

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Riverscour Vegetation (M881)
Group	Northeastern Riverscour Barrens & Prairie (G754)
Alliance	*Andropogon gerardii - Anemone virginiana var. alba* Riverscour Alliance (A3826)

Element Concept

Global Summary: These are tall alluvial grasslands in the temperate region of the northeastern United States. They are found on sandy point bars and linear deposits along semi-stable rivershores subject to periodic flooding. Ice build-up during the winter can scour the rivershore in spring, limiting woody growth. The substrate is cobble, gravel or coarse sediment with interstices of alluvial sand and silt. Bare cobble is exposed in some areas. Herbaceous plants dominate, and may form a dense cover; scattered shrubs may grow among them, but are generally kept short by the annual flooding. Bryophytes are absent or at most sparse. The dominant plants are tall grasses such as *Sorghastrum nutans, Andropogon gerardii, Schizachyrium scoparium*, and *Panicum virgatum*. Characteristic herbs include *Helianthemum canadense, Helianthus divaricatus, Asclepias tuberosa*, and *Lespedeza capitata*. *Spiraea alba, Rosa virginiana, Quercus ilicifolia, Betula nigra*, and *Prunus pumila* are common shrubs. Other herbaceous associates include *Anemone virginiana, Calamagrostis canadensis, Eupatorium maculatum, Solidago rugosa, Solidago nemoralis, Solidago gigantea, Spartina pectinata, Achillea millefolium, Baptisia tinctoria, Asclepias syriaca, Dichanthelium clandestinum, Euthamia graminifolia, Apocynum androsaemifolium, Thelypteris palustris, Lycopus uniflorus, Phalaris arundinacea, Scleria triglomerata*, and *Symphyotrichum novi-belgii*. This association differs from more northerly riverside ice meadows in being dominated by prairie grasses (*Andropogon gerardii, Sorghastrum nutans)* rather than by *Calamagrostis canadensis*.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This riverside grassland generally occurs along major rivers in flood-scoured areas. The sampled site is a small linear patch along a river.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: These are tall alluvial grasslands in the temperate region of the northeastern United States. They are found on sandy point bars and linear deposits along semi-stable rivershores subject to periodic flooding. Ice build-up during the winter can scour the rivershore in spring, limiting woody growth. The substrate is cobble, gravel or coarse sediment with interstices of alluvial sand and silt. Bare cobble is exposed in some areas.
Global Environment: These are tall alluvial grasslands in the temperate region of the northeastern United States. They are found on sandy point bars and linear deposits along semi-stable rivershores subject to periodic flooding. Ice build-up during the winter can scour the rivershore in spring, limiting woody growth. The substrate is cobble, gravel or coarse sediment with interstices of alluvial sand and silt. Bare cobble is exposed in some areas.

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This riverside grassland is dominated by tall prairie grasses such as *Andropogon gerardii, Sorghastrum nutans*, and *Schizachyrium scoparium*. Scattered *Salix* spp. are present.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: Herbaceous plants dominate and may form a dense cover; scattered shrubs may grow among them but are generally kept short by annual flooding. Bryophytes are absent or at most sparse. The dominant plants are tall grasses such as *Sorghastrum nutans, Andropogon gerardii, Schizachyrium scoparium*, and *Panicum virgatum*. Characteristic herbs include *Helianthemum canadense, Helianthus divaricatus, Apocynum cannabinum, Asclepias tuberosa, Lespedeza hirta*, and

Lespedeza capitata. *Spiraea alba, Rosa virginiana, Quercus ilicifolia, Betula nigra*, and *Prunus pumila* are common shrubs. Other herbaceous associates include *Anemone virginiana, Calamagrostis canadensis, Eupatorium maculatum, Solidago rugosa, Solidago gigantea, Solidago nemoralis, Spartina pectinata, Baptisia tinctoria, Asclepias syriaca, Dichanthelium clandestinum, Euthamia graminifolia, Thelypteris palustris, Achillea millefolium, Lycopus uniflorus, Phalaris arundinacea, Scleria triglomerata*, and *Symphyotrichum novi-belgii*.

Global Vegetation: Herbaceous plants dominate and may form a dense cover; scattered shrubs may grow among them but are generally kept short by annual flooding. Bryophytes are absent or at most sparse. The dominant plants are tall grasses such as *Sorghastrum nutans, Andropogon gerardii, Schizachyrium scoparium*, and *Panicum virgatum*. Characteristic herbs include *Helianthemum canadense, Helianthus divaricatus, Apocynum cannabinum, Asclepias tuberosa, Lespedeza hirta*, and *Lespedeza capitata*. *Spiraea alba, Rosa virginiana, Quercus ilicifolia, Betula nigra*, and *Prunus pumila* are common shrubs. Other herbaceous associates include *Anemone virginiana, Calamagrostis canadensis, Eupatorium maculatum, Solidago rugosa, Solidago gigantea, Solidago nemoralis, Spartina pectinata, Baptisia tinctoria, Asclepias syriaca, Dichanthelium clandestinum, Euthamia graminifolia, Thelypteris palustris, Achillea millefolium, Lycopus uniflorus, Phalaris arundinacea, Scleria triglomerata*, and *Symphyotrichum novi-belgii*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Andropogon gerardii*, *Schizachyrium scoparium*, *Sorghastrum nutans*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Apocynum cannabinum*, *Lespedeza hirta*
Herb (field)	Graminoid	*Andropogon gerardii*, *Panicum virgatum*, *Schizachyrium scoparium*, *Sorghastrum nutans*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Apocynum cannabinum*, *Lespedeza hirta*
Herb (field)	Graminoid	*Andropogon gerardii*, *Panicum virgatum*, *Schizachyrium scoparium*, *Sorghastrum nutans*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Andropogon gerardii*, *Sorghastrum nutans*

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Andropogon gerardii*, *Panicum virgatum*, *Prunus pumila* var. *susquehanae*, *Sorghastrum nutans*

Global: *Andropogon gerardii*, *Panicum virgatum*, *Prunus pumila* var. *susquehanae*, *Sorghastrum nutans*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (20-May-2011). Although there are likely well over 300 occurrences of this vegetation rangewide, many occurrences are very small patch, especially in the northern portions of the range. This vegetation is vulnerable to shoreline development, bank stabilization, invasive species, and some minor impacts as a result of recreational activities (trampling, boat ramp building, etc.)

RELATED CONCEPTS

CLASSIFICATION

Status: Standard

Classification Confidence: 3 - Weak

Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The sampled observation point site in Vermont is a riverwash herbaceous association with few tall graminoids and some *Salix* sp. It is higher and drier than Northeastern Temperate Cobble Scour Rivershore (CEGL006536) and without *Carex torta*. It is small-patch and linear (below MMU).

Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is listed as potentially occurring in the Northern Appalachian project area, but no plot or observation points have been collected.
Global Range: These are tall alluvial grasslands in the temperate region of the northeastern United States.
Nations: CA, US
States/Provinces: CT, MA, NH, NJ, NY, PA, QC:S3?, VT
TNC Ecoregions: 49:C, 59:C, 60:P, 61:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212Ea:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 221Af:CCC, 221Ba:CC?, 221Bc:CCC, 221Bd:CCC, 221Ea:CCC, M212Bb:CCC, M212De:CCC, M212Eb:CCC, M221Ac:CCC, M221Ad:CCC, M221Bf:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Delaware Water Gap, Upper Delaware)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HRGS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 observation point): APPA.1557.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: None.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler and E. Largay
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Metzler and Barrett 2001, Metzler and Barrett 2006, NYNHP 2009, Nichols et al. 2001, Perles et al. 2004, Perles et al. 2007, Perles et al. 2008, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson and Sorenson 2000, Zimmerman 2011a, Zimmerman et al. 2012

M880. Eastern North American Wet Shoreline Vegetation

G755. Eastern North American Riverine Wetland Vegetation

Group Summary Description: This eastern North American group consists of riverine wetlands. Even with this reduced concept, composition is variable enough that individual character species are somewhat difficult to isolate, but some reasonably constant species might include *Alnus serrulata, Carex torta, Elymus* spp., *Eupatorium* spp., *Panicum virgatum, Salix caroliniana, Salix interior* (more Midwest), *Solidago gigantea*, and others.

A0943 *Alnus serrulata* Riverscour Shrubland Alliance

Alliance Summary Description: This alliance includes temporarily flooded shrub thickets characterized by high-energy flooding events along rivers and streams on rocky shoals and gravel bars in the Appalachians and Interior Highlands. *Alnus serrulata* is characteristic; other common species include *Cephalanthus occidentalis, Cornus amomum, Cornus obliqua (= Cornus amomum ssp. obliqua), Cornus foemina, Hypericum prolificum, Lyonia ligustrina, Viburnum nudum, Physocarpus opulifolius, Amorpha fruticosa, Xanthorhiza simplicissima*, and others.

[CEGL003895] *Alnus serrulata - Xanthorhiza simplicissima* Wet Shrubland

Translated Name: **Hazel Alder - Yellowroot Wet Shrubland**
Common Name: **Rocky Bar and Shore (Alder - Yellowroot Type)**

USNVC Classification

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Riverine Wetland Vegetation (G755)
Alliance	*Alnus serrulata* Riverscour Shrubland Alliance (A0943)

Element Concept

Global Summary: This association includes shrublands on rocky or gravelly substrates along narrow river margins in the southeastern Blue Ridge Escarpment gorges, ranging elsewhere on the Southern Blue Ridge and into the Cumberland Plateau. Vegetation composition, density, and height vary with frequency of flooding, substrate, and soil depth. *Alnus serrulata* and *Xanthorhiza simplicissima* are common and characteristic but not always dominant. Other shrubs may include *Arundinaria gigantea, Diervilla sessilifolia, Salix nigra, Salix sericea, Rhododendron arborescens, Rhododendron viscosum, Rhododendron maximum, Rhododendron periclymenoides, Kalmia latifolia, Leucothoe fontanesiana, Cornus foemina, Cornus amomum, Physocarpus opulifolius, Itea virginica*, and *Viburnum nudum var. cassinoides*. Arborescent species that occur as tall shrubs (or as occasional trees, less than 10% cover) include *Acer rubrum, Carpinus caroliniana, Diospyros virginiana, Liquidambar styraciflua, Liriodendron tulipifera, Platanus occidentalis*, and *Tsuga canadensis*. Open areas dominated by grasses and forbs include species such as *Agrostis perennans, Boykinia aconitifolia, Carex torta, Eupatorium fistulosum, Lycopus virginicus, Trautvetteria caroliniensis, Houstonia serpyllifolia, Impatiens capensis, Hypericum mutilum, Viola x primulifolia*, and *Holcus lanatus* (exotic). Adjacent alluvial forests in the Blue Ridge are dominated by *Tsuga canadensis, Liriodendron tulipifera, Betula lenta*, and, at lower elevations, below 610 m (2000 feet), *Platanus occidentalis* and *Liquidambar styraciflua*.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: This shrubland occurs on rocky or gravelly substrates along narrow river margins and is subject to periodic flooding. Soils are moderately well-drained sandy loam. The unvegetated surface is dominated by leaf litter with some wood and bare soil. Evidence of disturbance includes the presence of trails and the abundance of exotic plant species.
Global Environment: This association includes shrublands on rocky or gravelly substrates along narrow river margins in the southeastern Blue Ridge Escarpment gorges, ranging elsewhere on the Southern Blue Ridge and into the Cumberland Plateau. Vegetation composition, density, and height vary with frequency of flooding, substrate, and soil depth. The occurrences can be in very narrow bands of 1-2 m or wider bars of up to 10-20 m wide adjacent to large creeks and small rivers.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: Characteristic species are *Alnus serrulata* and *Xanthorhiza simplicissima*, but they may not always be dominant. Other species may include *Arundinaria gigantea, Diervilla sessilifolia, Salix nigra, Salix sericea, Rhododendron arborescens, Rhododendron viscosum, Rhododendron maximum, Rhododendron periclymenoides, Kalmia latifolia, Leucothoe fontanesiana, Cornus foemina, Cornus amomum, Physocarpus opulifolius, Itea virginica*, and *Viburnum nudum var. cassinoides*. Tree species present may include *Platanus occidentalis, Ulmus* spp., and *Carpinus caroliniana*. Common and/or abundant herbs include *Andropogon gerardii, Solidago roanensis*, and *Solidago rugosa*. Repeated flooding has allow a large number (34 taxa in 2 sampled plots) of exotic species to become established.
Global Vegetation: *Alnus serrulata* and *Xanthorhiza simplicissima* are common shrubs and characteristic but not always dominant. Other shrubs may include *Arundinaria gigantea, Diervilla sessilifolia, Salix nigra, Salix sericea, Rhododendron arborescens, Rhododendron viscosum, Rhododendron maximum, Rhododendron periclymenoides, Kalmia latifolia, Leucothoe fontanesiana, Cornus foemina, Cornus amomum, Physocarpus opulifolius, Itea virginica*, and *Viburnum nudum var. cassinoides*. Arborescent species that occur as tall shrubs (or as occasional trees, less than 10% cover) include *Acer rubrum, Carpinus caroliniana, Diospyros virginiana, Liquidambar styraciflua, Liriodendron tulipifera, Platanus occidentalis*, and *Tsuga canadensis*. Open areas dominated by grasses and forbs include species such as *Agrostis perennans, Boykinia aconitifolia, Carex torta, Eupatorium fistulosum, Lycopus virginicus, Trautvetteria caroliniensis, Houstonia serpyllifolia, Impatiens capensis, Hypericum mutilum, Viola x primulifolia*, and *Holcus lanatus* (exotic). Adjacent alluvial forests in the Blue Ridge are dominated by *Tsuga canadensis, Liriodendron tulipifera, Betula lenta*, and, at lower elevations, below 610 m (2000 feet), *Platanus occidentalis* and *Liquidambar styraciflua*

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus serrulata*
Short shrub/sapling	Dwarf-shrub	*Xanthorhiza simplicissima*
Herb (field)	Flowering forb	*Solidago rugosa*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous tree	*Alnus serrulata*
Herb (field)	Flowering forb	*Xanthorhiza simplicissima*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Alnus serrulata*, *Physocarpus opulifolius*, *Salix nigra*, *Xanthorhiza simplicissima*
Global: *Alnus serrulata*, *Carpinus caroliniana*, *Diospyros virginiana*, *Leucothoe fontanesiana*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, *Tsuga canadensis*, *Xanthorhiza simplicissima*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Invasive/Exotic Plants: *Ailanthus altissima* (Medium, invasive/exotic), *Albizia julibrissin* (High/Low, invasive/exotic), *Anthoxanthum odoratum* (invasive/exotic), *Artemisia vulgaris* (invasive/exotic), *Arthraxon hispidus* (Medium/Low, invasive/exotic), *Cardamine hirsuta* (invasive/exotic), *Centaurea biebersteinii* (High/Medium, invasive/exotic), *Commelina communis* var. *ludens* (invasive/exotic), *Dactylis glomerata* (Medium/Insignificant, invasive/exotic), *Daucus carota* (Low, invasive/exotic), *Digitaria ischaemum* (invasive/exotic), *Dioscorea oppositifolia* (High/Medium, invasive/exotic), *Echinochloa crus-galli* (Medium/Insignificant, invasive/exotic), *Elaeagnus umbellata* var. *parvifolia* (invasive/exotic), *Glechoma hederacea* (Low, invasive/exotic), *Hesperis matronalis* (Medium/Low, invasive/exotic), *Holcus lanatus* (High/Medium, invasive/exotic), *Kummerowia striata* (Low, invasive/exotic), *Lespedeza cuneata* (Medium, invasive/exotic), *Leucanthemum vulgare* (Medium/Low, invasive/exotic), *Lonicera japonica* (High/Medium, invasive/exotic), *Medicago lupulina* (Medium/Insignificant, invasive/exotic), *Microstegium vimineum* (High/Medium, invasive/exotic), *Miscanthus sinensis* (Medium, invasive/exotic), *Polygonum cuspidatum* (High/Medium, invasive/exotic), *Rosa multiflora* (Medium/Low, invasive/exotic), *Rumex crispus* (Low/Insignificant, invasive/exotic), *Saponaria officinalis* (Low/Insignificant, invasive/exotic), *Silene noctiflora* (invasive/exotic), *Stellaria media* (Low, invasive/exotic), *Taraxacum officinale* (invasive), *Trifolium pratense* (Low/Insignificant, invasive/exotic), *Trifolium repens* (Medium/Low, invasive/exotic), *Verbascum thapsus* (Medium, invasive/exotic)

Global: Vulnerable Plants: *Diervilla rivularis* (G3), *Spiraea virginiana* (G2); **Invasive/Exotic Plants**: *Holcus lanatus* (High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (17-Dec-1999). This community is naturally restricted in terms of geography and habitat, thus could be vulnerable to elimination. However, this community is often overlooked in inventories or not separately distinguished, and is likely much more common than the number of documented occurrences suggests. Threats to this community include alteration of the natural flooding regime due to damming of rivers and invasion by exotic species carried on river courses.

RELATED CONCEPTS

Global Similar Types:

- *Platanus occidentalis / Dichanthelium clandestinum - Festuca subverticillata* Floodplain Forest (CEGL004031)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: Species-rich, somewhat weedy vegetation apparently representing riparian streambank / shrubland vegetation. Assigned to this shrubland type (CEGL003895) despite the presence of some trees. Doubtfully mappable.
Global Classification Comments: This association is known from the Bankhead National Forest, Alabama, but further inventory is needed to fully describe the variation of this type on the Bankhead and elsewhere in the Cumberland Plateau. In the Appalachian Trail study (Fleming and Patterson 2009a), four plots from North Carolina, Tennessee, and Virginia were classified as this association. Species that are 100% constant are *Alnus serrulata, Apios americana, Dichanthelium clandestinum, Rudbeckia laciniata, Solidago rugosa, Toxicodendron radicans, Verbesina alternifolia*, and *Viola sororia*; species that are 75% constant include *Ambrosia artemisiifolia, Amphicarpaea bracteata, Carpinus caroliniana, Clematis virginiana, Cryptotaenia canadensis, Impatiens capensis,* and *Xanthorhiza simplicissima*. Exotic species that may be present (at 75% constancy) include *Holcus lanatus, Microstegium vimineum,* and *Rosa multiflora*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: The two sampled plots are in Carter and Unicoi counties in Tennessee, including along the Nolichucky River in Pisgah National Forest.
Global Range: This association is found along montane rivers in the Southern Blue Ridge and Cumberlands. Occurrences in adjacent regions are possible.
Nations: US
States/Provinces: AL, GA, KY, NC, SC, TN, VA:SU
TNC Ecoregions: 50:C, 51:C, 52:P
USFS Ecoregions (1994/95): 221Ha:CCC, 221Hc:CCC, 221He:CCC, 231Cc:CCC, 231Cd:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Chickamauga-Chattanooga?, Great Smoky Mountains, Little River Canyon, Obed River); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont)?, Chattahoochee (Southern Blue Ridge), Daniel Boone, Nantahala, Pisgah, Sumter, Sumter (Mountains), Sumter (Piedmont)?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SRBS
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (2 plots; 1 accuracy assessment point): APPA.0161, APPA.0574, APPA_AA_1417.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): R. White and K.D. Patterson
References: Allard 1990, Fleming and Patterson 2009a, Fleming and Patterson 2011a, Fleming et al. 2006, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Newell and Peet 1995, Patterson 1994, Peet et al. unpubl. data, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Schotz et al. 2008, Schotz pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

A3647 *Carex torta* Riverbed Alliance

Alliance Summary Description: This herbaceous vegetation occurs on large coarse substrates deposited along medium- to high-energy river channels and, less frequently, exposed lakeshores with heavy wave action. Seasonal flooding and ice-scour maintain the open nature of these communities; generally, they develop in areas of the active channel that are exposed at low water or in drought years. Vegetation can be sparse to dense depending on degree of flooding and length of exposure. Characteristic perennial species that tolerate inundation and flood-scouring include *Carex torta* and low *Salix* spp. Associated species tend to vary widely from site to site, can be diverse, and may be sparse. Associated species vary with geography. In the Allegheny Mountains, associated species include *Doellingeria umbellata (= Aster umbellatus), Dichanthelium clandestinum, Solidago rugosa ssp. aspera, Juncus effusus var. solutus, Scirpus expansus, Scirpus cyperinus (= var. pelius), Equisetum arvense, Onoclea sensibilis, Vernonia noveboracensis, Lycopus virginicus, Scutellaria lateriflora*, and *Salix sericea*. In Southern Appalachian gorges, this vegetation often is associated with *Alnus serrulata - Xanthorhiza simplicissima* Wet Shrubland (CEGL003895). In the Cumberland Plateau of Alabama, herbaceous components may include *Lobelia cardinalis, Symphyotrichum dumosum (= Aster dumosus), Lycopus virginicus, Osmunda regalis*, and *Hypericum mutilum*. Physiognomy varies from strictly herbaceous to shrubby to wooded herbaceous. Scattered shrubs and small, battered specimens of *Platanus occidentalis, Betula nigra, Cornus amomum, Alnus serrulata*, and *Carpinus caroliniana* are present in some stands. Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum, Polygonum caespitosum var. longisetum*, and other weedy exotics.

[CEGL006536] *Carex torta - Apocynum cannabinum - Cyperus* spp. Riverbed Vegetation

Translated Name: **Twisted Sedge - Indian-hemp - Flatsedge species Riverbed Vegetation**
Common Name: **Northeastern Temperate Cobble Scour Rivershore**

USNVC Classification

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Riverine Wetland Vegetation (G755)
Alliance	*Carex torta* Riverbed Alliance (A3647)

Element Concept

Global Summary: This herbaceous vegetation occurs on large coarse substrates deposited along medium- to high-energy river channels and, less frequently, exposed lakeshores with heavy wave action. Seasonal flooding and ice-scour maintain the open nature of these communities; generally, they develop in areas of the active channel that are exposed at low water or in drought years. Vegetation can be sparse to dense depending on degree of flooding and length of exposure. Characteristic perennial species that tolerate inundation and flood scouring include *Carex torta* and low *Salix* spp. Associated species tend to vary widely from site to site, can be diverse, and may be sparse; they include *Apocynum cannabinum, Verbena hastata, Symphyotrichum puniceum (= Aster puniceus), Doellingeria umbellata (= Aster umbellatus), Solidago rugosa, Solidago canadensis, Solidago gigantea, Calamagrostis canadensis, Phalaris arundinacea, Scirpus expansus, Scirpus cyperinus, Thelypteris palustris, Scutellaria lateriflora, Agrostis stolonifera, Dichanthelium clandestinum, Eupatorium maculatum, Eupatorium perfoliatum, Elymus riparius, Cyperus strigosus* and other *Cyperus* spp., *Eleocharis* spp., *Lobelia cardinalis, Onoclea sensibilis, Viola* spp., *Clematis virginiana, Polygonum amphibium, Polygonum hydropiper, Polygonum pensylvanicum, Polygonum sagittatum, Polygonum persicaria, Polygonum punctatum, Polygonum lapathifolium, Schizachyrium scoparium, Andropogon gerardii*, and occasionally *Sanguisorba canadensis*. Battered and stunted shrubs and trees can occur, including *Salix sericea, Salix eriocephala, Cornus amomum, Betula nigra, Populus deltoides*, and *Platanus occidentalis*. Nonvascular plants can be sparse, but where present can include *Bryum* spp. Invasive, exotic species can be problematic in these areas, especially *Tussilago farfara, Lythrum salicaria, Polygonum cuspidatum, Polygonum persicaria*, and in the southern portion of the range *Microstegium vimineum*.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This herbaceous vegetation occurs on large coarse substrates deposited along medium- to high-energy river channels and, less frequently, exposed lakeshores with heavy wave action. Seasonal flooding and ice-scour maintain the open nature of this community. The sampled site is a small linear feature.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This small-patch herbaceous community is only known from two locations in Maine on seasonally flooded channel beds at elevations of 420 and 470 m (1,380-1,540 feet). Substrates are sandy and unvegetated surfaces are mostly comprised of large rocks and cobbles.
Global Environment: This community occurs on cobble, gravel, and sand bars or banks of streams and rivers with medium to high gradients. Seasonal flooding and ice-scour maintain the open nature of these communities.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Carex torta* is dominant. Characteristic perennial species that tolerate inundation and flood scouring include *Carex torta* and low *Salix* spp. Associated species tend to vary widely from site to site, can be diverse, and may be sparse.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This herbaceous association has a highly variable composition of flood- and scour-tolerant species. Total cover may be sparse to open, and the most consistent dominant species is the sedge *Carex torta*. Associated herbaceous species include *Agrostis perennans, Carex scabrata, Cinna latifolia, Doellingeria umbellata, Glyceria melicaria, Oclemena acuminata, Solidago rugosa*, and *Thalictrum pubescens*. Shrubs and tree saplings may form a sparse low-shrub layer. Species include *Alnus incana ssp. rugosa, Betula alleghaniensis, Populus tremuloides*, and *Rubus idaeus ssp. strigosus*. In some stands, *Rubus pubescens* may attain high cover and form a shrub-herbaceous community.
Global Vegetation: Vegetation can be sparse to dense depending on degree of flooding and length of exposure. Characteristic perennial species that tolerate inundation and flood scouring include *Carex torta* and low *Salix* spp. Associated species tend to vary widely from site to site, can be diverse, and may be sparse; they include *Apocynum cannabinum, Verbena hastata, Symphyotrichum puniceum (= Aster puniceus), Doellingeria umbellata (= Aster umbellatus), Solidago rugosa, Solidago canadensis, Solidago gigantea, Calamagrostis canadensis, Phalaris arundinacea, Scirpus expansus, Scirpus cyperinus, Thelypteris palustris, Scutellaria lateriflora, Agrostis stolonifera, Dichanthelium clandestinum, Eupatorium maculatum, Eupatorium perfoliatum, Elymus riparius, Cyperus strigosus* and other *Cyperus* spp., *Eleocharis* spp., *Lobelia cardinalis, Onoclea sensibilis, Viola* spp., *Clematis virginiana, Polygonum amphibium, Polygonum hydropiper, Polygonum pensylvanicum, Polygonum sagittatum, Polygonum persicaria, Polygonum punctatum, Polygonum lapathifolium, Schizachyrium scoparium, Andropogon gerardii*, and occasionally *Sanguisorba canadensis*. Battered and stunted shrubs and trees can occur, including *Salix sericea, Salix eriocephala, Cornus amomum, Betula nigra, Populus deltoides*, and *Platanus occidentalis*. Nonvascular plants can be sparse, but where present can include *Bryum* spp. Invasive, exotic species can be problematic in these areas, especially *Tussilago farfara, Lythrum salicaria, Polygonum cuspidatum, Polygonum persicaria*, and in the southern portion of the range *Microstegium vimineum*.
Global Dynamics: These are highly dynamic communities with regular disturbance from flooding and ice-scour. Vegetation cover can be inversely proportional to inundation and scour.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex torta*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Rubus pubescens*
Herb (field)	Graminoid	*Carex torta*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Salix* spp.
Herb (field)	Graminoid	*Carex torta*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Carex torta*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Carex torta*
Global: *Apocynum cannabinum*, *Carex torta*, *Cyperus* spp.

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Taraxacum officinale*, *Tussilago farfara* (Insignificant)
Global: Invasive/Exotic Plants: *Lythrum salicaria* (High), *Microstegium vimineum* (High/Medium), *Polygonum cuspidatum* (High/Medium), *Polygonum persicaria*, *Tussilago farfara* (Insignificant)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (2-Feb-2005). This community is common in tributaries in the upper portions of watersheds. The rank within Pennsylvania is S3; considering its whole range, its rank should probably be changed to G5.

RELATED CONCEPTS

Global Similar Types:
- *Carex torta* Riverbed Vegetation (CEGL004103)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This is a small and linear association and usually occurs on the landscape in small patches well below the minimum map unit size.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type was originally developed for the Northern Appalachians but later extended south to Pennsylvania. This is a very heterogeneous type, but analysis of the Pennsylvania data failed to reveal any consistent variants. Ongoing work (as of 2005) in the National Capital Region (Virginia, Maryland, West Virginia) is generating some plot data that may help determine if a different temporarily flooded herbaceous river-scour association is needed for that region. If so, the transition area from this more northern type to the more southern type will need to be defined, and that may alter the range of this type.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from two locations at Dunn Falls and Bemis Stream in Maine.
Global Range: This association is found from New England south through New York and Pennsylvania.
Nations: CA, US
States/Provinces: CT, MA, ME, NH, NY, PA, QC, RI?, VT
TNC Ecoregions: 49:C, 59:C, 60:C, 61:C, 63:C
USFS Ecoregions (1994/95): 212Fa:CCP, 212Fb:CCP, 212Fc:CCC, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Bd:CCP, 221D:CC, 221E:CC, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CCP, M212Eb:CCP, M221A:CC
Federal Lands: NPS (Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Saint-Gaudens)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HRGS
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 observation point): APPA.1562.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (3 plots; 1 accuracy assessment point): APPA.0971, APPA.0972, APPA.0982, APPA_AA_2322.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.L. Neid and S.C. Gawler
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Metzler and Barrett 2001, Metzler and Barrett 2006, Nichols et

al. 2001, Perles et al. 2004, Sperduto and Nichols 2004, Swain and Kearsley 2000, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Zimmerman 2011x, Zimmerman et al. 2012

[CEGL004103] *Carex torta* Riverbed Vegetation

Translated Name: **Twisted Sedge Riverbed Vegetation**
Common Name: **Rocky Bar and Shore (Twisted Sedge Type)**

USNVC Classification

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Riverine Wetland Vegetation (G755)
Alliance	*Carex torta* Riverbed Alliance (A3647)

Element Concept

Global Summary: This association accommodates herbaceous alluvial wetlands in which *Carex torta* is a dominant or characteristic species. It occupies sand, gravel, and rock bars along small rivers and streams in valleys and gorges in the Southern Appalachians, ranging west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont. This association is characterized by light-requiring, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* often forms dense, extensive colonies. Associated species vary with geography but can include *Polygonum sagittatum, Dichanthelium clandestinum, Solidago rugosa ssp. aspera, Juncus effusus, Equisetum arvense, Onoclea sensibilis, Vernonia noveboracensis, Lycopus virginicus, Lobelia cardinalis, Symphyotrichum dumosum (= Aster dumosus), Lycopus virginicus, Osmunda regalis, Hypericum mutilum, Eupatorium fistulosum, Solidago patula, Boehmeria cylindrica, Amphicarpaea bracteata, Acalypha rhomboidea, Hypericum mutilum, Impatiens capensis, Leersia oryzoides*, and *Symphyotrichum lateriflorum (= Aster lateriflorus)*. Physiognomy of this type varies from strictly herbaceous to wooded herbaceous to shrubby. Scattered shrubs and small, battered specimens of *Platanus occidentalis, Betula nigra, Cornus amomum, Alnus serrulata*, and *Carpinus caroliniana* are present in some stands. An overhanging canopy may include *Platanus occidentalis, Betula alleghaniensis var. alleghaniensis*, or *Acer rubrum*. Overhanging shrubs often include *Rhododendron maximum*. Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum, Polygonum caespitosum var. longisetum*, and other weedy exotics.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This twisted sedge-dominated vegetation occurs on rock, gravel and sand bars, and active channel shelves of high-gradient streams and small rivers, often forming small, discontinuous, linear patches along waterways. It was sampled once in Maryland in the Central Appalachian project area on a gently sloping small scour area along a creekbed which receives occasional high-energy flow. The stream is covered with large boulders and the soil is very poorly drained. No evidence of disturbance was reported.

Global Environment: This association occupies boulder and gravel bars on the frequently flooded, active channel shelves of high-gradient streams and small rivers, often forming small, discontinuous, linear patches. It is subject to frequent, high-energy inundation and flood-scouring, which can occur at any time of year. Flooding duration is probably similar to that documented along Passage Creek in Shenandoah County, Virginia, by Hupp (1982). In that drainage, the channel shelf was inundated approximately 15% of the time. Elevations in West Virginia range from 390-1200 m. Soils are moderately to poorly drained sand with pH averaging 6.5 (n=5). Organic soils are not present. Soil chemistry is characterized by high Cu, Mn; moderate B, Ca, Mg; and low Al, ENR, Fe, H, K, Na, P, S, TEC, Zn, and organic matter (n=3).

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Carex torta* dominates this herbaceous, flood-scoured community. Many other species can co-occur and stands can be relatively diverse floristically. *Boehmeria cylindrica* and *Lycopus virginicus* are characteristic. Physiognomy of this type varies from strictly herbaceous to wooded herbaceous to shrubby. Scattered shrubs and small, battered specimens of *Platanus occidentalis, Betula nigra, Cornus amomum, Alnus incana ssp. rugosa*, and *Carpinus caroliniana* are present in some stands. An overhanging canopy of these or other riparian species is also possible.

Global Vegetation: Vegetation is characterized by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* is usually the dominant species and typically forms dense,

extensive colonies. Associated species vary with geography. *Polygonum sagittatum, Solidago rugosa*, and *Dichanthelium clandestinum* are typical; others include *Acalypha rhomboidea, Amphicarpaea bracteata, Boehmeria cylindrica, Equisetum arvense, Eupatorium fistulosum, Euthamia graminifolia var. graminifolia, Juncus effusus, Hypericum mutilum, Hypericum perforatum, Impatiens capensis, Leersia oryzoides, Lobelia cardinalis, Lycopus virginicus, Onoclea sensibilis, Osmunda regalis, Prunella vulgaris, Solidago patula, Symphyotrichum dumosum (= Aster dumosus), Symphyotrichum lateriflorum (= Aster lateriflorus), Symphyotrichum prenanthoides, Thalictrum* spp., *Trautvetteria caroliniensis var. caroliniensis, Verbesina alternifolia*, and *Vernonia noveboracensis*. Cover by nonvascular plants is insignificant. Physiognomy of this type varies from strictly herbaceous to wooded herbaceous to shrubby. Scattered shrubs and small, battered specimens of *Platanus occidentalis, Betula nigra, Cornus amomum, Alnus serrulata*, and *Carpinus caroliniana* are present in some stands. An overhanging canopy with an average cover of 20% may include *Platanus occidentalis, Betula alleghaniensis var. alleghaniensis*, or *Acer rubrum*. Sparse overhanging shrubs often include *Rhododendron maximum*. Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum, Polygonum caespitosum var. longisetum*, and other weedy exotics. Mean species richness of vascular plants in six West Virginia plots was 36 taxa per 400 square meters, with most of the diversity in the herbaceous stratum.

Global Dynamics: Periodic large or severe floods transport and deposit large numbers of cobbles, stones, and even boulders in characteristic bars both within the channel (islands) and along its edges (streambanks). These bars provide a matrix for deposition of finer alluvium and habitats for the establishment of tough, adaptable herbaceous plants, which in turn stabilize the bars with massive networks of perennial rootstocks. Regular flood-scouring batters or removes woody plants which take root in these habitats, maintaining open-canopy conditions. These habitats are highly dynamic, with conditions more or less constantly shifting in response to an irregular but powerful disturbance regime. While some of the bar habitats may be damaged or removed by severe floods, others may accrete or be newly deposited during the same events (Hupp 1982). Successionally, this unit can be considered a pioneering type on new, coarse alluvial land, but it is also more or less permanently maintained by natural disturbances.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex torta*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex torta*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Boehmeria cylindrica*, *Carex torta*, *Lycopus virginicus*

Global: *Carex torta*, *Polygonum sagittatum*, *Solidago rugosa*

OTHER NOTEWORTHY SPECIES

Global: Other Plants: *Dichanthelium clandestinum* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (21-Jan-2000). This community is found as small-patch linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont. Although this community has a moderately large geographic range, it is uncommon within its range and occurrences are small. This community is more common than the number of documented occurrences would suggest, since it is often overlooked in inventories.

RELATED CONCEPTS

Global Similar Types:

- *Carex torta - Apocynum cannabinum - Cyperus* spp. Riverbed Vegetation (CEGL006536) has a more northern distribution (Pennsylvania, New York, and New England).
- *Platanus occidentalis / Dichanthelium clandestinum - Festuca subverticillata* Floodplain Forest (CEGL004031)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This is a small-patch community and many occurrences may fall below the minimum map unit size.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs along waterways in the Southern and Central Appalachians. It was sampled in the Appalachian Trail corridor at Raven Rock Hollow in Washington County, Maryland.
Global Range: This community is found as small-patch linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont.
Nations: US
States/Provinces: AL, DE:S1, GA, KY, MD:S4, NC, PA:S4, SC, TN, VA:S3, WV:S3
TNC Ecoregions: 44:C, 50:C, 51:C, 52:C, 58:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ba:CCC, 221Da:CCC, 221Db:CCC, 221Ea:CCC, 221Fa:CCC, 221Ha:CC?, 221Hc:CCC, 221He:CCC, 222Eg:CCC, 222En:CCC, 222Eo:CCC, 231Cd:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Cb:CCC, M221Cd:CCP, M221Da:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway?, C&O Canal, Catoctin Mountain, Great Smoky Mountains, New River Gorge, Prince William); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, George Washington, Jefferson, Monongahela, Nantahala, Pisgah, Sumter, Sumter (Mountains), Sumter (Piedmont))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HCRB
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot): APPA.0524.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G. Fleming, P. Coulling, S.C. Gawler
References: Allard 1990, Bowman 2000, Byers et al. 2007, CAP pers. comm. 1998, Cowardin et al. 1979, Coxe 2009, Eyre 1980, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 1996, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Harrison 2004, Hupp 1982, NatureServe Ecology - Southeastern U.S. unpubl. data, PNHP 2004, Palmer-Ball et al. 1988, Peet et al. unpubl. data, Perles et al. 2004, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007, Zimmerman 2011p, Zimmerman and Podniesinski 2008, Zimmerman et al. 2012

A2078 *Eupatorium serotinum - Verbesina alternifolia* Depositional Bar Alliance

Alliance Summary Description: This alliance consists of vegetation of active shorelines and depositional bars of streams and rivers in the Central Appalachians and Interior Low Plateau. Examples occur on sandy riverbanks and depositional bars, as well as in sand deposits on bedrock floodplains and boulder bars. The vegetation is maintained by periodic flooding, and flood dynamics vary from low to high rates of sediment erosion and turnover. These habitats experience high rates of sediment erosion and turnover during even moderate floods and are inundated for 3-12% of the year, but are generally exposed for most of the growing season. Vegetation may be sparse during years of more continuous high water during the growing season. In normal growing seasons, the vegetation is a dense growth of tall (1-2 m), fast-growing annual and perennial forbs. There may be some spatial separation within stands between perennial forbs, found on more stable shores and bars, and weedy annuals, found on high-gradient reaches that experience high rates of sediment erosion and turnover. Examples may have a very high cover of weedy and invasive species. Some typical components include *Amaranthus spinosus, Artemisia annua, Datura stramonium, Eupatorium serotinum, Polygonum lapathifolium, Polygonum pensylvanicum, Polygonum punctatum, Teucrium*

canadense, Verbesina alternifolia, and *Verbena urticifolia*, which are relatively constant and generally contribute most of the cover. Additional, less constant or abundant species include *Polygonum caespitosum var. longisetum, Conoclinium coelestinum (= Eupatorium coelestinum), Perilla frutescens, Chenopodium ambrosioides, Mollugo verticillata, Solanum ptychanthum, Verbena hastata, Urtica dioica ssp. dioica, Solanum carolinense*, and *Hibiscus laevis*. Herbaceous vines may also be numerous, with *Calystegia sepium, Cynanchum laeve*, and *Cuscuta gronovii* most frequent. Scattered individuals of shrubby to full-sized flood-tolerant trees (e.g., *Platanus occidentalis, Acer saccharinum*), as well as saplings of *Betula nigra* may be present.

[CEGL006481] *Eupatorium serotinum - Polygonum (lapathifolium, punctatum, pensylvanicum)* Riverbar Wet Meadow

Translated Name: **Late-flowering Thoroughwort - (Curlytop Knotweed, Dotted Smartweed, Pennsylvania Smartweed) Riverbar Wet Meadow**

Common Name: **Piedmont-Central Appalachian Scour Bar Wet Meadow**

USNVC Classification

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Riverine Wetland Vegetation (G755)
Alliance	*Eupatorium serotinum - Verbesina alternifolia* Depositional Bar Alliance (A2078)

Element Concept

Global Summary: This association is known only from the Potomac River in the Piedmont and mountain provinces of Maryland, Virginia, and West Virginia. Well-documented occurrences are concentrated in high-gradient reaches of the Potomac, particularly near the fall-line (Potomac Gorge) and at Harpers Ferry. The type occurs on sandy riverbanks and depositional bars, as well as in sand deposits on bedrock floodplains and boulder bars. These habitats experience high rates of sediment erosion and turnover during even moderate floods and are inundated for 3-12% of the year, but are generally exposed for most of the growing season. Vegetation may be sparse during years of more continuous high water during the growing season. In normal growing seasons, the type is a dense growth of tall (1-2 m), predominantly annual herbs. Some weedy, fast-growing perennials are also characteristic. *Artemisia annua, Amaranthus spinosus, Datura stramonium, Eupatorium serotinum, Polygonum lapathifolium, Polygonum pensylvanicum, Polygonum punctatum*, and *Verbena urticifolia* are relatively constant and generally contribute most of the cover. Additional, less constant or abundant species include *Chenopodium ambrosioides, Conoclinium coelestinum (= Eupatorium coelestinum), Hibiscus laevis, Mollugo verticillata, Perilla frutescens, Polygonum caespitosum var. longisetum, Solanum carolinense, Solanum ptychanthum, Teucrium canadense, Urtica dioica ssp. dioica, Verbena hastata*, and *Verbesina alternifolia*. Herbaceous vines may also be numerous, with *Calystegia sepium, Cynanchum laeve*, and *Cuscuta gronovii* most frequent. Scattered individuals of shrubby to full-sized flood-tolerant trees (e.g., *Platanus occidentalis, Acer saccharinum*) may be present.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This scour bar herbaceous annual vegetation occurs on sand deposits on bedrock floodplains and depositional and boulder bars. It experiences high rates of sediment erosion and turnover during floods, and sediment deposition is frequent. It was sampled once in the park at Harpers Ferry in West Virginia along a small, temporarily flooded sandy beach with well-drained sand soil. The unvegetated surface is dominated by bare sand with small amounts of exposed bedrock, large/small rocks, leaf litter, and Corbicula shells. Evidence of disturbance includes plantings to stabilize the bank, pedestrian traffic (heavy to moderate use), and the abundance of exotic plant species.

Global Environment: The type occurs on sandy riverbanks and depositional bars, as well as in sand deposits on bedrock floodplains and boulder bars. These habitats experience high rates of sediment erosion and turnover during even moderate floods and are inundated for 3-12% of the year (Lea 2000), but are generally exposed for most of the growing season.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This community is dominated by *Chamaesyce humistrata, Artemisia annua, Cyperus squarrosus, Datura stramonium*, and *Eragrostis* spp. *Eupatorium serotinum* and one or more *Polygonum* spp. can be patch dominants. *Salix nigra* may also be

present. Diversity is high in the sampled plot; 56 taxa were reported, but 21 of these are considered invasive exotics. This community also supports WV-state imperiled *Hibiscus laevis*.

Global Vegetation: Vegetation may be sparse during years of more continuous high water during the growing season. In normal growing seasons, the type is a dense growth of tall (1-2 m) predominantly annual herbs. Some weedy, fast-growing perennials are also characteristic. These include *Amaranthus spinosus, Artemisia annua, Datura stramonium, Eupatorium serotinum, Polygonum lapathifolium, Polygonum pensylvanicum, Polygonum punctatum, Teucrium canadense, Verbesina alternifolia*, and *Verbena urticifolia*, which are relatively constant and generally contribute most of the cover. Additional, less constant or abundant species include *Chenopodium ambrosioides, Conoclinium coelestinum (= Eupatorium coelestinum), Hibiscus laevis, Mollugo verticillata, Perilla frutescens, Polygonum caespitosum var. longisetum, Solanum carolinense, Solanum ptychanthum, Teucrium canadense, Urtica dioica ssp. dioica, Verbena hastata*, and *Verbesina alternifolia*. Herbaceous vines may also be numerous, with *Calystegia sepium, Cynanchum laeve*, and *Cuscuta gronovii* most frequent. Scattered individuals of shrubby to full-sized flood-tolerant trees (e.g., *Platanus occidentalis, Acer saccharinum*) may be present.

Global Dynamics: In habitats occupied by this community, sediment deposition is apparently frequent enough and sediment turnover extensive enough during even relatively small floods that most established perennial species are quickly buried or scoured away. These conditions favor the prevalence of annual herbs and rapidly growing perennials, both of which probably produce extensive seedbanks. It is uncertain whether this association is fully natural, as approximately 30% of its characteristic species are not indigenous to the region. While it is likely that this vegetation has been altered in both composition and distribution by anthropogenic watershed changes increasing the frequency and level of floods on the Potomac (favoring annual species and exotics), it also seems reasonable to presume that some similar form of low, frequently flooded depositional bar originally occurred along higher gradient stretches of the very powerful Potomac River. For now, the type is classified as a natural type that, like most floodplain communities, has been altered to a considerable degree by post-settlement disturbances. Multi-year research would be needed to elucidate competitive dynamics of this community type and to fully evaluate its conservation value.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Salix nigra*
Herb (field)	Flowering forb	*Artemisia annua*, *Chamaesyce humistrata*, *Datura stramonium*
Herb (field)	Graminoid	*Cyperus squarrosus*, *Eragrostis capillaris*, *Eragrostis frankii*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Amaranthus spinosus*, *Artemisia annua*, *Datura stramonium*, *Eupatorium serotinum*, *Polygonum lapathifolium*, *Polygonum pensylvanicum*, *Polygonum punctatum*, *Verbena urticifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area):
Global: *Amaranthus spinosus*, *Artemisia annua*, *Datura stramonium*, *Eupatorium serotinum*, *Polygonum lapathifolium*, *Polygonum pensylvanicum*, *Polygonum punctatum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Hibiscus laevis* (G5, WV state-imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Artemisia annua* (Medium/Insignificant), *Citrullus lanatus* var. *lanatus*, *Commelina communis*, *Cucurbita pepo* var. *pepo*, *Datura stramonium* (High/Low), *Digitaria ischaemum*, *Eleusine indica*, *Ipomoea hederacea*, *Melilotus officinalis* (Medium/Low), *Plantago lanceolata* (High/Low), *Saponaria officinalis* (Low/Insignificant), *Setaria viridis*, *Silene latifolia* ssp. *alba*, *Silene vulgaris*, *Trifolium pratense* (Low/Insignificant), *Verbascum thapsus* (Medium); **Other Plants**: *Chenopodium ambrosioides* var. *ambrosioides* (GNRTNR), *Chenopodium botrys* (GNR), *Leonurus marrubiastrum* (GNR)
Global: Invasive/Exotic Plants: *Artemisia annua* (Medium/Insignificant), *Datura stramonium* (High/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Jun-2007). More data on the global range and dynamics are needed to rank this community.

RELATED CONCEPTS

Global Similar Types:

- *Verbesina alternifolia - Elymus riparius - Solidago gigantea - (Teucrium canadense)* Riverbar Wet Meadow (CEGL006480) of more stable riverbanks and depositional bars with low sediment turnover during floods and prevalence of perennial herbs.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Approximately 30% of this community's characteristic species are weedy exotics.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Classification is supported by analysis of data from 19 plots sampled throughout the known range. Currently, the type is classified as natural that, like most floodplain communities in the Mid-Atlantic region, has been altered to a considerable degree by post-settlement disturbances. However, approximately 30% of this community's characteristic species are weedy exotics, and further study is needed to determine whether this vegetation should be considered a natural or modified type.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs in the Piedmont and mountain provinces of Maryland, Virginia, and West Virginia. It was sampled near Virginicus Island along the Shenandoah River in Jefferson County, West Virginia.
Global Range: This association is known only from the Potomac River in the Piedmont and mountain provinces of Maryland, Virginia, and West Virginia. Well-documented occurrences are concentrated in high-gradient reaches of this river, particularly near the fall-line (Potomac Gorge) and at Harpers Ferry.
Nations: US
States/Provinces: DC, MD, VA:S2S3, WV
TNC Ecoregions: 52:C, 59:C, 61:C
USFS Ecoregions (1994/95): M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal, George Washington Parkway, Harpers Ferry)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HCRB
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 1 accuracy assessment point): APPA.0455, APPA_AA_0432.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): C. Lea and G.P. Fleming
References: Eastern Ecology Working Group n.d., Fleming 2007, Fleming and Patterson 2003, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Harrison 2004, Lea 2000, Lea 2000*, Lea 2003, Lea 2004, Walton et al. 2001

[CEGL006480] *Verbesina alternifolia - Elymus riparius - Solidago gigantea - (Teucrium canadense)* Riverbar Wet Meadow

Translated Name: **Wingstem - Riverbank Wildrye - Giant Goldenrod - (Canada Germander) Riverbar Wet Meadow**
Common Name: **Piedmont-Central Appalachian Riverbar Tall Wet Meadow**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Riverine Wetland Vegetation (G755)
Alliance	*Eupatorium serotinum* - *Verbesina alternifolia* Depositional Bar Alliance (A2078)

ELEMENT CONCEPT

Global Summary: This tall herb-dominated association is known from the shores of rivers and large streams in the Piedmont and mountain regions of Maryland and West Virginia, as well as from the Green River of Kentucky. It occupies well-drained riverbanks and, less commonly, depositional bars or alluvial fans of medium-sized to large rivers that experience low rates of sediment erosion and turnover during small to moderate floods. Heavy annual deposits of alluvial sediments inhibit tree establishment. The type typically occurs as a narrow, linear strip along the outer edge of a floodplain forest. Occurrences have high solar exposure, though they may experience partial shading from adjacent (landward) forests. Vegetation is characterized by a dense growth of tall (1-3 m), light-demanding, native perennial herbs. The most characteristic species across the range are *Chasmanthium latifolium, Dichanthelium clandestinum, Verbesina alternifolia, Elymus* spp. (*Elymus riparius, Elymus canadensis, Elymus villosus, Elymus virginicus*), *Conoclinium coelestinum (= Eupatorium coelestinum)*, several species of *Eupatorium* (*Eupatorium fistulosum, Eupatorium perfoliatum, Eupatorium serotinum*), *Rudbeckia laciniata, Solidago gigantea, Calystegia sepium*, and *Verbena urticifolia*. Along the Potomac in the Great Valley of Virginia downstream to the fall line, *Teucrium canadense* and *Scrophularia marilandica* are also abundant; less abundant species include *Ageratina altissima, Helianthus decapetalus, Oenothera biennis, Phytolacca americana*, and *Monarda fistulosa*.. Along the New and Bluestone rivers in West Virginia, additional characteristic species include *Amphicarpaea bracteata, Apios americana, Helenium autumnale, Helianthus strumosus, Heliopsis helianthoides, Packera aurea, Phlox paniculata, Polygonum scandens, Polygonum virginianum, Senna hebecarpa, Solanum carolinense, Solidago canadensis, Symphyotrichum lanceolatum, Symphyotrichum lateriflorum, Tradescantia ohiensis, Tripsacum dactyloides, Verbesina occidentalis*, and *Vernonia noveboracensis*. Tall annual species characteristically dominant on less stabilized bars may be present but generally do not dominate. Woody vines are often common and include *Toxicodendron radicans, Vitis riparia*, and *Vitis vulpina*. Scattered shrubby or occasionally full-sized trees of flood-tolerant species may occur, with *Acer saccharinum, Platanus occidentalis, Fraxinus pennsylvanica, Betula nigra*, and *Acer negundo* the most frequent. *Lindera benzoin* may be present as a shrub. This type often has a number of invasive exotic weeds, including *Polygonum cuspidatum, Polygonum perfoliatum, Lolium arundinaceum (= Festuca arundinacea), Phalaris arundinacea, Humulus japonicus, Glechoma hederacea, Microstegium vimineum*, and *Stellaria media*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This tall riverbank herbaceous community occupies higher parts of riverbanks along the edge of floodplain forests. It experiences lower rates of sediment erosion and turnover during small to moderate floods. It was sampled once along the Shenandoah River at Harpers Ferry in West Virginia along a sloping, south-facing riverbank consisting of sand, gravel, and cobble alluvium on top of a bedrock channel shelf. The site is temporarily flooded, and the soil consists of well-drained sand. The unvegetated surface is a mix of small rocks, sand and leaf litter. Evidence of disturbance includes the presence of exotic plant species.

Global Environment: This community occupies well-drained riverbanks and, less commonly, depositional bars of medium-sized to large rivers that experience low rates of sediment erosion and turnover during small to moderate floods. The type typically occurs as a narrow, linear strip along the outer edge of a floodplain forest, where heavy annual deposits of alluvial sediments inhibit tree establishment. Along the Potomac River in the Potomac River Gorge west of Washington, DC, habitats are inundated for 1-4% of the full year and are generally exposed for nearly all of the growing season in most years (Lea 2000). Hydrologic regime is best described as temporarily flooded. Substrates in the Potomac River Gorge are sandy loams or loamy sands (Lea 2000). Samples collected from 10 plots in the Potomac drainage had 100% total base saturation, high pH, and very high calcium levels. Along the New and Bluestone rivers, West Virginia, patches typically occur along slow, straight reaches of river with high banks, as well as on eroded alluvial fans at the mouths of small drainages. Soils are deep alluvial sands with little horizon development. Soils in seven plots along the Bluestone River are described as temporarily flooded, deep, moderately well-drained to well-drained, stone-free or slightly stony sand and loamy sand. They tested medium to slightly acidic (mean pH = 5.8) with relatively high levels of Ca, Cu, Mg, Mn, and Zn, and relatively low levels of organic

matter, estimated N release, S, Al, B, Fe, K, Na, and P compared to average values in the area. Elevations range from near sea level on the Potomac River to 506 m on the Bluestone River.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This tall riverbank herbaceous vegetation is dominated by *Eupatorium fistulosum, Tripsacum dactyloides, Solidago altissima (= Solidago canadensis var. scabra)*, and *Solidago gigantea*. *Apios americana, Elymus canadensis, Helianthus decapetalus*, and *Asclepias syriaca* may be common. Shrubs and vines can include *Fraxinus pennsylvanica, Platanus occidentalis, Salix caroliniana, Salix nigra*, and *Vitis riparia*. Exotics are common. This community also supports WV-state imperiled *Hibiscus laevis* and *Smallanthus uvedalius*.

Global Vegetation: This association represents vegetation consisting of a dense growth (90% cover) of tall (1-3 m), light-demanding, native perennial herbs. Scattered shrubby or occasionally full-sized trees of flood-tolerant species may occur, with *Acer saccharinum, Platanus occidentalis, Betula nigra, Liriodendron tulipifera, Fraxinus pennsylvanica*, and *Acer negundo* the most frequent. Along the Potomac River in the Great Valley of Virginia downstream to the fall line, the most abundant herbs are *Verbesina alternifolia, Teucrium canadense, Elymus riparius, Verbena urticifolia, Conoclinium coelestinum (= Eupatorium coelestinum)*, several species of *Eupatorium* (*Eupatorium fistulosum, Eupatorium perfoliatum, Eupatorium serotinum*), *Dichanthelium clandestinum, Scrophularia marilandica*, and *Chasmanthium latifolium*. Less abundant species include *Ageratina altissima, Elymus villosus, Elymus virginicus, Helianthus decapetalus, Oenothera biennis, Phytolacca americana, Monarda fistulosa, Rudbeckia laciniata, Calystegia sepium*, and *Solidago gigantea*. Tall annual species characteristically dominant on less stabilized bars may be present but generally do not dominate. Woody vines are often common and include *Toxicodendron radicans*, and *Vitis riparia*. Along the New and Bluestone rivers in West Virginia, herbs with high constancy and/or cover include *Amphicarpaea bracteata, Apios americana, Boehmeria cylindrica, Chasmanthium latifolium, Conoclinium coelestinum, Dichanthelium clandestinum, Elymus canadensis, Elymus riparius, Elymus virginicus, Eupatorium fistulosum, Eupatorium serotinum, Helenium autumnale, Helianthus strumosus, Heliopsis helianthoides, Leersia virginica, Packera aurea, Phlox paniculata, Polygonum scandens, Polygonum virginianum, Rudbeckia laciniata, Senna hebecarpa, Solanum carolinense, Solidago canadensis, Solidago gigantea, Symphyotrichum lanceolatum, Symphyotrichum lateriflorum, Tradescantia ohiensis, Tripsacum dactyloides, Verbena urticifolia, Verbesina alternifolia, Verbesina occidentalis*, and *Vernonia noveboracensis*. Vascular plant richness is generally high: in West Virginia plots, values range from 41-80 species per 400 square meters, averaging 44.6 (Vanderhorst et al. 2008). This type often has a number of invasive exotic weeds, including *Polygonum cuspidatum, Polygonum perfoliatum, Lolium arundinaceum (= Festuca arundinacea), Phalaris arundinacea, Humulus japonicus, Glechoma hederacea, Microstegium vimineum, Urtica dioica*, and *Stellaria media*. In some locations, non-native species may out-compete the native herbs in this association and form large monospecific patches in floodplain openings, especially those affected by reservoir backup. On the Potomac River above the Great Valley, on the Monocacy River, and on smaller streams outside the Great Valley, several of the more characteristic species for the Shenandoah River, Antietam Creek, and the rest of the Potomac are apparently rare or absent, particularly *Rudbeckia laciniata* and *Solidago gigantea*. These differences may reflect the influence of more calcareous substrates and/or stream order on the communities. *Hasteola suaveolens, Sida hermaphrodita, Iresine rhizomatosa, Rumex altissimus*, and *Ruellia strepens* are Maryland rare species known from this type. Some examples at Mammoth Cave National Park, Kentucky also contain *Xanthium strumarium, Vernonia gigantea ssp. gigantea (= Vernonia altissima), Echinochloa muricata, Dipsacus fullonum (= Dipsacus sylvestris)*, and *Setaria parviflora*, in addition to many of the species recorded at other sites.

Global Dynamics: During years of more continuous high water during the growing season, vegetation may be sparse. Comparison of the frequency of this type at New River Gorge and nearby Bluestone National Scenic River noted that "the rate and extent of sedimentation has been greatly increased by flooding of Bluestone Lake, probably increasing the extent of this association. It can also occur as successional vegetation on floodplains previously cleared for agriculture" (Vanderhorst et al. 2008).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Apios americana*, *Eupatorium fistulosum*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Verbesina alternifolia*
Herb (field)	Graminoid	*Chasmanthium latifolium*, *Dichanthelium clandestinum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Apios americana*, *Eupatorium fistulosum*, *Solidago canadensis*, *Solidago gigantea*, *Tripsacum dactyloides*, *Vitis riparia*
Global: *Chasmanthium latifolium*, *Dichanthelium clandestinum*, *Elymus canadensis*, *Elymus riparius*, *Elymus virginicus*, *Eupatorium fistulosum*, *Eupatorium serotinum*, *Helianthus strumosus*, *Heliopsis helianthoides*, *Leersia virginica*, *Packera aurea*, *Polygonum virginianum*, *Rudbeckia laciniata*, *Scrophularia marilandica*, *Solanum carolinense*, *Solidago canadensis*, *Solidago gigantea*, *Verbena urticifolia*, *Verbesina alternifolia*, *Vernonia noveboracensis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Hibiscus laevis* (G5, WV state-imperiled), *Smallanthus uvedalius* (G4G5, WV state-imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium), *Lolium arundinaceum* (High/Medium), *Lonicera japonica* (High/Medium), *Medicago sativa* (Insignificant), *Rosa multiflora* (Medium/Low), *Silene latifolia* ssp. *alba*
Global: Vulnerable Plants: *Carex emoryi* (G5, WV state-rare), *Hasteola suaveolens* (G4, MD state-rare), *Iresine rhizomatosa* (G5, MD state-rare), *Ruellia strepens* (G4G5, WV & MD state-rare plant), *Rumex altissimus* (G5, MD state-rare), *Sida hermaphrodita* (G3, WV & MD state-rare plant), *Spiraea virginiana* (G2); **Invasive/Exotic Plants**: *Glechoma hederacea* (Low), *Humulus japonicus* (Medium/Low), *Lolium arundinaceum* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum cuspidatum* (High/Medium), *Polygonum perfoliatum* (Medium), *Stellaria media* (Low), *Urtica dioica*

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (2-Aug-2006). More data on the global distribution are needed to determine a conservation rank for this community.

RELATED CONCEPTS

Global Similar Types:

- *Eupatorium serotinum - Polygonum (lapathifolium, punctatum, pensylvanicum)* Riverbar Wet Meadow (CEGL006481)

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This is a small-patch community and some occurrences may fall below the minimum map unit size.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: The classification of this type was based, in part, on analysis of data from 10 plots collected during the National Capital Region Parks project, with an additional 10 plots from the New River Gorge and Bluestone River in West Virginia. Although some plots of this type performed convincingly as a discrete group in the National Capital Region analysis, others could not be separated from a group representing the Central Appalachian silver maple floodplain forest, with which this type frequently co-occurs. These results suggest that this type is weakly distinct floristically, sharing many species with the silver maple forest and varying from it along a gradual cline of (presumed) light exposure and increased stress from flooding near the channel. Because the type also tends to occur in small patches, it might, therefore, be considered an ecotonal expression of the silver maple forest. However, it also has similar classification issues with other floodplain forest and woodland types, and the distinctiveness of its physiognomy and habitat (open canopy which promotes rank growth of herbs adapted to full sunlight), its occurrence adjacent to various floodplain forest associations, as well as floristic similarity of stands across a broad range, and certain conservation issues supports its recognition.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs on the shores of rivers and large streams in the Piedmont and mountain regions of Maryland, Virginia, and West Virginia. It was sampled at Virginicus Island along the Shenandoah River at Harpers Ferry in West Virginia.
Global Range: This community is known from the shores of rivers and large streams in the Piedmont and mountain regions of Maryland and West Virginia and the Interior Low Plateau in Kentucky. It has been documented by plots or observed on the Potomac, Shenandoah, New, Bluestone, and Monocacy rivers and Antietam Creek (Maryland). Small-stream analogues or variants have been observed on Fifteen Mile Creek (Maryland) and on the South Fork of Quantico Creek (Virginia). Potential habitat for this association is widespread, and the type is likely to have a wider geographic range than current documentation indicates.
Nations: US
States/Provinces: DC, KY, MD, PA, WV
TNC Ecoregions: 44:C, 49:C, 50:C, 52:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Am:CCC, 221Da:CCC, 221Db:CCC, 221Ea:CCC, 221Fa:CCC, 222D:CC, M221Ac:CCC, M221Ad:CCC, M221Be:CCC, M221Bf:CCC, M221Cb:CCC, M221Da:CCC
Federal Lands: NPS (Antietam, Appalachian Trail [Central Appalachians], Bluestone, C&O Canal, Harpers Ferry, Mammoth Cave, New River Gorge); USFS (Monongahela)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HCRB
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot; 2 accuracy assessment points): APPA.0457, APPA_AA_0258, APPA_AA_0695.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): C. Lea, G.P. Fleming, S.C. Gawler
References: Eastern Ecology Working Group n.d., Harrison 2004, Harrison 2011, Lea 2000, Lea 2000*, Lea 2003, Lea 2004, Pyne et al. 2010, Vanderhorst et al. 2007, Vanderhorst et al. 2008, WVNHP unpubl. data b, Zimmerman 2011q, Zimmerman and Podniesinski 2008, Zimmerman et al. 2012

A1657 *Justicia americana* Riverbed Alliance

Alliance Summary Description: This alliance covers rocky river shoals dominated by *Justicia americana* with *Leersia* spp., *Saururus cernuus*, and others. It occurs in the Piedmont, Central Appalachians, Cumberland Plateau, Interior Low Plateau, Ozarks, Ouachita Mountains, and adjacent provinces. There is some apparent regional variation in the associated species. More Appalachian examples may contain *Orontium aquaticum* as a codominant. In parts of the Ridge and Valley and Piedmont, *Hymenocallis caroliniana (= Hymenocallis coronaria)* is codominant.

[CEGL004286] *Justicia americana* Riverbed Vegetation

Translated Name: **American Water-willow Riverbed Vegetation**
Common Name: **Water-willow Rocky Bar and Shore**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Riverine Wetland Vegetation (G755)
Alliance	*Justicia americana* Riverbed Alliance (A1657)

ELEMENT CONCEPT

Global Summary: This widespread association is found primarily in the Piedmont, Central Appalachians, Cumberland Plateau, Interior Low Plateau, Ozarks, Ouachita Mountains, and adjacent provinces. Stands occur on the shoals or bars of rocky streams and riverbeds, where they are subject to frequent high-energy floods. Slopes range from level to moderate but are typically gentle. The substrate is a variable mixture of sand, gravel and cobbles, often with deposits of silt and muck. Rooting occurs in the interstices between cobbles and boulders. *Justicia americana* is the characteristic dominant. *Saururus cernuus* is often present and may be codominant. Other

herbaceous species that may be present include *Bidens* spp., *Cyperus* spp., *Diodia teres, Elodea* sp., *Eleocharis* spp., *Equisetum arvense, Gratiola brevifolia, Leersia oryzoides, Leersia virginica, Lemna minor, Orontium aquaticum, Physostegia virginiana, Podostemum ceratophyllum, Polygonum caespitosum var. longisetum, Scirpus* spp., *Schoenoplectus pungens, Schoenoplectus tabernaemontani*, and *Xyris difformis var. difformis*. Exotics include *Lythrum salicaria* and *Lysimachia vulgaris*; where present, these are sparse. Some stands have low cover by scattered flood-suppressed trees or an overhanging canopy. Trees in plots include *Acer saccharinum, Betula nigra, Carpinus caroliniana, Fraxinus pennsylvanica*, and *Platanus occidentalis*. Scattered shrub seedlings of *Salix nigra, Salix caroliniana, Betula nigra, Cephalanthus occidentalis, Acer saccharinum*, or *Platanus occidentalis* may also be present. This association provides habitat in some portions of its range for globally rare dragonflies and herbs.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This American water-willow association occurs on shoals or bars of rocky streams and riverbeds and is entirely submerged by most flood events. It was sampled at four locations in the Central Appalachian project area. Sites are intermittently to semipermanently flooded channel beds, bars, bedrock ledges, and stream terraces. Soils range from rapidly drained to very poorly drained sandy loam and sand. The unvegetated surface consists of a mix of exposed bedrock, large/small rocks, sand, leaf litter, downed wood, and/or standing water. Evidence of disturbance includes the presence of exotic plant species.

Global Environment: This association occurs on the shoals or bars of rocky streams and riverbeds, on bedrock, boulders, cobble, gravel, and sands. They are subject to frequent high-energy floods, and are entirely submerged by most flood events. During extreme low water periods, the substrate can be exposed, showing a varied mixture of sand, gravel and cobbles, often with deposits of silt and muck. Rooting occurs in the interstices between cobbles and boulders. Stands commonly occur on the edge of the river and at the heads and tails of islands and may sometimes occur on deposition bars in the middle of the river. Substrate pH is circumneutral (mean = 6.0) in four samples. Slopes range from level to moderate but are typically gentle. Elevations of West Virginia stands range from 73 to at least 654 m; the type occurs at lower elevations in the Piedmont and Coastal Plain.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Justicia americana* is the dominant (and sometimes the only) species, forming lawnlike stands in shallow reaches of rivers. *Saururus cernuus* is often present and may be codominant. Additional species may include *Boehmeria cylindrica, Eupatorium pilosum, Hibiscus laevis, Leersia oryzoides*, and *Phalaris arundinacea*. Exotics are common in this community.

Global Vegetation: *Justicia americana* is the dominant (and sometimes the only) species, forming lawnlike stands in shallow reaches of rivers. Cover by *Justicia americana* ranges from 40 to 85%. *Saururus cernuus* is often present and may be codominant. Other herbaceous species may be present but rarely achieve more than 2% cover; they include *Bidens* spp., *Cyperus* spp., *Diodia teres, Elodea* sp., *Eleocharis* spp., *Equisetum arvense, Gratiola brevifolia, Leersia oryzoides, Leersia virginica, Lemna minor, Orontium aquaticum, Physostegia virginiana, Podostemum ceratophyllum, Polygonum caespitosum var. longisetum, Scirpus* spp., *Schoenoplectus pungens, Schoenoplectus tabernaemontani*, and *Xyris difformis var. difformis*. Exotics include *Lythrum salicaria* and *Lysimachia vulgaris*; they have not been observed in abundance in this community, possibly due to intolerance of high-energy flooding. In some areas, *Justicia* usually grows in nearly pure patches, so that few other species are associated with it. *Cuscuta gronovii, Mimulus ringens, Polygonum* spp., *Rumex* spp., and *Salix interior* can also occur (Anderson 1982). Some stands have low cover by scattered flood-suppressed trees or an overhanging canopy. Trees in plots include *Acer saccharinum, Betula nigra, Carpinus caroliniana, Fraxinus pennsylvanica*, and *Platanus occidentalis*. Scattered shrub seedlings of *Salix nigra, Salix caroliniana, Betula nigra, Cephalanthus occidentalis, Acer saccharinum*, or *Platanus occidentalis* may also be present. In the Cumberland Plateau of Alabama, *Justicia americana* is present in dense patches with some interspersion of other species, including *Pilea pumila, Boehmeria cylindrica, Eclipta prostrata (= Eclipta alba), Juncus coriaceus, Mikania scandens, Ludwigia palustris, Leersia* sp., and *Bidens* sp. Schmalzer and DeSelm (1982) discuss *Orontium aquaticum* growing along streambanks or in shallow riffles "along or with" *Justicia americana* in the Obed River in the Cumberland Plateau of Tennessee. In 29 plots sampled in the Potomac River watershed (Piedmont, Blue Ridge and Ridge and Valley provinces), *Justicia* was overwhelmingly dominant (50-75% mean cover), and no associated species occurred in more than 48% of the plots. Vascular plant species richness in sampled plots is low (typically 6-14 taxa).

Global Dynamics: Stands in some situations may be obliterated by ongoing river channeling. Anderson (1982) describes some of the life-history characteristics of *Justicia americana* that allow it to persist in river channels.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Justicia americana*, *Saururus cernuus*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Justicia americana*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Boehmeria cylindrica*, *Justicia americana*, *Leersia oryzoides*, *Saururus cernuus*
Global: *Eleocharis* spp., *Justicia americana*, *Leersia oryzoides*, *Leersia virginica*, *Orontium aquaticum*, *Polygonum amphibium*, *Saururus cernuus*, *Schoenoplectus pungens*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Conium maculatum* (Medium/Low), *Datura stramonium* (High/Low), *Lythrum salicaria* (High), *Poa annua* (Medium/Insignificant), *Portulaca grandiflora*, *Rorippa sylvestris* (Medium/Low)
Global: Vulnerable Plants: *Marshallia trinervia* (G3), *Ptilimnium nodosum* (G2), *Sagittaria secundifolia* (G1); **Invasive/Exotic Plants**: *Lysimachia vulgaris*, *Lythrum salicaria* (High), *Polygonum caespitosum* var. *longisetum*; **Other Plants**: *Boehmeria cylindrica* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (2-Oct-2012). The range of this type is huge, and a more careful analysis might turn up differences based on associated species that warrant splitting the type, but we may not have sufficiently detailed data rangewide to do so.

RELATED CONCEPTS

Global Similar Types:
- *Hymenocallis coronaria - Justicia americana* Riverbed Vegetation (CEGL004285)
- *Justicia americana - Peltandra virginica* Tidal Marsh (CEGL006579) occurs in freshwater tidal habitats.
- *Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Marsh (CEGL007696)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community was observed along the Shenandoah River, the C&O Canal, and the Conodoguinet River in Pennsylvania.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: In Ohio this type often forms pure patches, but consistent identification may require a simple cutoff rule, such as at least 50% cover of *Justicia* (Anderson 1982). However, Anderson (1996) no longer recognizes this type.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community ranges from the Piedmont and Central Appalachians to the Southern Appalachians. It was sampled in Maryland (near the C&O Canal), Pennsylvania (Conodoguinet River), and West Virginia (Shenandoah River).
Global Range: This type is found primarily in the Piedmont, Interior Low Plateau, Cumberland Plateau, Ozarks, Ouachita Mountains, Central Appalachians, and adjacent provinces. It ranges from Alabama, Georgia and the Carolinas west to Arkansas and Oklahoma and north to Ohio, New York, and New Jersey, with possible outliers north to southern Quebec.
Nations: US
States/Provinces: AL, AR, GA, KY, MD:S5, NC, NJ, NY, OH:S4, OK, PA:S4, SC?, TN, VA:S4, WV
TNC Ecoregions: 38:C, 39:C, 43:C, 44:C, 45:C, 48:C, 49:C, 50:C, 51:C, 52:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Am:CCC, 221Ba:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Ea:CCP, 221Ec:CCC, 221Ed:CCP, 221Ef:CCP, 221Fa:CCC, 221Ha:CCC, 221Hc:CCC, 221He:CCC, 222Dg:CCC, 222Eb:CCC, 222Eg:CCC,

222Ej:CCP, 222En:CCC, 222Eo:CCC, 222Ha:CCC, 231Af:CCC, 231B:CC, 231Cc:CCC, 231Cd:CCC, 231D:CC, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Ca:CCC, M221Cb:CCC, M221Cd:CCC, M221Da:CCC, M221Dc:CCC, M222A:CC, M231A:CC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Big South Fork, Buffalo River, C&O Canal, Chickasaw NRA, Delaware Water Gap, Gauley River, George Washington Parkway, Harpers Ferry, Little River Canyon, Mammoth Cave, Manassas, Natchez Trace, New River Gorge, Obed River, Stones River, Upper Delaware); USFS (Bankhead, Cherokee, Daniel Boone, Nantahala, Oconee?, Ouachita, Ouachita (Mountains), Ozark, Pisgah, Sumter (Mountains)?, Sumter (Piedmont)?, Sumter?, Uwharrie, Wayne)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HWBS
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (3 plots; 1 observation point; 4 accuracy assessment points): APPA.0104, APPA.0105, APPA.0456, APPA.1229, APPA_AA_0059, APPA_AA_0515, APPA_AA_1103, APPA_AA_1234.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): A.S. Weakley, D. Faber-Langendoen and S.C. Gawler
References: Allard 1990, Anderson 1982, Anderson 1996, Edinger et al. 2002, Fike 1999, Fleming 2007, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Harrison 2004, Harrison 2011, Hoagland 1997, Hoagland 2000, Lea 2000, Lea 2004, Major et al. 1999, McCoy 1958, Nelson 1986, Nordman 2004a, Nordman et al. 2011, ONHD unpubl. data, Palmer-Ball et al. 1988, Peet et al. unpubl. data, Penfound 1953, Perles et al. 2004, Perles et al. 2007, Perles et al. 2008, Pyne et al. 2010, Salas et al. 2010c, Schafale 1998b, Schafale 2002, Schafale 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Schotz et al. 2008, Schotz pers. comm., Southeastern Ecology Working Group n.d.*, TDNH unpubl. data, TNC and WPC 2004, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2010, Walton and Anderson 1997, Zimmerman 2011r, Zimmerman et al. 2012

A0948 *Salix nigra* Riverscour Scrub Alliance

Alliance Summary Description: This alliance is composed of vegetation occurring on sand and gravel rivershores receiving high-energy flood-scour. The physiognomy is best characterized as scrub, formed by intermittent flood-scour. *Salix nigra* is characteristic, but floristic composition and structure is widely variable. Other species of *Salix* may co-occur, as well as *Alnus serrulata, Cornus sericea*, and a variety of herbaceous species that tolerate flood disturbance. Alluvial tree saplings often occur as well, including *Acer saccharinum, Populus deltoides*, and others. This alliance occurs throughout the eastern United States and possibly adjacent Canada.

[CEGL006065] *Salix nigra / Phalaris arundinacea - Apocynum cannabinum* Wet Shrubland

Translated Name: **Black Willow / Reed Canarygrass - Indian-hemp Wet Shrubland**
Common Name: **Black Willow Riverbar Shrubland**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Riverine Wetland Vegetation (G755)
Alliance	*Salix nigra* Riverscour Scrub Alliance (A0948)

ELEMENT CONCEPT

Global Summary: This community is a willow shrubland of low riverbanks along moderate- to high-energy rivers in the northeastern U.S. and High Allegheny Plateau. It occurs on cobble substrates with sand and gravel in areas that are flooded only during high-water events, but receive winter ice-scour. It occupies an intermediate position along a disturbance gradient between open, herbaceous cobble shores and higher floodplain forests. *Salix nigra* is often dominant or codominant with other willows or dogwoods forming a dense shrub layer. Less frequent shrubs and tree saplings include *Salix eriocephala, Salix lucida, Salix sericea, Alnus incana, Alnus serrulata, Cornus amomum, Cornus sericea (= Cornus stolonifera), Spiraea alba var. latifolia, Platanus occidentalis, Acer rubrum, Acer saccharinum*, and *Populus deltoides*. The herbaceous layer is often sparse but variable in cover and composition, including *Carex torta, Panicum dichotomiflorum, Panicum virgatum, Dichanthelium clandestinum (=*

Panicum clandestinum), Echinochloa crus-galli, Elymus virginicus, Justicia americana, Boehmeria cylindrica, Polygonum amphibium, Phalaris arundinacea, Calamagrostis canadensis, Apocynum cannabinum (= Apocynum sibiricum), Agrostis spp., *Solidago gigantea, Solidago rugosa, Eupatorium maculatum, Rorippa islandica, Lysimachia terrestris, Polygonum* spp., and *Bidens* spp. Invasive, exotic species can be problematic in this community, including *Polygonum cuspidatum, Lythrum salicaria, Tussilago farfara*, and *Cynanchum louiseae*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This early-successional shrubland occurs on floodplains and river gravel bars and islands.
Global Environment: This community occurs on low riverbanks along moderate- to high-energy rivers on cobble substrates within a sand or gravel matrix.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This shrubland is dominated by *Salix* spp. *Salix nigra* is often dominant or codominant with other willows or dogwoods forming a dense shrub layer. It lacks *Betula nigra*. The herbaceous layer is often sparse but variable in cover and composition.
Global Vegetation: *Salix nigra* is often dominant or codominant with other willows or dogwoods forming a dense shrub layer. Less frequent shrubs and tree saplings include *Salix eriocephala, Salix lucida, Salix sericea, Alnus incana, Alnus serrulata, Cornus amomum, Cornus sericea (= Cornus stolonifera), Spiraea alba var. latifolia, Platanus occidentalis, Acer rubrum, Acer saccharinum*, and *Populus deltoides*. The herbaceous layer is typically sparse with variable composition, including *Carex torta, Panicum dichotomiflorum, Panicum virgatum, Dichanthelium clandestinum (= Panicum clandestinum), Echinochloa crus-galli, Elymus virginicus, Phalaris arundinacea, Calamagrostis canadensis, Apocynum cannabinum (= Apocynum sibiricum), Agrostis* spp., *Solidago gigantea, Solidago rugosa, Eupatorium maculatum, Rorippa islandica, Lysimachia terrestris, Polygonum* spp., and *Bidens* spp. Invasive, exotic species can be problematic in this community, including *Polygonum cuspidatum, Lythrum salicaria, Tussilago farfara*, and *Cynanchum louiseae*.
Global Dynamics: It occurs on cobble substrates with sand and gravel in areas that are flooded only during high-water events, but receive winter ice-scour. It occupies an intermediate position along a disturbance gradient between open, herbaceous cobble shores and higher floodplain forests.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Salix* spp.
Short shrub/sapling	Broad-leaved deciduous shrub	*Salix nigra*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous tree	*Salix nigra*
Herb (field)	Flowering forb	*Apocynum cannabinum*, *Polygonum hydropiper*
Herb (field)	Graminoid	*Phalaris arundinacea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Salix nigra*, *Salix* spp.
Global: *Cornus amomum*, *Dichanthelium clandestinum*, *Phalaris arundinacea*, *Platanus occidentalis*, *Salix nigra*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Cynanchum louiseae* (High), *Echinochloa crus-galli* (Medium/Insignificant), *Lythrum salicaria* (High), *Polygonum cuspidatum* (High/Medium), *Polygonum hydropiper*, *Tussilago farfara* (Insignificant)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (20-Jun-2006). This community is not well-documented but occurs over a large range and is a frequent component of floodplain systems.

RELATED CONCEPTS

Global Similar Types:
- *Salix caroliniana* Coastal Plain Wet Shrubland (CEGL007052)
- *Salix caroliniana* Ozark Riverscour Shrubland (CEGL007064)
- *Salix interior - Salix eriocephala* Sandbar Wet Shrubland (CEGL005078)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed by UMESC in Massachusetts and Vermont during mapping reconnaissance.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed in Massachusetts and Vermont during UMESC mapping reconnaissance.
Global Range: This association occurs in the eastern United States from New Hampshire and Vermont south to Pennsylvania and New Jersey.
Nations: US
States/Provinces: CT, DE, MA, MD?, ME, NH:S3, NJ, NY, PA, VT
TNC Ecoregions: 49:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fa:CCP, 212Fb:CCP, 212Fc:CCC, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCP, 221Am:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, M212Bb:CCC, M212Bd:CCC, M212Cc:CCC, M212Eb:CCP
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap, Upper Delaware); USFWS (Great Meadows)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SXMW
Appalachian National Scenic Trail (Lower New England Project Area) Plots: None.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): S.L. Neid and S.C. Gawler
References: Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Fike 1999, Gawler 2002, Metzler and Barrett 2001, Metzler and Barrett 2006, Nichols et al. 2001, Perles et al. 2004, Perles et al. 2007, Perles et al. 2008, Sperduto and Nichols 2004, Swain and Kearsley 2001, TNC and WPC 2004, Thompson and Sorenson 2000, Zimmerman 2011b, Zimmerman 2011n, Zimmerman and Podniesinski 2008, Zimmerman et al. 2012

A4152 Mid-Atlantic Piedmont & Mountain Riverscour Annual Vegetation Alliance

Alliance Summary Description:

[CEGL006483] *Eragrostis hypnoides - Ludwigia palustris - Lindernia dubia - Cyperus squarrosus* Riverbar Wet Meadow

Translated Name: **Teal Lovegrass - Marsh Seedbox - Yellowseed False Pimpernel - Bearded Flatsedge Riverbar Wet Meadow**
Common Name: **Appalachian-Atlantic Riverbar Drawdown Shore**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Riverine Wetland Vegetation (G755)
Alliance	Mid-Atlantic Piedmont & Mountain Riverscour Annual Vegetation Alliance (A4152)

ELEMENT CONCEPT

Global Summary: This association occurs along major rivers in the Piedmont and mountains of Maryland, Virginia, West Virginia, and the District of Columbia. It occupies the lowest parts of riverbanks or very low rivershore depositional bars in areas that receive essentially full sunlight. These habitats are inundated for most of the winter and spring and are generally consistently exposed only from early summer to early autumn (i.e., the "drawdown" zone). During wet years they may be nearly continuously inundated. The type usually occurs as a narrow strip (frequently <2 m wide) along the shoreline. This association may also develop, sometimes as very large (>1 ha) patches, on the drawdown shores and seasonally exposed islands of impounded rivers. Vegetation of stands

varies from sparse to dense (10-80% cover) and is characterized by low-growing mats of predominantly annual species, with some low, fast-growing perennials also present. *Eragrostis hypnoides, Ludwigia palustris, Lindernia dubia var. dubia*, and *Cyperus squarrosus* are constant and often abundant. Other characteristic annuals (and biennials) are *Acalypha rhomboidea, Ammannia coccinea, Artemisia annua, Bidens frondosa, Chamaesyce humistrata, Chamaesyce maculata, Chenopodium ambrosioides, Cyperus bipartitus, Cyperus odoratus, Diodia virginiana, Echinochloa crus-galli, Eclipta prostrata, Elsholtzia ciliata, Eragrostis frankii, Fimbristylis autumnalis, Hypericum mutilum, Lindernia dubia var. anagallidea, Lindernia dubia var. dubia, Lipocarpha micrantha, Mollugo verticillata, Panicum dichotomiflorum var. dichotomiflorum, Panicum gattingeri (= Panicum philadelphicum ssp. gattingeri), Paspalum fluitans, Polygonum caespitosum var. longisetum, Rorippa palustris ssp. fernaldiana, Rotala ramosior, Solanum ptychanthum*, and *Xanthium strumarium*. Frequent perennials include *Boehmeria cylindrica, Cyperus strigosus, Leersia virginica, Justicia americana, Lycopus americanus, Mimulus alatus, Penthorum sedoides, Phyla lanceolata, Rorippa sylvestris*, and *Samolus valerandi ssp. parviflorus*. Stranded mats of *Heteranthera dubia (= Zosterella dubia)* are also frequent. Seedlings of taller annuals and perennials such as *Hibiscus laevis, Eupatorium* spp., and *Polygonum* spp. are also frequent but rarely reach full stature. Overhanging trees of *Platanus occidentalis* and *Acer saccharinum* may be present, as well as saplings of *Betula nigra*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This river bar drawdown shore occupies the lowest parts of riverbanks, wet beaches, and/or very low rivershore depositional bars in areas that receive essentially full sunlight. It occurs as a narrow strip (frequently <2 m wide) along the shoreline and may also occur in back channels and sloughs. It was sampled once in Maryland in the Central Appalachian project area on a depositional bar on a bank of the Potomac River which is frequently under water. Soil is poorly drained clay. The unvegetated surface is dominated by bare soil with a few small rocks. Evidence of disturbance includes the presence of exotic plant species. The short periods of exposure and heavy disturbance regime select for opportunistic, non-competitive annual species and low, short-lived, fast-growing perennials, all of which can grow and reproduce quickly.

Global Environment: Natural occurrences of this community occupy the lowest parts of riverbanks or very low rivershore depositional bars in areas that receive essentially full sunlight. It occurs on eroded riverbanks and wet beaches and may also occur in back channels and sloughs. These habitats are inundated for most of the winter and spring and are generally consistently exposed only from early summer to early autumn (i.e., the "drawdown" zone). During wet years they may be nearly continuously inundated. The type usually occurs as a narrow strip (frequently <2 m wide) along the shoreline. Though more frequently flooded than higher depositional bars that support tall annual or perennial herbaceous vegetation, the habitats of this type probably experience lesser amounts of sediment turnover (erosion and deposition) during a flood of a given magnitude (i.e., are less stochastically disturbed). Soils are usually deep to somewhat shallow sandy loams, loamy sands, or silt loams that are likely saturated to near the surface throughout the growing season. They would likely be classified as Entisols and generally have high pH (7.0), high calcium levels, and are 100% base-saturated. Mean particle size (phi) of samples collected from several Potomac River sites is 2.7 to 1.9. This association may also develop, sometimes as very large (>1 ha) patches, on the drawdown shores and seasonally exposed islands of impounded rivers, e.g., at the upper end of the John H. Kerr Reservoir on the Roanoke River in Halifax, Mecklenburg, and Charlotte counties, Virginia.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Eragrostis hypnoides, Ludwigia palustris, Rotala ramosior, Cyperus strigosus*, and *Cyperus squarrosus* are often abundant. Other herbs include *Verbena hastata, Chamaesyce maculata, Eupatorium serotinum*, and *Lindernia dubia*. The vegetation is characterized by low-growing mats of predominantly annual species.

Global Vegetation: With the exception of several semi-aquatic perennial species, the short periods of exposure and heavy disturbance regime select for opportunistic, non-competitive annual species and low, short-lived, fast-growing perennials, all of which can grow and reproduce quickly. It would be expected that many species in this community type have relatively long-lived seedbanks and, possibly, specialized germination requirements. Vegetation of stands varies from sparse to dense (10-80% cover) and is characterized by low-growing mats of predominantly annual species. *Eragrostis hypnoides, Ludwigia palustris, Lindernia dubia var. dubia*, and *Cyperus squarrosus* are constant and often abundant. Other characteristic annuals (and biennials) are *Acalypha rhomboidea, Ammannia coccinea, Artemisia annua, Bidens frondosa, Chamaesyce humistrata, Chamaesyce maculata, Chenopodium ambrosioides, Cyperus bipartitus, Cyperus odoratus, Diodia virginiana, Echinochloa crus-galli, Eclipta prostrata, Elsholtzia ciliata, Eragrostis frankii, Fimbristylis autumnalis, Hypericum mutilum, Lindernia dubia var. anagallidea, Lindernia dubia var. dubia, Lipocarpha micrantha, Mollugo verticillata, Panicum dichotomiflorum var.*

dichotomiflorum, Panicum gattingeri (= Panicum philadelphicum ssp. gattingeri), Paspalum fluitans, Polygonum caespitosum var. longisetum, Rorippa palustris ssp. fernaldiana, Rotala ramosior, Solanum ptychanthum, and *Xanthium strumarium*. Frequent perennials include *Boehmeria cylindrica, Cyperus strigosus, Leersia virginica, Justicia americana, Lycopus americanus, Mimulus alatus, Penthorum sedoides, Phyla lanceolata, Rorippa sylvestris*, and *Samolus valerandi ssp. parviflorus*. Stranded mats of *Heteranthera dubia (= Zosterella dubia)* are also frequent. Seedlings of taller annuals and perennials such as *Hibiscus laevis, Eupatorium* spp., and *Polygonum* spp. are also frequent but rarely reach full stature. A variant of this community in the Potomac River drainage is characterized primarily by low, rhizomatous colonies of *Eleocharis tenuis*. Species that are more characteristic of the James River and Roanoke River occurrences in central and southern Virginia include *Cyperus flavicomus, Cyperus erythrorhizos, Ludwigia decurrens, Paspalum dissectum, Rorippa sessiliflora*, and *Sagittaria calycina var. calycina*. Overhanging trees of *Platanus occidentalis* and *Acer saccharinum* may be present, as well as saplings of *Betula nigra*.

Global Dynamics: Patches may be highly ephemeral, but this association will likely persist on the landscape under natural or altered flooding regimes.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Ludwigia palustris*, *Rotala ramosior*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Lindernia dubia*, *Ludwigia palustris*, *Rotala ramosior*
Herb (field)	Graminoid	*Eragrostis hypnoides*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Cyperus squarrosus*, *Cyperus strigosus*, *Eragrostis hypnoides*, *Ludwigia palustris*, *Rotala ramosior*

Global: *Acalypha rhomboidea*, *Artemisia annua*, *Chamaesyce humistrata*, *Chenopodium ambrosioides*, *Cyperus* spp., *Diodia virginiana*, *Echinochloa crus-galli*, *Eclipta prostrata*, *Eragrostis frankii*, *Eragrostis hypnoides*, *Fimbristylis autumnalis*, *Hypericum mutilum*, *Leersia virginica*, *Lindernia dubia*, *Lipocarpha micrantha*, *Ludwigia palustris*, *Mimulus alatus*, *Oxalis stricta*, *Panicum dichotomiflorum*, *Panicum gattingeri*, *Rotala ramosior*, *Solanum ptychanthum*, *Verbascum thapsus*, *Verbena urticifolia*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Artemisia annua* (Medium/Insignificant), *Rorippa sylvestris* (Medium/Low)

Global: Vulnerable Plants: *Lipocarpha micrantha* (G5, state-rare), *Paspalum dissectum* (G4?, state-rare), *Rorippa sessiliflora* (G5, VA & WV state-rare), *Sagittaria calycina* var. *calycina* (G5T5?, VA & WV state-rare);
Invasive/Exotic Plants: *Artemisia annua* (Medium/Insignificant), *Chenopodium ambrosioides*, *Echinochloa crus-galli* (Medium/Insignificant), *Polygonum caespitosum* var. *longisetum*, *Verbascum thapsus* (Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (29-Sep-2006). Although natural stands occur in very small, somewhat ephemeral patches, this type is widely distributed along major rivers in the greater Mid-Atlantic Piedmont and mountain region and is adaptable to artificial drawdown shores, where it sometimes occurs in extensive patches.

RELATED CONCEPTS

Global Similar Types:

- *Eragrostis hypnoides - Micranthemum umbrosum - Lipocarpha micrantha - (Juncus repens)* Wet Meadow (CEGL004341) on drawdown shores of Coastal Plain rivers.

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Data for this community came from the Harpers Ferry (Maryland) vegetation classification. It occurs along the Potomac River. Many occurrences are below the minimum map unit size.

Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: The classification is supported by analysis of data from 25 plots collected for the National Capital Region Parks project, three plots collected along the Roanoke River in southern Virginia, and one plot from the New River in West Virginia. Many of the annual species which characterize this association are also common in *Salix nigra - Betula nigra / Schoenoplectus pungens* Riverscour Shrubland (CEGL006463) and *Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Marsh (CEGL007696), and distinction between these types may depend on the size of the sampled patch.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community occurs along major rivers in the Piedmont and mountains of Maryland, Virginia, West Virginia, and the District of Columbia. It was sampled at Potomac Wayside in Washington County, Maryland.
Global Range: This community occurs along major rivers in the Piedmont and mountains of Maryland, Virginia, West Virginia, and the District of Columbia. It is definitely known from the Potomac, Shenandoah, Monocacy, New, James, and Roanoke rivers, and likely occurs in other drainages of the region.
Nations: US
States/Provinces: DC, MD, VA:S3, WV
TNC Ecoregions: 50:C, 52:C, 59:C, 61:C
USFS Ecoregions (1994/95): M221Cb:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal, George Washington Parkway, Harpers Ferry, Monocacy, New River Gorge)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HCRB
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 plot): APPA.0450.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): C. Lea, G.P. Fleming, S.C. Gawler
References: Eastern Ecology Working Group n.d., Fleming 2002b, Fleming 2007, Fleming and Patterson 2003, Fleming and Patterson 2011a, Fleming and Taverna 2006, Fleming et al. 2001, Fleming et al. 2004, Harrison 2004, Lea 2000, Lea 2000*, Lea 2003, Lea 2004, Vanderhorst et al. 2007

M303. Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland

G556. EASTERN RUDERAL WET MEADOW & MARSH

Group Summary Description: This group includes heavily disturbed marshes and wet meadows in the eastern half of the United States north of a line running from North Carolina to Arkansas, which are usually dominated or at least have a strong component of exotic species. This group is composed of herbaceous-dominated, seasonal to semipermanently flooded wetlands. Sites often have a history of significant disturbance such as heavy pasturing, chemical and soil run-off from nearby fields or developed areas, or alteration in hydrologic regimes. Along with the wide range in flooding regimes, there can be a wide variety of dominant species, some of which can form near monocultures. Some common dominants include *Lythrum salicaria, Phalaris arundinacea, Phragmites australis, Polygonum cuspidatum*, and *Typha* spp.

A1381 *Phalaris arundinacea* Eastern Ruderal Marsh Alliance

Alliance Summary Description: This alliance is found throughout the northeastern and midwestern United States, but its distribution as a natural type is complicated elsewhere. Stands are typically minerotrophic wetlands rather than river shores. Stands are dominated by *Phalaris arundinacea*, which tends to occur in monocultures or associated with *Calamagrostis canadensis*. Other associates in the Northeast include *Agrostis gigantea, Alnus incana* or *Alnus serrulata, Viburnum dentatum*, and *Viburnum nudum*. Western stands tend to be monotypic. Further work is required to resolve the natural versus introduced nature of this type in North America before a thorough alliance description can be completed.

[CEGL006044] *Phalaris arundinacea* Eastern Ruderal Marsh

Translated Name: **Reed Canarygrass Eastern Ruderal Marsh**
Common Name: **Eastern Ruderal Reed Canarygrass Marsh**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland (M303)
Group	Eastern Ruderal Wet Meadow & Marsh (G556)
Alliance	*Phalaris arundinacea* Eastern Ruderal Marsh Alliance (A1381)

ELEMENT CONCEPT

Global Summary: This association is found throughout the northeastern United States and Canada, but its distribution as a natural type is complicated elsewhere. *Phalaris arundinacea* is native to the United States and Canada but is now more widely distributed and abundant because of local introductions from both local and European populations. The introduced strains may be more aggressive ecotypes than native strains. Stands are found in both minerotrophic basin wetlands as well as rivershores. *Phalaris arundinacea* has been widely used as a forage and hay crop, especially in marshes and floodplains, and it is used for wildlife food and for shoreline and ditch stabilization. Stands are dominated by *Phalaris arundinacea*, a 0.5- to 2-m tall perennial grass, which tends to occur in monocultures or associated with *Calamagrostis canadensis*. Associates in the glaciated Northeast include *Viburnum nudum, Alnus incana* or *Alnus serrulata, Viburnum dentatum*, and *Agrostis gigantea*. In Central Appalachian bottomland old fields, characteristic associates include *Verbesina alternifolia* (which may be codominant), *Solidago rugosa, Boehmeria cylindrica*, and *Euthamia graminifolia*, along with exotic species such as *Glechoma hederacea, Coronilla varia, Rosa multiflora*, and *Elaeagnus umbellata*. Midwest associates include species characteristic of wet meadows. *Phalaris arundinacea* can displace native species over time. Further work is required to resolve the natural versus introduced nature of this type in the Southeast before a description can be completed.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This reed canarygrass-dominated vegetation is found in both basin wetlands and along rivershores. It was sampled four times in Pennsylvania in the Central Appalachian project area on cobbly/sandy gravel bars of alluvial flats which flood

frequently. Soils are well-drained sandy loam. The unvegetated surface consists of a mix of large and small rocks, leaf litter, downed wood, and/or bare soil. Evidence of disturbance includes a nearby powerline right-of-way and farmland, frequent flooding, and the abundance of exotic plant species.

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This reed canarygrass-dominated vegetation is found in both basin wetlands and along rivershores. Sites include seasonally flooded depressions and saturated alluvial flats. Soils are poorly to very poorly drained muck. The unvegetated surface consists of leaf litter, with standing water possible. Evidence of disturbance includes alterations to hydrology (beaver activity), past clearing, minor recreational use and the presence of exotic plants.

Global Environment: Stands are found in both minerotrophic basin wetlands as well as rivershores. The dominant species has been widely used as a forage and hay crop, especially in marshes and floodplains, and it is used for wildlife food and for shoreline and ditch stabilization (Barnes 1999).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This perennial herbaceous wetland community is composed of near-monocultural stands of the invasive native grass *Phalaris arundinacea*. Additional taxa found in much smaller amounts include *Bidens frondosa, Leersia oryzoides, Polygonum cuspidatum, Polygonum hydropiper, Polygonum pensylvanicum, Polygonum persicaria*, and *Rumex crispus*, most of which are invasive exotics.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Phalaris arundinacea* is clearly dominant in these marshes. Other species present may include *Solidago canadensis, Boehmeria cylindrica, Impatiens capensis, Onoclea sensibilis, Polygonum hydropiperoides, Euthamia graminifolia*, and *Eupatorium maculatum*. Several exotic species have invaded these sites. In addition, this community supports MA state-critically imperiled *Agrimonia parviflora*.

Global Vegetation: Stands are dominated by *Phalaris arundinacea*, a 0.5- to 2-m tall perennial grass that is native to the United States and Canada, but which has also been introduced from European strains. The introduced strains may be more aggressive ecotypes than native strains (Barnes 1999). It tends to occur in monocultures or associated with *Calamagrostis canadensis* or, less commonly, with a mixture of forbs equaling the graminoid cover. Associates in the glaciated Northeast include *Viburnum nudum, Salix* spp., *Alnus incana* or *Alnus serrulata, Viburnum dentatum, Poa palustris, Mentha arvensis, Leersia virginica, Lythrum salicaria*, and *Agrostis gigantea*. In Central Appalachian bottomland old fields, characteristic associates include *Verbesina alternifolia* (which may be codominant), *Solidago rugosa, Boehmeria cylindrica*, and *Euthamia graminifolia*, along with exotic species such as *Glechoma hederacea, Coronilla varia, Rosa multiflora*, and *Elaeagnus umbellata*. Midwest associates include species characteristic of wet meadows. *Phalaris arundinacea* can displace native species over time (Apfelbaum and Sams 1987, Barnes 1999, and references therein). Further work is required to resolve the natural versus introduced nature of this type in the Southeast.

Global Dynamics: Shoreline habitats can be temporarily or seasonally flooded in spring. *Phalaris arundinacea* may respond well to summer drawdowns (Barnes 1999).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phalaris arundinacea*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Impatiens capensis*, *Polygonum hydropiperoides*
Herb (field)	Graminoid	*Phalaris arundinacea*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phalaris arundinacea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Phalaris arundinacea*
Appalachian National Scenic Trail (Lower New England Project Area): *Impatiens capensis*, *Phalaris arundinacea*, *Polygonum hydropiperoides*
Global: *Phalaris arundinacea*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Polygonum cuspidatum* (High/Medium), *Polygonum hydropiper*, *Polygonum persicaria*, *Rumex crispus* (Low/Insignificant)
Appalachian National Scenic Trail (Lower New England Project Area): Vulnerable Plants: *Agrimonia parviflora* (G5, MA state-critically imperiled); **Invasive/Exotic Plants**: *Agrostis gigantea* (Medium/Low), *Lythrum salicaria* (High), *Microstegium vimineum* (High/Medium), *Pennisetum glaucum*, *Polygonum caespitosum*, *Rumex obtusifolius*, *Taraxacum officinale*
Global: Invasive/Exotic Plants: *Coronilla varia* (High), *Elaeagnus umbellata* (High), *Glechoma hederacea* (Low), *Phalaris arundinacea* (High), *Rosa multiflora* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (1-Dec-1997). *Phalaris arundinacea* is native to the United States and Canada but is now more widely distributed and abundant because of local introductions from both local and European populations (Apfelbaum and Sams 1987). It can invade a variety of habitats.

RELATED CONCEPTS

Global Similar Types:
- *Calamagrostis canadensis* - *Carex* spp. Laurentian & Northeast Wet Meadow (CEGL005448)
- *Calamagrostis canadensis* North-Central Wet Meadow (CEGL005449)
- *Phalaris arundinacea* Western Marsh (CEGL001474)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This community is common on the Delaware River in Pennsylvania.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571), Eastern Cattail Marsh (CEGL006153), and/or Eastern Ruderal Common Reed Marsh (CEGL004141) often occur adjacent to or interdigitated with this community.

Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: In New York, *Phalaris arundinacea* is native.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Type has a broad distribution; in fact, it is widespread throughout temperate areas of the northern hemisphere. It is native to the United States and Canada, but is now more widely distributed and abundant because of local introductions from both local and European populations (Apfelbaum and Sams 1987). It can invade a variety of habitats, suggesting that little unites these stands apart from the dominance of *Phalaris arundinacea*. However, that may be the only reasonable way to describe this type. This vegetation is documented from Shady Valley TNC Preserve, Johnson County, Tennessee, where it occupies channelized streams, impoundments, and fen restoration sites. In these examples, characteristic associates include *Juncus effusus, Carex lurida, Carex gynandra*, and *Alnus serrulata*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled in Cumberland and Perry counties in Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Hubbard Brook Natural Heritage Site in Massachusetts, Pochuck Creek and Wawayanda State Park in New Jersey, and in New York.
Global Range: This association is found throughout the northeastern United States and Canada, but its distribution as a natural type is complicated elsewhere. It currently ranges from Virginia north to Vermont, east to Minnesota and south to Tennessee.
Nations: CA, US
States/Provinces: CT, DE, IA, IN, MA, MD, ME, MN, NH, NJ, NY, OH, ON, PA, QC, RI, TN, VA, VT, WI?, WV
TNC Ecoregions: 46:P, 47:C, 48:C, 49:C, 50:C, 51:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fc:CCC, 212G:CP, 221Aa:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Fa:CCC, 222Ib:CCC, 222Ic:CCC, 222Jj:CCC, 222L:CC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bf:CCC, M221Dc:CCC

Federal Lands: NPS (Allegheny Portage Railroad, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], C&O Canal, Catoctin Mountain, Cuyahoga Valley, Delaware Water Gap, Effigy Mounds, Eisenhower, Gettysburg, Harpers Ferry, Indiana Dunes, Mississippi, Saint Croix, Saratoga, Saugus Iron Works, Upper Delaware); USFWS (Assabet River?, Erie, Great Meadows?, Great Swamp, Iroquois, Montezuma, Oxbow, Parker River, Rachel Carson?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HXSC, XBMV
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (2 plots; 1 observation point): APPA.0660, APPA.0668, APPA.1228.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 plots; 2 observation points; 22 accuracy assessment points): APPA.0026, APPA.0917, APPA.1368, APPA.1535, APPA_AA_1711, APPA_AA_1795, APPA_AA_1841, APPA_AA_2014, APPA_AA_2036, APPA_AA_2080, APPA_AA_2176, APPA_AA_2311, APPA_AA_2393, APPA_AA_2504, APPA_AA_2506, APPA_AA_2526, APPA_AA_2580, APPA_AA_2632, APPA_AA_2765, APPA_AA_2790, APPA_AA_2799, APPA_AA_2879, APPA_AA_2941, APPA_AA_2993, APPA_AA_3079, APPA_AA_3227.

Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): D. Faber-Langendoen and S.C. Gawler
References: Apfelbaum and Sams 1987, Barnes 1999, CDPNQ unpubl. data, Cowardin et al. 1979, Coxe 2009, Edinger et al. 2002, Edinger et al. 2007, Fike 1999, Hop et al. 2005, Hop et al. 2009, Largay and Sneddon 2008, MNNHP 1993, Metzler and Barrett 2001, Metzler and Barrett 2006, Midwestern Ecology Working Group n.d.*, NRCS 2004a, ONHD unpubl. data, Perles et al. 2004, Perles et al. 2006c, Perles et al. 2006d, Perles et al. 2007, Perles et al. 2008, Rawinski 1984a, Sperduto 2000a, Swain and Kearsley 2001, TDNH unpubl. data, TNC and WPC 2004, Thompson 1996, Thompson and Sorenson 2000, Vanderhorst 2001a, Vanderhorst and Streets 2006, Zimmerman 2011h, Zimmerman et al. 2012

A1431 *Phragmites australis ssp. australis* Ruderal Marsh Alliance

Alliance Summary Description: This alliance consists of non-tidal *Phragmites australis ssp. australis* marshes with semipermanently or, rarely, seasonally flooded hydrology, occurring either in depressions or along rivers with seasonal fluctuation in water level throughout the United States and adjacent Canada. This includes semipermanently flooded marshes, ditches, impoundments, etc., which are strongly dominated by essentially monospecific stands of *Phragmites australis*, which is rapidly spreading in disturbed areas and excluding native vegetation. Stands may be composed entirely of *Phragmites australis*, with few or no other vascular plants present.

[CEGL004141] *Phragmites australis ssp. australis* Eastern Ruderal Marsh

Translated Name: **European Common Reed Eastern Ruderal Marsh**
Common Name: **Eastern Ruderal Common Reed Marsh**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland (M303)
Group	Eastern Ruderal Wet Meadow & Marsh (G556)
Alliance	*Phragmites australis ssp. australis* Ruderal Marsh Alliance (A1431)

ELEMENT CONCEPT

Global Summary: This reed marsh type is found across the east-temperate regions of the United States and Canada. Stands occur in semipermanently flooded marshes, ditches, impoundments, etc., that have often been disturbed by human activity. The vegetation is variable, as *Phragmites australis* will often invade into existing natural or semi-natural communities present on the site. Once firmly established, this community is usually strongly dominated by *Phragmites australis ssp. australis*, with few or no other vascular plants present.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: Stands occur in a variety of disturbed, wet settings including semipermanently flooded marshes, ditches and impoundments.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: This common reed marsh is found on sites that are saturated basins with very poorly drained muck soil. The unvegetated surface includes leaf litter, standing water or a combination of both. No evidence of disturbance was reported.
Global Environment: Stands occur in semipermanently flooded marshes, ditches, impoundments, etc. that have often been disturbed by human activity.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Phragmites australis* is dominant, typically forming a monoculture.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: *Phragmites australis* dominates these marshes. Additional herbs are sparse and variable but may include *Boehmeria cylindrica, Calamagrostis canadensis, Carex stricta, Osmunda cinnamomea, Polygonum amphibium*, and *Thelypteris palustris*, among others. Scattered trees such as *Acer rubrum* and shrubs, including *Spiraea* spp., may also occur.
Global Vegetation: The vegetation is often variable, as *Phragmites australis ssp. australis* will often invade into existing natural or semi-natural communities present on the site. Once firmly established, this community is usually strongly dominated by *Phragmites australis*, with few or no other vascular plants present.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phragmites australis*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phragmites australis*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phragmites australis* ssp. *australis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Phragmites australis*
Appalachian National Scenic Trail (Lower New England Project Area): *Phragmites australis*
Global: *Phragmites australis* ssp. *australis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Phragmites australis* (High)
Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Phragmites australis* (High)
Global: Invasive/Exotic Plants: *Phragmites australis* ssp. *australis*

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (23-Nov-1997). Although almost always occurring as a naturalized type that arises from human disturbance, some stands in northern Minnesota and further north in Canada may be native. If so, they should be tracked as a separate type, dominated instead by *Phragmites australis ssp. americanus*.

RELATED CONCEPTS

Global Similar Types:
- *Phragmites australis* Western Ruderal Wet Meadow (CEGL001475)
- *Phragmites australis ssp. australis* Tidal Ruderal Marsh (CEGL004187)
- *Typha* spp. - *(Phragmites australis)* - *Carex* spp. Floating Marshy Fen (CEGL002541) from Canada, is perhaps dominated by the native *Phragmites australis ssp. americanus*.

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: See Global Comments.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This is not a native community but is the result of the invasion of alien *Phragmites australis ssp. australis* into natural or semi-natural vegetation. The vegetation has variable hydrology and, unless *Phragmites* is clearly dominant, is often treated as part of other marsh and meadow types. The geographic distribution of the type is arbitrarily limited to Bailey's Humid Temperate Domain in eastern North America (Bailey 1997, 1998). Stands in northern Minnesota and farther north in Canada may represent native stands. If so, they should be tracked as a different type. Tidal vegetation of the Gulf Coast of Louisiana and Texas dominated by *Phragmites australis* is classified in *Sagittaria lancifolia* Gulf Coast Tidal Freshwater Marsh Alliance (A1987).

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community is highly likely in disturbed wetland settings along the AT in the Central Appalachian project area. The UMESC mapping team observed it in Northampton County, Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Canopus Lake South and Sunken Mine Road North in Fahnestock State Park, New York.
Global Range: This reed marsh type is found across the east-temperate regions of the United States and Canada, ranging from Maine west to the eastern Dakotas and Manitoba, south to Texas and east to Florida.
Nations: CA, US
States/Provinces: AL, AR, CT, DE, FL, GA, IA, IN, LA, MA, MD, ME, MI, MN, MS, NC, NH, NJ:S5, NY, OH, ON, PA:S5, QC, RI, SC, TX, VA, VT, WI, WV?
TNC Ecoregions: 31:C, 39:P, 40:C, 41:C, 42:C, 47:C, 48:C, 52:P, 53:C, 55:C, 56:C, 57:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212C:CP, 212Fc:CCC, 212Ho:CCC, 212Hw:CCC, 221Aa:CCP, 221Ab:CCC, 221Ae:CCC, 221Ai:CCC, 221Bc:CCC, 221Da:CCC, 222Ic:CCC, 222Jj:CCC, 231Fb:CCC, 232Ab:CCC, 232Ac:CCC, 232Ch:CCC, 232Dc:CCC, 232E:CC, 232G:CC, 234A:PP, 255Dc:CCC, M212:C, M221:P
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Assateague Island, Boston Harbor Islands, Cape Cod, Cuyahoga Valley, Indiana Dunes, Minute Man, Mississippi, Padre Island, Saint Croix, Saratoga, Sleeping Bear Dunes, Upper Delaware, Voyageurs); USFWS (Alligator River, Aransas, Bon Secour, Brazoria, Cape May, E.B. Forsythe, Great Dismal Swamp, Great Meadows, Great Swamp, Matagorda Island, Monomoy, Montezuma, Oxbow, Parker River, Prime Hook, Supawna Meadows)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HXCR, XBMV
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: The UMESC mapping team observed it in Northampton County, Pennsylvania, during the summer of 2011 and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 accuracy assessment point): APPA_AA_1211.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 observation points; 23 accuracy assessment points): APPA.1408, APPA.1410, APPA.1411, APPA.1414, APPA_AA_1682, APPA_AA_1906, APPA_AA_2093, APPA_AA_2148, APPA_AA_2184, APPA_AA_2231, APPA_AA_2249, APPA_AA_2355, APPA_AA_2396, APPA_AA_2409, APPA_AA_2501, APPA_AA_2549, APPA_AA_2593, APPA_AA_2774, APPA_AA_2846, APPA_AA_2862, APPA_AA_2902, APPA_AA_2908, APPA_AA_3048, APPA_AA_3172, APPA_AA_3177, APPA_AA_3209, APPA_AA_3314.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): D. Faber-Langendoen and M. Pyne
References: Bailey 1997, Bailey 1998, Bell et al. 2002, Brock et al. 2007, CDPNQ unpubl. data, Chapman et al. 1989, Clancy 1993b, Coxe 2009, Edinger et al. 2002, Edinger et al. 2007, Eichelberger 2011f, Faber-Langendoen

2001, Gawler et al. 2005, Harris et al. 1996, Homoya et al. 1988, Hop et al. 1999, Hop et al. 2009, INAI n.d., Largay and Sneddon 2010, MNNHP 1993, Metzler and Barrett 1992, Metzler and Barrett 2001, Metzler and Barrett 2006, NRCS 2004a, NatureServe 2009, Nelson 1986, ONHD unpubl. data, Perles et al. 2008, Rawinski 1984a, Schafale and Weakley 1990, Schotz pers. comm., Sneddon et al. 2010, Southeastern Ecology Working Group n.d.*, Swain and Kearsley 2001, TNC 1995c, Zimmerman et al. 2012

A4106 *Spiraea tomentosa - Rubus* spp. Ruderal Wet Shrubland Alliance

Alliance Summary Description: This wet meadow vegetation of the northeastern states is complex and variable, ranging from shrub thicket to herbaceous meadow with scattered shrubs. Shrub species usually include *Spiraea tomentosa, Spiraea alba var. alba, Cornus amomum, Rubus allegheniensis, Rubus hispidus, Salix* spp., and others. *Hypericum densiflorum* often occurs in the Central Appalachians. The invasive exotic shrubs *Lonicera morrowii* and *Rosa multiflora* may be locally abundant. Associated herbaceous species are also variable in composition, depending on land-use history. Commonly seen are *Calamagrostis canadensis, Carex folliculata, Carex lupulina, Carex lurida, Carex scoparia, Carex trichocarpa, Carex vulpinoidea, Eleocharis* spp., *Eupatorium maculatum, Impatiens capensis, Juncus effusus, Leersia oryzoides, Lycopus uniflorus, Onoclea sensibilis, Phalaris arundinacea, Polygonum sagittatum, Scirpus cyperinus, Scirpus expansus, Solidago canadensis, Solidago gigantea, Solidago rugosa, Thelypteris palustris, Triadenum virginicum, Vernonia noveboracensis*, and others. The invasive species *Microstegium vimineum, Lythrum salicaria*, and *Phragmites australis* can be abundant or form monocultures in these wetlands. Successional wet meadows in the Atlantic Coastal Plain of New Jersey can include scattered patches of *Liquidambar styraciflua* and *Morella pensylvanica*, and more predominantly grassy patches of *Andropogon virginicus, Panicum rigidulum, Panicum virgatum*, and *Spiraea tomentosa*. The alliance occurs in a variety of settings, most frequently in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands.

[CEGL006571] *Spiraea tomentosa - Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland

Translated Name: **Steeplebush - Blackberry species / Reed Canarygrass Ruderal Wet Shrubland**
Common Name: **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland (M303)
Group	Eastern Ruderal Wet Meadow & Marsh (G556)
Alliance	*Spiraea tomentosa - Rubus* spp. Ruderal Wet Shrubland Alliance (A4106)

ELEMENT CONCEPT

Global Summary: This wet meadow vegetation of the northeastern states occurs in a variety of settings, most frequently in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands. The physiognomy is complex and variable, ranging from shrub thicket to herbaceous meadow with scattered shrubs. Shrub species usually include *Spiraea tomentosa, Spiraea alba var. alba, Cornus amomum, Rubus allegheniensis, Rubus hispidus, Salix* spp., and others. *Hypericum densiflorum* often occurs in the Central Appalachians. The invasive exotic shrubs *Lonicera morrowii* and *Rosa multiflora* may be locally abundant. Associated herbaceous species are also variable in composition, depending on land-use history. Commonly seen are *Phalaris arundinacea, Solidago rugosa, Solidago gigantea, Solidago canadensis, Juncus effusus, Scirpus cyperinus, Scirpus expansus, Leersia oryzoides, Calamagrostis canadensis, Carex scoparia, Carex folliculata, Carex lurida, Carex lupulina, Carex vulpinoidea, Carex trichocarpa, Vernonia noveboracensis, Triadenum virginicum, Lycopus uniflorus, Impatiens capensis, Eupatorium maculatum, Polygonum sagittatum, Thelypteris palustris, Onoclea sensibilis, Eleocharis* spp., and others. The invasive species *Microstegium vimineum, Lythrum salicaria*, and *Phragmites australis* can be abundant or form monocultures in these wetlands. Successional wet meadows in the Coastal Plain of New Jersey can include scattered patches of *Liquidambar styraciflua* and *Morella pensylvanica*, and more predominantly grassy patches of *Andropogon virginicus, Panicum rigidulum, Panicum virgatum*, and *Spiraea tomentosa*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This disturbed, successional wet meadow occurs in a variety of settings including agricultural and residential areas. Wetland species are often intermixed with upland species. These "wet old fields" may be mowed annually and referred to as "wet old fields."

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This disturbed, successional wet meadow occurs in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands. Wetland species are often intermixed with upland species.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This shrub and herbaceous meadow occurs on temporarily flooded, flat to gently sloping alluvial terraces at elevations ranging from 500 to 740 m (1,640-2,427 feet). Soils are poorly drained silt loam or muck.

Global Environment: This wet meadow vegetation of the northeastern states occurs in a variety of settings, most frequently in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands. These wetlands typically flood early in the growing season and may be saturated to near the surface for some of the growing season, but they are generally dry for much of the year. The substrate is typically mineral soil with a layer of muck at the surface.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: This successional wet meadow is dominated by an admixture of upland and wetland old-field species. It may also contain successional shrubs (<50% cover). Commonly seen are *Phalaris arundinacea, Solidago rugosa, Solidago gigantea, Solidago canadensis, Juncus effusus, Scirpus cyperinus, Scirpus expansus, Leersia oryzoides, Calamagrostis canadensis, Carex scoparia, Carex folliculata, Carex lurida, Carex lupulina, Carex vulpinoidea, Carex trichocarpa, Vernonia noveboracensis, Triadenum virginicum, Lycopus uniflorus, Impatiens capensis, Eupatorium maculatum, Polygonum sagittatum, Thelypteris palustris, Onoclea sensibilis, Eleocharis* spp., and others.

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These wet meadows range from shrub thickets to herbaceous meadows with scattered shrubs dominated by *Spiraea* spp. and *Rubus* spp. with variable combinations of wetland old-field species such as *Phalaris arundinacea, Juncus effusus, Thelypteris palustris, Onoclea sensibilis, Solidago* spp., *Impatiens capensis, Lycopus uniflorus*, and *Lythrum salicaria* (exotic).

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is physiognomically variable and may be herb- or shrub-dominated. Dominant shrubs may include *Clematis virginiana, Viburnum lantanoides, Rubus allegheniensis, Alnus incana*, and *Salix bebbiana*. Dominant herbaceous species may include *Galium boreale, Matteuccia struthiopteris, Muhlenbergia glomerata, Onoclea sensibilis*, and *Veronica verna*.

Global Vegetation: The physiognomy is complex and variable, ranging from shrub thicket to herbaceous meadow with scattered shrubs. Within each wetland, species may be locally abundant and often have patchy distribution. Shrub species usually include *Spiraea tomentosa, Spiraea alba var. alba, Cornus amomum, Rubus allegheniensis, Rubus hispidus, Salix* spp., and others. *Hypericum densiflorum* often occurs in the Central Appalachians. The invasive exotic shrubs *Lonicera morrowii* and *Rosa multiflora* may be locally abundant. Associated herbaceous species are also variable in composition, depending on land-use history. Commonly seen are *Phalaris arundinacea, Solidago rugosa, Solidago gigantea, Solidago canadensis, Juncus effusus, Scirpus cyperinus, Scirpus expansus, Leersia oryzoides, Calamagrostis canadensis, Carex scoparia, Carex folliculata, Carex lurida, Carex lupulina, Carex vulpinoidea, Carex trichocarpa, Vernonia noveboracensis, Triadenum virginicum, Lycopus uniflorus, Impatiens capensis, Eupatorium maculatum, Polygonum sagittatum, Thelypteris palustris, Onoclea sensibilis, Eleocharis* spp., and others. *Sphagnum* spp. are often abundant along with lesser amounts of other nonvascular species. The invasive species *Microstegium vimineum, Lythrum salicaria*, and *Phragmites australis* can be abundant or form monocultures in these wetlands. Successional wet meadows in the Coastal Plain of New Jersey can include scattered patches of *Liquidambar styraciflua* and *Morella pensylvanica*, and more predominantly grassy patches of *Andropogon virginicus, Panicum rigidulum, Panicum virgatum*, and *Spiraea tomentosa*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus allegheniensis*, *Spiraea alba* var. *alba*, *Spiraea tomentosa*
Herb (field)	Flowering forb	*Solidago canadensis*, *Solidago rugosa*
Herb (field)	Graminoid	*Leersia oryzoides*, *Phalaris arundinacea*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Spiraea alba* var. *alba*, *Spiraea tomentosa*
Short shrub/sapling	Dwarf-shrub	*Rubus allegheniensis*
Herb (field)	Graminoid	*Juncus effusus*, *Phalaris arundinacea*
Herb (field)	Fern (Spore-bearing forb)	*Onoclea sensibilis*, *Thelypteris palustris*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus incana*
Short shrub/sapling	Broad-leaved deciduous shrub	*Clematis virginiana*, *Rubus allegheniensis*, *Salix bebbiana*, *Viburnum lantanoides*
Herb (field)	Flowering forb	*Galium boreale*
Herb (field)	Graminoid	*Muhlenbergia glomerata*
Herb (field)	Fern (Spore-bearing forb)	*Matteuccia struthiopteris*, *Onoclea sensibilis*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus allegheniensis*, *Spiraea alba* var. *alba*, *Spiraea tomentosa*
Herb (field)	Flowering forb	*Solidago canadensis*, *Solidago rugosa*
Herb (field)	Graminoid	*Carex* spp., *Leersia oryzoides*, *Phalaris arundinacea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area):
Appalachian National Scenic Trail (Lower New England Project Area): *Rubus allegheniensis*, *Spiraea tomentosa*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Rubus allegheniensis*, *Viburnum lantanoides*
Global: *Rubus allegheniensis*, *Spiraea tomentosa*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Hypericum perforatum* (High/Medium, exotic/invasive), *Veronica verna* (exotic/invasive), *Vicia cracca* (exotic/invasive)
Global: Invasive/Exotic Plants: *Lonicera morrowii* (High/Medium), *Rosa multiflora* (Medium/Low); **Other Plants**: *Thelypteris palustris* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (15-Jul-2013).

RELATED CONCEPTS

Global Similar Types:
- *Cornus (amomum, sericea)* - *Viburnum dentatum* - *Rosa multiflora* Ruderal Shrub Swamp (CEGL006576)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: This is a successional wet meadow that has shrub-dominated and herb-dominated expressions, but because the shrubs are usually only about 1 m tall, this gives the impression of a wet meadow rather than a shrubland. *Cornus* can be present but is not dominant. Ruderal Dogwood - Arrow-wood Shrub Swamp (CEGL006576) is a successional wet shrubland dominated by shrubs over 2 m in height.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: Observed in New Jersey by the mapping reconnaissance team during the summer of 2012.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This ruderal vegetation occurs in disturbed wet meadow areas along the Appalachian Trail. It was observed in Warren County, Virginia, and Hogestown Run in Cumberland Valley, Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This ranges from New Jersey north through New England.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from Wyman Mountain, Kennebec River and Nahmakanta Lake.
Global Range: Although this vegetation is widespread, its range has not been evaluated. It is known from the Central Appalachian ecoregion, the High Alleghany Plateau, Western Alleghany Plateau, North Atlantic Coast, and the Lower New England / Northern Piedmont ecoregions, and is likely in others.
Nations: US
States/Provinces: CT, MA, ME?, NJ, NY, PA, WV:S2
TNC Ecoregions: 48:C, 49:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Ae:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Fa:CCC, 222Ib:CCC, 222Ic:CCC, 232Ac:CCC, M221Ac:CCC, M221Bc:CCC
Federal Lands: NPS (Allegheny Portage Railroad, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Boston Harbor Islands, Cape Cod, Delaware Water Gap, Johnstown Flood, Saratoga, Upper Delaware, Weir Farm); USFS (Monongahela); USFWS (Assabet River?, Erie, Great Meadows?, Great Swamp, Iroquois, Montezuma, Parker River?, Rachel Carson?, Supawna Meadows)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HXSC, XBMV
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: This community was observed in the Central Appalachian project area by UMESC mappers and Natural Heritage ecologists during the 2011 field season and during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed in New Jersey (LNE) by the mapping reconnaissance team during the summer of 2012 and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 accuracy assessment point): APPA_AA_0409.

Appalachian National Scenic Trail (Lower New England Project Area) Plots: (25 accuracy assessment points): APPA_AA_1639, APPA_AA_1676, APPA_AA_1877, APPA_AA_1883, APPA_AA_1983, APPA_AA_1992, APPA_AA_2041, APPA_AA_2179, APPA_AA_2208, APPA_AA_2252, APPA_AA_2282, APPA_AA_2351, APPA_AA_2484, APPA_AA_2485, APPA_AA_2551, APPA_AA_2628, APPA_AA_2746, APPA_AA_2820, APPA_AA_2837, APPA_AA_2880, APPA_AA_2939, APPA_AA_2959, APPA_AA_3056, APPA_AA_3151, APPA_AA_3217.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 3 observation points; 9 accuracy assessment points): APPA.1599, APPA.1633, APPA.1634, APPA.1635, APPA.1671, APPA_AA_2206, APPA_AA_2354, APPA_AA_2595, APPA_AA_2612, APPA_AA_2645, APPA_AA_2724, APPA_AA_2737, APPA_AA_2940, APPA_AA_3198.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): L.A. Sneddon, S.C. Gawler and E.F. Largay
References: Byers et al. 2007, Decker 1955, Eastern Ecology Working Group n.d., Edinger et al. 2002, Edinger et al. 2007, Fike 1999, Largay and Sneddon 2010, Metzler et al. 2009, NRCS 2004a, NatureServe and Russell 2003, NatureServe n.d.*, Perles et al. 2006d, Perles et al. 2006e, Perles et al. 2007, Perles et al. 2008, Sneddon et al. 2010

G557. SOUTHEASTERN RUDERAL MARSH, WET MEADOW & SHRUBLAND

Group Summary Description: These are herbaceous wetlands which are characterized by ruderal conditions or dominance by exotic plant species. Also included here are wetlands which may have been severely disturbed by vehicles or equipment, such as coastal plain depressions which have been subjected to intensive forest management

(i.e., bedded and site-prepped) and ponds used by recreational off-road vehicles. These ruderal herbaceous and shrub wetlands tend to be dominated by *Andropogon glomeratus, Juncus effusus*, and exotic plant species, such as the exotic shrub *Ligustrum sinense* or exotic grasses *Pennisetum purpureum* or *Arundo donax*.

A3412 *Juncus effusus - Andropogon glomeratus var. pumilus - Saccharum giganteum* Ruderal Marsh Alliance

Alliance Summary Description: These disturbed marshes and other open wetlands are dominated by native graminoid plants, and have few or no trees. These areas may be dominated by *Andropogon glomeratus var. pumilus, Juncus effusus, Saccharum giganteum, Scirpus cyperinus, Typha* spp., or other graminoid plants. This alliance is found in the southern and eastern United States, from Maryland and West Virginia, south to Florida and Texas. This vegetation occurs in disturbed wetland sites, such as old fields (particularly old fields in bottomlands), as well as low areas and ditches in old fields.

[CEGL004112] *Juncus effusus* Marsh

Translated Name: **Common Rush Marsh**
Common Name: **Common Rush Marsh**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland (M303)
Group	Southeastern Ruderal Marsh, Wet Meadow & Shrubland (G557)
Alliance	*Juncus effusus - Andropogon glomeratus var. pumilus - Saccharum giganteum* Ruderal Marsh Alliance (A3412)

ELEMENT CONCEPT

Global Summary: This broadly defined type represents freshwater marsh vegetation dominated by *Juncus effusus*. Additional types may be developed as more information becomes available. This vegetation may occur in natural or artificial ponds, including beaver-enhanced ones. In various parts of its broad range as currently defined, associated species may include *Andropogon glomeratus, Cyperus* spp., *Typha latifolia, Scirpus cyperinus, Triadenum walteri, Apios americana*, and *Galium aparine*. This type includes seasonally to temporarily flooded vegetation dominated or codominated by *Juncus effusus* in the Central and Southern Appalachians.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This is a seasonally (to temporarily) flooded marsh vegetation community; it may occur in natural or artificial ponds, including beaver-enhanced ponds, artificial waterways (wet ditches), and disturbed wet fields.
Global Environment: This is a seasonally (to temporarily) flooded marsh vegetation type; it may occur in natural or artificial ponds, including beaver-enhanced ponds, artificial waterways (wet ditches), and disturbed wet fields.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This type is currently broadly and literally defined, based on dominance by *Juncus effusus*. In various parts of its broad range as currently defined, associated species may include *Andropogon glomeratus, Carex* spp., *Cyperus* spp., other *Juncus* spp., *Typha latifolia, Scirpus cyperinus, Triadenum walteri, Apios americana*, and *Galium aparine*.
Global Vegetation: This type is currently broadly and literally defined, based on dominance by *Juncus effusus*. In various parts of its broad range as currently defined, associated species may include *Andropogon glomeratus, Carex* spp., *Cyperus* spp., other *Juncus* spp., *Typha latifolia, Scirpus cyperinus, Triadenum walteri, Apios americana*, and *Galium aparine*. In Georgia, Wharton (1978) cites *Carex rostrata, Carex stipata, Schoenoplectus pungens (= Scirpus americanus)*, and *Sagittaria latifolia* as associates of beaver pond vegetation containing *Juncus effusus*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Juncus effusus*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Juncus effusus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Juncus effusus*
Global: *Juncus effusus*

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Pycnanthemum beadlei* (G2G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (28-Mar-2001). This is a broadly defined, widely distributed, and reasonably secure vegetation type.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: No observation points or plots collected for this community, but it was observed in 2012 in VT during map reconnaissance.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: A new association is likely to be split from CEGL004112 to represent northeastern expressions of the community as new data become available.

Though this association was not seen at the Bankhead National Forest, it is expected to occur there.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This marsh was observed in mapping area in Vermont.
Global Range: The range of this broadly defined association has not been fully described. It is confirmed as occurring in the Northern Appalachians south through the Central Appalachians and is thought to occur in the Interior Low Plateau, Cumberland Plateau, Southern Ridge and Valley, Southern Blue Ridge, Piedmont, Chesapeake Bay Lowlands, and the Coastal Plain from the Mid-Atlantic to the Upper East Gulf Coastal Plain.
Nations: US
States/Provinces: AL, AR, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA:SU, VT, WV:S5
TNC Ecoregions: 38:C, 39:C, 40:C, 42:C, 43:C, 44:C, 50:P, 51:C, 52:C, 53:P, 56:P, 57:P, 58:P, 59:C
USFS Ecoregions (1994/95): 222Eb:CCC, 231Bg:CCC, 231Bi:CCC, 231Ca:CPP, 231Cd:CPP, 231Db:CCC, 232Ce:PPP, M221Ab:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); DOD (Arnold, Fort Benning); NPS (Appalachian Trail [Lower New England], Blue Ridge Parkway, Carl Sandburg Home, Chattahoochee River, Chickamauga-Chattanooga?, Cumberland Island?, Great Smoky Mountains, Mammoth Cave?, Natchez Trace); USFS (Bankhead, Cherokee?, Nantahala, Oconee?, Pisgah, Talladega, Talladega (Oakmulgee), Talladega (Talladega)?); USFWS (Patuxent)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HCRM, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: Observed in VT on the AT during 2012 mapping reconnaissance by Lesley Sneddon and the UMESC mapping team and during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 accuracy assessment point): APPA_AA_3033.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): Southeastern Ecology Group

References: Allard 1990, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming pers. comm., Hillestad et al. 1975, Hoagland 1998c, Hoagland 2000, McCoy and Fleming 2000, Nordman et al. 2011, Peet et al. unpubl. data, Pyne et al. 2010, Schafale 2012, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, TNC 1998a, WVNHP unpubl. data b, Wharton 1978, White 2003, Wichmann 2009, Wichmann 2009*

4. Polar & High Montane Scrub, Grassland & Barrens

4.B.1. Temperate & Boreal Alpine Tundra

4.B.1.Na. Eastern North American Alpine Tundra

M131. Eastern North American Alpine Tundra

G108. Eastern Alpine Cliff, Scree & Rock Vegetation

Group Summary Description: This group encompasses lithomorphic sparse or nonvascular vegetation above treeline in alpine areas of Eastern North America. It includes lichen-dominated expanses known as felsenmeer ("sea of rocks") as well as alpine cliffs where the near-vertical exposure prevents much vegetation growth. On flat or gently-sloped tablelands and ridgelines, felsenmeer develops where freeze-thaw cycles have broken rocks into variously-sized fragments. Crustose, umbilicate, and foliose lichens dominate. Scattered vascular plants such as *Juncus trifidus, Minuartia groenlandica*, and *Carex bigelowii* occur where patches of soil have accumulated. On alpine cliffs, the patchy vegetation is concentrated in areas kept wet by runoff and is dominated by bryophytes and certain alpine vascular plants. Some plants on the cliffs, such as *Juncus trifidus, Minuartia groenlandica, Vaccinium uliginosum, Ledum groenlandicum*, and *Agrostis mertensii*, can be found in other types of northeastern alpine vegetation. Others are more-or-less restricted to these alpine cliffs: these include *Polygonum viviparum (= Persicaria vivipara), Festuca prolifera, Saxifraga cernua, Saxifraga paniculata (= Saxifraga aizoon), Cardamine bellidifolia, Carex scirpoidea, Pinguicula vulgaris*, and *Phleum alpinum*.

A4003 *Rhizocarpon geographicum - Umbilicaria hyperborea* Eastern Alpine Fell-field Alliance

Alliance Summary Description: This alliance occurs at high elevations on Northern Appalachian and eastern Canadian summits. Serpentine mountains often develop fell-fields. Sites are near or above treeline and are generally windswept and exposed to high solar radiation. Lichens are the dominant vegetation; vascular plants may occur in very sparse abundance, confined to sheltered crevices. Typically, the rock surfaces are covered with various lichen species, including *Rhizocarpon geographicum, Arctoparmelia centrifuga*, and *Umbilicaria hyperborea*. Various dwarf-shrubs and herbs may occur in sheltered areas, and where soil areas are more extensive, dwarf-shrub heath types may be found. Patterned ground caused by frost action is common, with rocks sorting by size classes in polygons, in flat areas, or in stripes, on slopes.

[CEGL006420] *Arctoparmelia centrifuga - Rhizocarpon geographicum* Nonvascular Vegetation
Translated Name: **Concentric-ring Lichen - World Map Lichen Nonvascular Vegetation**
Common Name: **Eastern Lichen Fell-field**

USNVC Classification

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Cliff, Scree & Rock Vegetation (G108)
Alliance	*Rhizocarpon geographicum - Umbilicaria hyperborea* Eastern Alpine Fell-field Alliance (A4003)

Element Concept

Global Summary: These fell-fields are blocky boulderfields on ridges and flats above treeline in the Northern Appalachians. Vascular vegetation is very sparse, confined to pockets among the rocks. Nonvascular species dominate, with a prominent cover of crustose lichens. Dominant lichens include *Rhizocarpon geographicum, Arctoparmelia centrifuga (= Parmelia centrifuga)*, and *Umbilicaria hyperborea*. Vascular plants scattered in protected pockets include *Juncus trifidus, Carex bigelowii, Sibbaldiopsis tridentata, Diapensia lapponica, Picea mariana, Abies balsamea*, and *Betula* spp.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: The only sampled occurrence of this association is located on a steep southwest-facing midslope at 630 m (2,065 feet) in elevation. The substrate is composed entirely of rapidly drained large boulders.
Global Environment: This association is found on windswept barrens above treeline (1000-1900 m [3300-6200 feet]) in the Northern Appalachians. Moisture is derived from snow, rain and fog.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This sparsely vegetated association is dominated by lichens with trace amounts of tree saplings.
Global Vegetation: Nonvascular species dominate, with a prominent cover of crustose lichens. Dominant lichens include *Rhizocarpon geographicum, Arctoparmelia centrifuga (= Parmelia centrifuga)*, and *Umbilicaria hyperborea*. Vascular plants scattered in protected pockets include *Juncus trifidus, Carex bigelowii, Sibbaldiopsis tridentata, Diapensia lapponica, Picea mariana, Abies balsamea*, and *Betula* spp.
Global Dynamics: This association is not well-studied. Hiker traffic is a management concern in some locations.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Nonvascular	Lichen	unknown lichen spp.

Global

Stratum	Lifeform	Species
Nonvascular	Lichen	*Arctoparmelia centrifuga*, *Rhizocarpon geographicum*, *Umbilicaria hyperborea*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): unknown lichen spp.
Global: *Arctoparmelia centrifuga*, *Rhizocarpon geographicum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (17-Jul-2009). This association is very limited in distribution (but may be locally extensive) in the northeastern United States. It is believed to occur in adjacent Canada, where distribution is not well-known.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: Vegetation studies focusing on vascular plants generally fail to document this association. Appalachian Mountain Club alpine vegetation mapping project has this type mapped [see http://appalachia.outdoors.org/mapping/ and follow links to alpine areas]. This is clearly a distinct type, just poorly documented.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is has only been sampled from one location near Ethel Pond in Maine. It is likely to occur elsewhere in the Northern Appalachian project area but is undersampled.
Global Range: This association is known to occur, but not well-documented, in the higher peaks of the Northern Appalachians from New York east to Maine, and presumably into adjacent Canada.
Nations: CA?, US
States/Provinces: ME, NH:S2, NY, ON?, QC
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ac:CCC, M212Ad:CCP, M212Ae:CCP
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: VAFB
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 observation point; 30 accuracy assessment points): APPA.1606, APPA_AA_1658, APPA_AA_1707, APPA_AA_1712, APPA_AA_1733, APPA_AA_1796, APPA_AA_1832, APPA_AA_1951, APPA_AA_1995, APPA_AA_1997, APPA_AA_2010, APPA_AA_2065, APPA_AA_2081, APPA_AA_2145, APPA_AA_2175, APPA_AA_2242, APPA_AA_2258, APPA_AA_2459, APPA_AA_2565, APPA_AA_2636, APPA_AA_2741, APPA_AA_2798, APPA_AA_2808, APPA_AA_2822, APPA_AA_2919, APPA_AA_2983, APPA_AA_3020, APPA_AA_3025, APPA_AA_3034, APPA_AA_3081, APPA_AA_3131.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Bliss 1963, Bliss 1963*, CDPNQ unpubl. data, Eastern Ecology Working Group n.d., Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Kimball and Weihrauch 2000, Levin 2001, May and Davis 1978, Sperduto 1994, Sperduto and Nichols 2004

G104. EASTERN ALPINE TUNDRA

Group Summary Description: This dwarf-shrub-, herb-, or lichen-dominated vegetation occurs above treeline on northeastern mountains of North America, where wind, snow, and cloud-cover fog limit plant growth. Sites encompass the ancient and weathered summits and plateaus of the Canadian Shield and the northern Appalachian Mountains. Most of the cover is dwarf-shrubland or lichen-dominated; islands of taller shrubs or small graminoid meadows may occur in protected spots. The dominant plants are ericads: *Vaccinium uliginosum* is diagnostic and often dominant, and *Vaccinium vitis-idaea* is often common. Other alpine-restricted heaths such as *Phyllodoce caerulea, Rhododendron lapponicum, Arctostaphylos alpina*, and *Loiseleuria procumbens* are present, with composition generally varying by microsite characteristics. Other low shrubs include dwarf birches, alders and willows, such as *Betula minor, Betula glandulosa, Alnus viridis, Salix uva-ursi*, and *Salix argyrocarpa*. *Diapensia lapponica* is a characteristic cushion-plant, especially in highly exposed flats. *Carex bigelowii* is a characteristic and locally dominant sedge, *Agrostis mertensii* and *Hierochloe alpina* are characteristic grasses, and *Juncus trifidus* is a dominant rush. Forbs are comparatively scarce (except in snowbank settings), with characteristic species including *Solidago cutleri, Minuartia groenlandica, Prenanthes boottii*, and in a few locations, *Geum peckii* and *Potentilla robbinsiana*.

A3285 *Betula papyrifera var. cordifolia - Betula glandulosa - Alnus viridis* Alpine Shrubland Alliance

Alliance Summary Description: Thickets are dominated by *Betula papyrifera var. cordifolia (= Betula cordifolia), Betula glandulosa*, and *Alnus viridis*. Other shrub associates include *Amelanchier bartramiana* and *Viburnum edule*. The birch-alder alpine shrubland is found on mid-elevation slopes and ravines of many of the northern ranges. These communities can cover hundreds of hectares in the alpine areas of the Canadian Shield, and are abundant on north-facing slopes of Tuckerman Ravine in the Presidential Range of New Hampshire.

[CEGL006064] *Alnus viridis ssp. crispa - Spiraea alba / Solidago macrophylla* Shrubland

Translated Name: **Mountain Alder - White Meadowsweet / Largeleaf Goldenrod Shrubland**
Common Name: **Alpine Slope Shrub Thicket**

USNVC CLASSIFICATION

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Betula papyrifera var. cordifolia - Betula glandulosa - Alnus viridis* Alpine Shrubland Alliance (A3285)

ELEMENT CONCEPT

Global Summary: These alder-birch shrublands are found in the subalpine to lower alpine zones of the higher mountains in the Northern Appalachians. They typically develop in somewhat unstable settings such as avalanche paths, old landslides, or cirque walls. The most common setting is on a steep, concave slope, although they may also occur on flats. Deciduous shrubs averaging 1-2 m tall dominate and may form thickets. Herb cover is best developed

in openings among the shrubs, and so is patchy. Dwarf-shrubs are a minor component, and bryophytes are sparse. The dominant species are *Alnus viridis ssp. crispa* and *Betula papyrifera* (possibly including the subalpine var. *cordifolia*). *Diervilla lonicera* may be locally abundant, especially in somewhat drier microsites. Stunted *Picea mariana* and *Abies balsamea* may occur with the shrubs. *Viburnum edule* is often present, although in very low numbers. Herbs include *Solidago macrophylla, Prenanthes trifoliolata, Eurybia radula (= Aster radula), Sibbaldiopsis tridentata* (in drier openings), *Dryopteris campyloptera, Dryopteris intermedia, Athyrium filix-femina*, and *Calamagrostis canadensis*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is known from one location on a snowbank on a steep, southeast-facing slope at 1475 m (4,840 feet) in elevation. Soils are completely organic.

Global Environment: These shrublands occur on somewhat unstable settings such as avalanche paths, old landslides, or cirque walls. The most common setting is on a steep, concave slope between treeline and the true dwarf-shrub alpine zone. Slope can vary, however, from essentially vertical to nearly flat. Elevation ranges from 800 to 1600 m (2600-5300 feet).

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This dense shrubland snowbank community is dominated by *Alnus viridis ssp. crispa*. Other shrub associates include *Betula minor, Betula nana*, and *Vaccinium caespitosum*. The herbaceous layer is open and dominated by *Phegopteris connectilis*. Other herbaceous associates include *Houstonia caerulea, Symphyotrichum puniceum var. puniceum, Trichophorum caespitosum*, and *Veratrum viride*.

Global Vegetation: Deciduous shrubs averaging 1-2 m tall dominate, and may form thickets. Herb cover is best developed in openings among the shrubs, and so is patchy. Dwarf-shrubs are a minor component, and bryophytes are sparse. The dominant species are *Alnus viridis ssp. crispa* and *Betula papyrifera* (possibly including the subalpine var. *cordifolia*). *Diervilla lonicera* may be locally abundant, especially in somewhat drier microsites. Stunted *Picea mariana* and *Abies balsamea* may occur with the shrubs. *Viburnum edule* is often present, although in very low numbers. Herbs include *Solidago macrophylla, Prenanthes trifoliolata, Eurybia radula (= Aster radula), Sibbaldiopsis tridentata* (in drier openings), *Dryopteris campyloptera, Dryopteris intermedia, Athyrium filix-femina*, and *Calamagrostis canadensis*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus viridis* ssp. *crispa*
Herb (field)	Fern (Spore-bearing forb)	*Phegopteris connectilis*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous tree	*Betula papyrifera*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus viridis* ssp. *crispa*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Alnus viridis* ssp. *crispa*
Global: *Alnus viridis* ssp. *crispa*, *Solidago macrophylla*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Calamagrostis pickeringii* (G5, NH state-imperiled), *Geum peckii* (G2, NH state-imperiled), *Salix argyrocarpa* (G5, NH state-critically imperiled), *Vaccinium caespitosum* (G5, NH state-imperiled)
Global: Vulnerable Plants: *Geum peckii* (G2)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (21-Mar-2003).

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Mount Monroe in the Presidential Range of New Hampshire.
Global Range: This community is found on the higher summits of the Northern Appalachians.
Nations: CA?, US
States/Provinces: ME:S2, NH:S1S2
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ac:CCC, M212Ad:CCC
Federal Lands: NPS (Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: WHOT
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 3 accuracy assessment points): APPA.0424, APPA.0438, APPA_AA_1956, APPA_AA_2261, APPA_AA_2768.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Gawler 2002, Gawler and Cutko 2010, Kimball and Weihrauch 2000, Sperduto 2000a, Sperduto and Cogbill 1999, Sperduto and Nichols 2004

A1295 *Carex bigelowii* Alpine Meadow Alliance

Alliance Summary Description: This alliance includes alpine meadows above timberline the Northern Appalachians and adjacent Canada, dominated by *Carex bigelowii* and/or *Juncus trifidus*. Associated species include *Minuartia groenlandica, Sibbaldiopsis tridentata (= Potentilla tridentata)*, and *Vaccinium vitis-idaea*. Soils are typically thin, acidic and have a low moisture-holding capacity. Low temperatures, heavy fog and high winds result in a unusually severe climate. Alpine areas in this region have greater floristic affinities with arctic areas in Canada, Alaska and Greenland than with alpine areas of the western United States.

[CEGL006081] *Carex bigelowii* Alpine Meadow

Translated Name: **Bigelow's Sedge Alpine Meadow**
Common Name: **Bigelow's Sedge Alpine Meadow**

USNVC CLASSIFICATION

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Carex bigelowii* Alpine Meadow Alliance (A1295)

ELEMENT CONCEPT

Global Summary: These alpine meadows are restricted to the highest elevations of the Northern Appalachians. Low temperatures, heavy fog and high winds result in an unusually severe climate. These meadows are typically found at the highest elevations, generally over 1460 m (4800 feet), on north and west slopes, where there is both high moisture intercept (from precipitation or fog) and lower snow cover than in some other alpine habitats. The soils are typically thin, acidic and have a low moisture-holding capacity, consisting of organic turf over stone, gravel or coarse sediment. The ground cover is graminoid litter. Graminoids, almost entirely *Carex bigelowii*, dominate the vegetation. Associated species include *Minuartia groenlandica, Sibbaldiopsis tridentata (= Potentilla tridentata)*, and minor amounts of *Vaccinium vitis-idaea* or other heaths. This association may grade into the more widespread alpine sedge-rush-heath association, *Vaccinium uliginosum - Rhododendron lapponicum / Juncus trifidus* Dwarf-shrubland (CEGL006298), but is distinguished by the greater abundance of *Carex bigelowii* than of all other species combined.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: These high-elevation alpine meadows usually occur at over 1,463 m (4,800 feet) elevation, on north and west slopes, where there is both high moisture intercept (from precipitation or fog) and lower snow cover than other alpine habitats. Soils are typically thin, acidic and have a low moisture-holding capacity, consisting of organic turf over stone, gravel or coarse sediment.
Global Environment: These alpine meadows are restricted to the highest elevations of the Northern Appalachians. Low temperatures, heavy fog and high winds result in an unusually severe climate. These meadows are typically found at the highest elevations, generally over 1460 m (4800 feet), on north and west slopes, where there is both high moisture intercept (from precipitation or fog) and lower snow cover than in some other alpine habitats. The soils are typically thin, acidic and have a low moisture-holding capacity, consisting of organic turf over stone, gravel or coarse sediment. The ground cover is graminoid litter.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: *Carex bigelowii* dominates the vegetation.
Global Vegetation: Graminoids, almost entirely *Carex bigelowii*, dominate the vegetation. Associated species include *Minuartia groenlandica, Sibbaldiopsis tridentata (= Potentilla tridentata)*, and minor amounts of *Vaccinium vitis-idaea* or other heaths.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex bigelowii*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex bigelowii*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Carex bigelowii*
Global: *Carex bigelowii*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (19-Mar-2003). These alpine sedge meadows occur as distinct entities in only a few locations in the Presidential Range in New Hampshire and on Katahdin (possibly on Bigelow) in Maine.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This community is extensive in the Presidential Range and occurs as very small patches on Katahdin; these small patches could be included in Alpine Heath Meadow (CEGL006298).
Global Range: These alpine meadows are restricted to the highest elevations of the Northern Appalachians from New York to Maine and Quebec.
Nations: CA, US
States/Provinces: ME, NH:S1, NY, QC:S2?, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ac:CCC, M212Ad:CCC, M212B:CC, M212C:CC, M212D:CC
Federal Lands: NPS (Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HBAM
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: 11 accuracy assessment points): APPA_AA_1721, APPA_AA_1776, APPA_AA_2209, APPA_AA_2540, APPA_AA_2986, APPA_AA_3046, APPA_AA_3142, APPA_AA_3155, APPA_AA_3282, APPA_AA_3291, APPA_AA_3297.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): E. Largay and M. Russo
Global Description Author(s): Northern Appalachian Planning Team
References: Bliss 1963, CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Kimball and Weihrauch 2000, Sperduto 2000a, Sperduto and Cogbill 1999, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

A1120 *Diapensia lapponica* - Mixed Alpine Dwarf-shrubland Alliance

Alliance Summary Description: Alpine tundra community of exposed wind-blown areas where snow cover is slight or absent. Sites are dominated by *Diapensia lapponica*, along with *Juncus trifidus, Rhododendron lapponicum, Loiseleuria procumbens*, and *Vaccinium uliginosum*. Herbs include *Agrostis mertensii, Carex bigelowii, Juncus trifidus, Minuartia groenlandica*, and *Solidago multiradiata*.

[CEGL006322] *Diapensia lapponica* Dwarf-shrubland

Translated Name: **Pincushion Plant Dwarf-shrubland**
Common Name: **Windswept Alpine Ridge**

USNVC CLASSIFICATION

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Diapensia lapponica* - Mixed Alpine Dwarf-shrubland Alliance (A1120)

ELEMENT CONCEPT

Global Summary: These alpine barrens are found on extremely exposed areas above treeline on the highest peaks of the northern Appalachian Mountains. They occur on relatively flat, windswept areas where snow cover is slight or absent, at elevations of 1220 to 1675 m (4000-5500 feet). The soils are minimally developed, well-drained gravels, where frost heaving and winter freezing is characteristic. Dwarf-shrub cushion plants are the dominant feature of the vegetation, which is often less than 10 cm high; herbs and lichens are sparse. Between the plants, the ground cover is bare gravel. The dominant shrub is *Diapensia lapponica* forming low domes. Associated shrubs, in compact mats, include *Vaccinium uliginosum* and *Empetrum nigrum*, and, at the higher elevations, *Rhododendron lapponicum, Loiseleuria procumbens*, and *Arctostaphylos alpina*. Herbs include *Juncus trifidus, Carex bigelowii, Solidago multiradiata, Minuartia groenlandica*, and *Agrostis mertensii*. This association is differentiated from co-occurring alpine vegetation (primarily *Vaccinium uliginosum - Rhododendron lapponicum / Juncus trifidus* Dwarf-shrubland (CEGL006298)) by the greater dominance of *Diapensia*, which in most cases has higher cover than any other shrub species.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This alpine dwarf-shrub association is restricted to the highest elevations of the White Mountains of New Hampshire above 1,300 m (4,265 feet). Positions are extremely exposed and windswept. Slopes are variable from gentle to very steep.
Global Environment: These alpine barrens are found on extremely exposed areas above treeline on the highest peaks of the northern Appalachian Mountains. They occur on windswept areas where snow cover is slight or absent, at elevations of 1220 to 1675 (4000-5500 feet). The soils are minimally developed, well-drained gravels, where frost heaving and winter freezing is characteristic.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This dwarf-shrub association is dominated by *Diapensia lapponica* which ranges from open to dense cover in association with *Vaccinium uliginosum*. Herbaceous cover is typically sparse to open. Species may include *Agrostis mertensii, Carex*

bigelowii, Huperzia selago, Juncus trifidus, Minuartia glabra, Minuartia groenlandica, and *Sibbaldiopsis tridentata*. A variety of lichen and moss species may be interspersed among the herbs and shrubs.
Global Vegetation: Dwarf-shrub cushion plants are the dominant feature of the vegetation, which is often less than 10 cm high; herbs and lichens are sparse. Between the plants, the ground cover is bare gravel. The dominant shrub is *Diapensia lapponica* forming low domes. Associated shrubs, in compact mats, include *Vaccinium uliginosum* and *Empetrum nigrum*, and, at the higher elevations, *Rhododendron lapponicum, Loiseleuria procumbens*, and *Arctostaphylos alpina*. Herbs include *Juncus trifidus, Carex bigelowii, Solidago multiradiata, Minuartia groenlandica*, and *Agrostis mertensii*.

Most Abundant Species

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Diapensia lapponica*, *Vaccinium uliginosum*
Herb (field)	Flowering forb	*Minuartia glabra*, *Minuartia groenlandica*

Characteristic Species

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Diapensia lapponica*, *Minuartia glabra*, *Minuartia groenlandica*
Global:

Other Noteworthy Species

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Carex bigelowii* (G5, NH state-imperiled), *Diapensia lapponica* (G4G5, NH state-imperiled), *Minuartia glabra* (G4, NH state-critically imperiled), *Salix uva-ursi* (G5, NH state-imperiled)
Global:

Conservation Status Rank

Global Rank & Reasons: G2G3 (18-Nov-1997). In the northern Appalachian Mountains there are less than 100 high-elevation bare summits that exhibit alpine conditions. Of these, a much smaller pool have extensive windswept ridges where this community, in some cases consisting of only Diapensia, thrives. Although alpine sites have received considerable attention, examples of this particular community was not tracked by most state natural heritage programs until the late 1990s. This association appears to be far more limited than the typical northeastern alpine ridge community (CEGL006298). The combined factors of small size, rarity, specialized conditions and the relative isolation of these communities from each other make them vulnerable conservation targets.

Related Concepts

Global Similar Types:
- *Vaccinium uliginosum - Diapensia lapponica* Dwarf-shrub Tundra (CEGL002540) may be floristically similar but is open tundra, in a lowland formation, not alpine.

Classification

Status: Standard
Classification Confidence:

Element Distribution

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association has been sampled from Mount Lafayette and Mount Guyot, but occurs at other locations above treeline in the White Mountains of New Hampshire.
Nations: CA?, US
States/Provinces: ME:S1, NH:S1, NY, QC:S2?, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Ag:CCC, M212B:CP, M212C:CP
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

Element Sources

Appalachian National Scenic Trail Map-Class Code: SWAR
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (6 plots; 8 accuracy assessment points): APPA.0271, APPA.0277, APPA.0278, APPA.0295, APPA.0307, APPA.0322, APPA_AA_1746,

APPA_AA_1817, APPA_AA_2415, APPA_AA_2426, APPA_AA_2663, APPA_AA_2913, APPA_AA_3150, APPA_AA_3337.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Bliss 1963, CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, NAP pers. comm. 1998, Sperduto 2000a, Sperduto and Cogbill 1999, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

A3286 *Ledum groenlandicum / Trichophorum caespitosum / Sphagnum* spp. Alpine Bog & Fen Alliance

Alliance Summary Description: This alliance encompasses alpine bogs and fens occurring on northern Newfoundland and Quebec, and on slopes and concavities at high elevations in New England and the Adirondack Mountains. It is dominated by *Sphagnum* spp., other mosses and lichens, and vascular plants such as *Andromeda polifolia, Betula glandulosa, Chamaedaphne calyculata, Ledum groenlandicum (= Rhododendron groenlandicum), Rubus chamaemorus*, and *Vaccinium* spp. Herbs include *Eriophorum* spp. and *Trichophorum caespitosum*.

[CEGL006140] *Empetrum nigrum - Vaccinium uliginosum - Vaccinium oxycoccos / Rubus chamaemorus* Dwarf-shrubland

Translated Name: **Black Crowberry - Bog Blueberry - Small Cranberry / Cloudberry Dwarf-shrubland**
Common Name: **Black Crowberry Wet Alpine Bog**

USNVC CLASSIFICATION

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Ledum groenlandicum / Trichophorum caespitosum / Sphagnum* spp. Alpine Bog & Fen Alliance (A3286)

ELEMENT CONCEPT

Global Summary: These heath-sedge bogs occur in alpine and subalpine depressions in the montane regions of the northeastern United States. Found at elevations above 1067 m (3500 feet), these peatlands form where bedrock basins retain water (or ice) through all or most of the year. The bog vegetation covers the flat portion of the basin and may also creep upslope on the margins. The bogs may receive small amounts of runoff from upslope bedrock, but conditions are extremely nutrient-poor. Combined with the cold temperatures and frequent clouds and fog, this creates conditions suitable for only a limited number of subalpine and boreal species. The substrate is acidic, permanently saturated organic soil, where lenses of peat beneath the surface may remain frozen through much of the growing season. Trees are generally absent, although a few small islands of stunted *Picea mariana* and *Abies balsamea* may occur. Dwarf-shrubs are the dominant vascular layer, with coverage of up to about 50%. Among the dwarf-shrubs, herbs (primarily sedges) are scattered, with up to 20% cover. Bryoids are generally more extensive than the vascular vegetation, approaching 100% cover. The dwarf-shrub cover is generally a mixture of *Vaccinium uliginosum, Empetrum nigrum, Chamaedaphne calyculata, Ledum groenlandicum, Kalmia polifolia, Kalmia angustifolia*, and *Vaccinium oxycoccos*. *Eriophorum vaginatum var. spissum* and *Trichophorum caespitosum (= Scirpus cespitosus)* are typically the most abundant graminoids; *Carex magellanica ssp. irrigua (= Carex paupercula), Carex canescens*, and *Carex pauciflora* may be present in lower abundance. *Rubus chamaemorus* is a diagnostic herb, although it may not always be present. *Sphagnum* spp. are the most abundant bryophytes, particularly *Sphagnum capillifolium, Sphagnum fuscum, Sphagnum fallax*, and *Sphagnum magellanicum*. The combination of subalpine species such as *Vaccinium uliginosum* and bog species such as *Eriophorum vaginatum var. spissum* is diagnostic. This community is related to, and may be adjacent to, *(Picea mariana, Abies balsamea) / Kalmia angustifolia - Ledum groenlandicum* Dwarf-shrubland (CEGL006031); that association is less wet and lacks the true bog species such as *Eriophorum vaginatum var. spissum, Chamaedaphne calyculata*, and *Sphagnum* spp. It is also related to *Kalmia angustifolia - Chamaedaphne calyculata / Rubus chamaemorus / Cladina* spp. Dwarf-shrubland (CEGL006425), but that type is not constantly saturated and occurs on subalpine or alpine slopes rather than basins.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: These heath sedge bogs are restricted to elevations above 1,000 m (3,280 feet) in the White Mountains of New Hampshire and occasionally in Maine. Slopes are flat to moderate with saturated substrates composed of organic material or peat.
Global Environment: These heath-sedge bogs occur in alpine and subalpine depressions in the montane regions of the northeastern United States. Found at elevations above 3500 feet, these peatlands form where bedrock basins retain water (or ice) through all or most of the year. The bog vegetation covers the flat portion of the basin, and may also creep upslope on the margins. The bogs may receive small amounts of runoff from upslope bedrock, but conditions are extremely nutrient-poor. Combined with the cold temperatures and frequent clouds and fog, this creates conditions suitable for only a limited number of subalpine and boreal species. The substrate is acidic, permanently saturated organic soil, where lenses of peat beneath the surface may remain frozen through much of the growing season.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by an assortment of dwarf heath species with sedges interspersed among them. Overall shrub cover is typically dense. Characteristic species include *Chamaedaphne calyculata, Empetrum nigrum, Eriophorum vaginatum, Kalmia angustifolia, Kalmia polifolia, Ledum groenlandicum, Vaccinium oxycoccos*, and *Vaccinium uliginosum*. The dominant sedges are *Eriophorum vaginatum* and *Trichophorum caespitosum*. Other herbaceous associates may include *Carex bigelowii, Carex trisperma var. trisperma, Coptis trifolia, Deschampsia flexuosa, Drosera rotundifolia, Gaultheria hispidula, Geum peckii, Maianthemum trifolium*, and *Melampyrum lineare*. Nonvascular vegetation cover is typically high and dominated by *Sphagnum* spp.
Global Vegetation: Trees are generally absent, although a few small islands of stunted *Picea mariana* and *Abies balsamea* may occur. Dwarf-shrubs are the dominant vascular layer, with coverage of up to about 50%. Among the dwarf-shrubs, herbs (primarily sedges) are scattered, with up to 20% cover. Bryoids are generally more extensive than the vascular vegetation, approaching 100% cover. The dwarf-shrub cover is generally a mixture of *Vaccinium uliginosum, Empetrum nigrum, Chamaedaphne calyculata, Ledum groenlandicum, Kalmia polifolia, Kalmia angustifolia*, and *Vaccinium oxycoccos*. *Eriophorum vaginatum var. spissum* and *Trichophorum caespitosum (= Scirpus cespitosus)* are typically the most abundant graminoids; *Carex magellanica ssp. irrigua (= Carex paupercula), Carex canescens*, and *Carex pauciflora* may be present in lower abundance. *Rubus chamaemorus* is a diagnostic herb, although it may not always be present. *Sphagnum* spp. are the most abundant bryophytes, particularly *Sphagnum capillifolium, Sphagnum fuscum, Sphagnum fallax*, and *Sphagnum magellanicum*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Chamaedaphne calyculata*, *Empetrum nigrum*, *Kalmia angustifolia*, *Kalmia polifolia*, *Ledum groenlandicum*, *Vaccinium oxycoccos*, *Vaccinium uliginosum*
Herb (field)	Graminoid	*Eriophorum vaginatum*, *Trichophorum caespitosum*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium uliginosum*
Short shrub/sapling	Broad-leaved evergreen shrub	*Empetrum nigrum*, *Vaccinium oxycoccos*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Vaccinium oxycoccos*
Global: *Empetrum nigrum*, *Rubus chamaemorus*, *Vaccinium oxycoccos*, *Vaccinium uliginosum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Carex bigelowii* (G5, NH state-imperiled), *Geum peckii* (G2, NH state-imperiled), *Rubus chamaemorus* (G5, NH state-imperiled), *Salix argyrocarpa* (G5, NH state-critically imperiled), *Sphagnum contortum* (G5, NH state-imperiled), *Vaccinium boreale* (G4G5, NH state-imperiled), *Vaccinium caespitosum* (G5, NH state-imperiled)
Global: Vulnerable Plants: *Geum peckii* (G2), *Lycopodiella subappressa* (G2)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:

- (*Picea mariana, Abies balsamea*) / *Kalmia angustifolia - Ledum groenlandicum* Dwarf-shrubland (CEGL006031)
- *Empetrum nigrum - Gaylussacia dumosa - Rubus chamaemorus / Sphagnum* spp. Acidic Peatland (CEGL006248)
- *Kalmia angustifolia - Chamaedaphne calyculata / Rubus chamaemorus / Cladina* spp. Dwarf-shrubland (CEGL006425) is not constantly saturated and occurs on subalpine or alpine slopes rather than basins.
- *Trichophorum caespitosum - Gaylussacia dumosa / Sphagnum (fuscum, rubellum, magellanicum)* Acidic Peatland (CEGL006260) where *Trichophorum caespitosum* is abundant.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is found at the highest elevations of the Presidential Range of the White Mountains of New Hampshire with one known location on Saddleback Mountain in Maine.
Nations: CA?, US
States/Provinces: ME:S2, NH:S1, NY, QC, VT:S1
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ad:CCC, M212Ae:CCC, M212B:CP
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SWEB
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (17 plots; 1 observation point; 5 accuracy assessment points): APPA.0269, APPA.0283, APPA.0287, APPA.0290, APPA.0292, APPA.0294, APPA.0301, APPA.0309, APPA.0310, APPA.0315, APPA.0316, APPA.0318, APPA.0323, APPA.0427, APPA.0428, APPA.0433, APPA.0434, APPA.1618, APPA_AA_2142, APPA_AA_2204, APPA_AA_2676, APPA_AA_3144, APPA_AA_3304.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Doyle et al. 1987, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Sperduto 2000a, Sperduto 2000b, Sperduto and Cogbill 1999, Sperduto and Nichols 2004, Thompson and Sorenson 2000

A3360 *Picea mariana* Krummholz Alliance

Alliance Summary Description: This alliance is composed of severely wind-pruned, stunted *Picea mariana, Abies balsamea*, and boreal heathland thickets bordering the treeline and true alpine vegetation. The vegetation ranges from dense thickets to patches interspersed with deciduous dwarf-shrubs, forbs, mosses, and lichens. The canopy is characterized by stunted *Picea mariana* and *Abies balsamea*, sometimes in association with *Picea rubens, Betula papyrifera var. cordifolia (= Betula cordifolia)*, and *Sorbus americana*. Shrubs may form a distinct layer where stunted trees are scattered, or as distinct patches in association. Characteristic shrubs are ericaceous species such as *Ledum groenlandicum, Kalmia angustifolia, Vaccinium vitis-idaea, Vaccinium uliginosum, Rhododendron canadense*, as well as *Empetrum nigrum* and *Sibbaldiopsis tridentata*, and are of variable closure, but may be patchy and interspersed with expanses of bare or lichen-covered bedrock. Herbaceous species, such as *Paronychia argyrocoma (= var. albimontana)* and *Juncus trifidus*, are usually confined to crevices. *Pleurozium schreberi* and *Dicranum scoparium* are characteristic mosses. This alliance occurs at high elevations, usually just above tree line, where cool temperatures and high winds prevail. Snow tends to accumulate in and around the stunted trees creating a protected environment. This alliance occurs in Maine, New Hampshire, Vermont, and New York. It is also likely to occur in Canada.

[CEGL006031] (*Picea mariana, Abies balsamea*) / *Kalmia angustifolia - Ledum groenlandicum* Dwarf-shrubland

Translated Name: **(Black Spruce, Balsam Fir) / Sheep Laurel - Bog Labrador-tea Dwarf-shrubland**
Common Name: **Subalpine Summit Heath**

USNVC Classification

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Picea mariana* Krummholz Alliance (A3360)

Element Concept

Global Summary: This heathland occurs in subalpine regions of northern New England and adjacent Canada, or at lower elevations in boreal coastal regions. It is found on acidic rock outcrops, upper ridges, or summits; a common subalpine setting is between the open alpine ridges and the lower-elevation forest. Exposed bedrock is typical; soil development is restricted to crevices or sheltered areas, where shallow organic accumulation occurs over thin a mineral layer, with shallow peat accumulating in depressions. The organic horizon may be saturated by fog in spring and fall but dry in summer. Soils are shallow, stony, coarse gravels and sands over gravel, scree or bedrock. Elevations range from 550-1435 m (1800-4700 feet) inland to near sea level in coastal regions. Physiognomy of this community is variable, ranging from sparse woodland to shrubland to sparsely vegetated rock; many occurrences will have patches of all three. The tree canopy is sparse, averaging less than 20%, and individuals are stunted. Most trees in this community actually fall into the "tall shrub" physiognomic form. Tall shrubs may be scattered, or form patches in somewhat protected areas. The dwarf-shrub layer is very well-developed, and the dominant feature of the vegetation. Herbs are sparse. The bryoid layer is variable but is often extensive, with both bryophytes and lichens. The most typical trees are *Picea mariana* and *Picea rubens*; associates include *Abies balsamea, Betula papyrifera var. cordifolia, Betula papyrifera var. papyrifera*, and occasionally *Acer rubrum*. Characteristic tall shrubs are *Nemopanthus mucronatus, Sorbus americana, Sorbus decora*, and *Viburnum nudum var. cassinoides*. *Kalmia angustifolia* and *Ledum groenlandicum* are prominent dwarf heaths, in association with others such as *Vaccinium angustifolium, Vaccinium myrtilloides, Vaccinium uliginosum, Vaccinium vitis-idaea, Gaylussacia baccata, Rhododendron canadense, Empetrum nigrum*, and *Empetrum eamesii ssp. atropurpureum*. At the higher elevations (>1220 m [4000 feet]), *Kalmia angustifolia* drops out, and *Picea mariana* replaces *Picea rubens*. Herbs include *Sibbaldiopsis tridentata, Maianthemum canadense, Deschampsia flexuosa*, and *Geocaulon lividum*. The bryoid layer includes *Pleurozium schreberi, Polytrichum commune, Leucobryum glaucum*, and *Cetraria, Cladina*, and *Cladonia* lichens. This community is distinguished from other northeastern subalpine/alpine types by the prevalence of dwarf-shrubs (rather than tree species or bare rock) and the lack of true alpine plants (*Diapensia lapponica, Carex bigelowii*, etc.). It differs from more temperate dwarf-shrublands in the presence of some more northern or boreal species, such as *Ledum groenlandicum* and *Empetrum* spp., and the absence of temperate bald species such as *Quercus rubra* and *Betula populifolia*.

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association occurs throughout the subalpine zones of the Northern Appalachian project area at elevations ranging from 850 to 1500 m (2,790-4,920 feet) on exposed high slopes ridges and summits. Slopes are gentle to steep on all aspects. Soils are well-drained to rapidly drained.

Global Environment: This heathland occurs in subalpine regions of northern New England and adjacent Canada, or at lower elevations in boreal coastal regions. It is found on acidic rock outcrops, upper ridges, or summits; a common subalpine setting is between the open alpine ridges and the lower-elevation forest. Exposed bedrock is typical; soil development is restricted to crevices or sheltered areas, where shallow organic accumulation occurs over thin a mineral layer, with shallow peat accumulating in depressions. The organic horizon may be saturated by fog in spring and fall but dry in summer. Soils are shallow, stony, coarse gravels and sands over gravel, scree or bedrock. Elevations range from 550-1435 m (1800-4700 feet) inland to near sea level in coastal regions.

Vegetation Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is dominated by a combination of stunted, dwarf evergreen trees and heath shrubs. Canopy composition is highly variable. Trees typically occur as tall shrubs and may dominate singly or in combination with *Picea mariana, Abies balsamea*, and *Betula papyrifera var. cordifolia*. The shrub layer is highly variable and may be open to dense; height

may be tall to dwarf. Dominant species include *Kalmia angustifolia, Ledum groenlandicum, Rhododendron canadense, Vaccinium angustifolium, Vaccinium boreale, Vaccinium uliginosum*, and *Vaccinium vitis-idaea*. Herbaceous species are few, inconsistent and typically sparse. Species may include *Carex bigelowii, Carex deflexa, Cornus canadensis, Gaultheria hispidula, Melampyrum lineare, Minuartia glabra, Minuartia groenlandica*, and *Ptilidium ciliare*.

Global Vegetation: The tree canopy is sparse, averaging less than 20%, and individuals are stunted. Most trees in this community actually fall into the "tall shrub" physiognomic form. Tall shrubs may be scattered, or form patches in somewhat protected areas. The dwarf-shrub layer is very well-developed, and the dominant feature of the vegetation. Herbs are sparse. The bryoid layer is variable but is often extensive, with both bryophytes and lichens. The most typical trees are *Picea mariana* and *Picea rubens*; associates include *Abies balsamea, Betula papyrifera var. cordifolia, Betula papyrifera var. papyrifera*, and occasionally *Acer rubrum*. Characteristic tall shrubs are *Nemopanthus mucronatus, Sorbus americana, Sorbus decora*, and *Viburnum nudum var. cassinoides*. *Kalmia angustifolia* and *Ledum groenlandicum* are prominent dwarf heaths, in association with others such as *Vaccinium angustifolium, Vaccinium myrtilloides, Vaccinium uliginosum, Vaccinium vitis-idaea, Gaylussacia baccata, Rhododendron canadense, Empetrum nigrum*, and *Empetrum eamesii ssp. atropurpureum*. At the higher elevations (>4000 feet), *Kalmia angustifolia* drops out, and *Picea mariana* replaces *Picea rubens*. Herbs include *Sibbaldiopsis tridentata, Maianthemum canadense, Deschampsia flexuosa*, and *Geocaulon lividum*. The bryoid layer includes *Pleurozium schreberi, Polytrichum commune, Leucobryum glaucum*, and *Cetraria, Cladina*, and *Cladonia* lichens.

Most Abundant Species

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Needle-leaved tree	*Abies balsamea*, *Picea mariana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium uliginosum*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Ledum groenlandicum*, *Vaccinium vitis-idaea*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Needle-leaved tree	*Picea mariana*, *Picea rubens*
Short shrub/sapling	Broad-leaved deciduous shrub	*Ledum groenlandicum*, *Vaccinium angustifolium*

Characteristic Species

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Abies balsamea*, *Ledum groenlandicum*, *Vaccinium uliginosum*
Global: *Ledum groenlandicum*, *Vaccinium angustifolium*

Other Noteworthy Species

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Carex bigelowii* (G5, NH state-imperiled), *Diapensia lapponica* (G4G5, NH state-imperiled), *Minuartia glabra* (G4, NH state-critically imperiled), *Rubus chamaemorus* (G5, NH state-imperiled), *Vaccinium boreale* (G4G5, ME & NH state-imperiled)
Global:

Conservation Status Rank

Global Rank & Reasons: GNR (1-Dec-1997).

Related Concepts

Global Similar Types:
- *Empetrum nigrum - Vaccinium uliginosum - Vaccinium oxycoccos / Rubus chamaemorus* Dwarf-shrubland (CEGL006140)
- *Vaccinium angustifolium - Sorbus americana / Sibbaldiopsis tridentata* Dwarf-shrubland (CEGL005094)

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: This community most often occurs as a small patch type, but may be more extensive on the higher-elevation northern Appalachian Mountains.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association occurs throughout the subalpine region of the White Mountains of New Hampshire and Saddleback Mountain, South Crocker Mountain, West Peak and White Cap Mountain in Maine.
Global Range: This boreal heathland occurs in subalpine regions of northern New England and adjacent Canada, or at lower elevations in coastal regions.
Nations: CA?, US
States/Provinces: ME:S4, NB?, NH, NS?, NY, QC?, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): 212Cb:PPP, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SMCK
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (22 plots; 2 observation points; 15 accuracy assessment points): APPA.0274, APPA.0275, APPA.0276, APPA.0279, APPA.0280, APPA.0281, APPA.0284, APPA.0286, APPA.0289, APPA.0300, APPA.0302, APPA.0305, APPA.0317, APPA.0321, APPA.0324, APPA.0421, APPA.0422, APPA.0423, APPA.0442, APPA.0443, APPA.0712, APPA.0853, APPA.1617, APPA.1771, APPA_AA_1722, APPA_AA_1723, APPA_AA_1800, APPA_AA_2006, APPA_AA_2045, APPA_AA_2078, APPA_AA_2092, APPA_AA_2201, APPA_AA_2523, APPA_AA_2793, APPA_AA_2906, APPA_AA_3084, APPA_AA_3130, APPA_AA_3185, APPA_AA_3229.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Doyle et al. 1987, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Sperduto 2000a, Sperduto and Cogbill 1999, Sperduto and Nichols 2004, Thompson and Sorenson 2000

[CEGL006038] *Picea mariana - Abies balsamea / Sibbaldiopsis tridentata* Shrubland

Translated Name: **Black Spruce - Balsam Fir / Shrubby Fivefingers Shrubland**
Common Name: **Black Spruce Krummholz**

USNVC CLASSIFICATION

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Picea mariana* Krummholz Alliance (A3360)

ELEMENT CONCEPT

Global Summary: This shrubby alpine krummholz occurs at high elevations in the Northern Appalachians of the northeastern United States and adjacent Canada. The setting is high, wind-exposed alpine peaks and exposed high-elevation summits, usually from 1067-1494 m (3500-4900 feet) elevation. Soils are thin organic Histosols or peat. The stunted trees form matted, wind-pruned alpine conifer thickets, usually of 60-100% cover. Dwarf-shrubs and herbs are occasional in openings among the shrubby trees. Bryoids, also in the openings, are sparse; decomposing organic litter makes up the remainder of the ground cover. The krummholz is dominated by a variable mixture of *Picea mariana, Abies balsamea*, and *Betula papyrifera var. cordifolia*. Dwarf-shrubs and herbs include *Ledum groenlandicum, Vaccinium uliginosum, Empetrum nigrum, Vaccinium vitis-idaea, Clintonia borealis, Cornus canadensis, Sibbaldiopsis tridentata, Trientalis borealis, Gaultheria hispidula*, and *Solidago macrophylla*. This association shares many species with subalpine spruce-fir forests (e.g., *Abies balsamea - (Betula papyrifera var. cordifolia)* Forest (CEGL006112)), but the low stature and matted form of the trees is distinctive.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This near-treeline krummholz association is known from high elevations ranging from 1,000 to 1,200 m (3,280-3,940 feet) on exposed, windswept high slopes and summits. Slopes range from flat to steep on southeast and southwest aspects. Soils are poorly developed, rapidly drained organic material, sand and gravel. Exposed bedrock is common.

Global Environment: This shrubby alpine krummholz occurs at high elevations in the Northern Appalachians of the northeastern United States and adjacent Canada. The setting is high, wind-exposed alpine peaks and exposed high-elevation summits, usually from 1067-1494 m (3500-4900 feet) elevation. Soils are thin organic Histosols or peat.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is dominated by stunted, dwarf evergreen trees that form dense mats. *Abies balsamea* and *Picea mariana* are both consistently present in stands, typically with one dominating over the other. *Betula papyrifera var. cordifolia* and *Sorbus americana* may occur at low cover. Heath species predominate within openings between tree species, including *Ledum groenlandicum, Vaccinium angustifolium, Vaccinium myrtilloides, Vaccinium uliginosum*, and *Vaccinium vitis-idaea*. Herbaceous species occur with low cover and frequency, but may include *Carex bigelowii, Clintonia borealis, Coptis trifolia, Linnaea borealis, Lycopodium annotinum, Lycopodium lagopus, Maianthemum canadense, Oclemena acuminata, Oxalis montana*, and *Trientalis borealis*.
Global Vegetation: The stunted trees form matted, wind-pruned alpine conifer thickets, usually of 60-100% cover. Dwarf-shrubs and herbs are occasional in openings among the shrubby trees. Bryoids, also in the openings, are sparse; decomposing organic litter makes up the remainder of the ground cover. The krummholz is dominated by a variable mixture of *Picea mariana, Abies balsamea*, and *Betula papyrifera var. cordifolia*. Dwarf-shrubs and herbs include *Ledum groenlandicum, Vaccinium uliginosum, Empetrum nigrum, Vaccinium vitis-idaea, Clintonia borealis, Cornus canadensis, Sibbaldiopsis tridentata, Trientalis borealis, Gaultheria hispidula*, and *Solidago macrophylla*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Picea mariana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Vaccinium angustifolium*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Ledum groenlandicum*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Abies balsamea*, *Picea mariana*
Tree canopy	Broad-leaved deciduous tree	*Betula papyrifera* var. *cordifolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Abies balsamea*, *Picea mariana*, *Vaccinium angustifolium*
Global: *Abies balsamea*, *Picea mariana*, *Sibbaldiopsis tridentata*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Carex bigelowii* (G5, ME state-imperiled)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- *Abies balsamea - (Betula papyrifera var. cordifolia)* Forest (CEGL006112)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is found throughout the high-elevation mountains of the Northern Appalachian project area near treeline. Although few samples exist in the Northern Appalachian project area, it is certain to occur more frequently than the data suggest and is undersampled due to as inaccessibility and sampling difficulty.

Nations: CA, US
States/Provinces: ME:S3, NB, NH, NY, QC, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212B:CC, M212Ca:CCC, M212Df:CCC
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SMCK
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 2 observation points; 19 accuracy assessment points): APPA.0709, APPA.0852, APPA.1612, APPA.1615, APPA_AA_1664, APPA_AA_1736, APPA_AA_1750, APPA_AA_1815, APPA_AA_2153, APPA_AA_2236, APPA_AA_2250, APPA_AA_2343, APPA_AA_2390, APPA_AA_2454, APPA_AA_2931, APPA_AA_3071, APPA_AA_3108, APPA_AA_3109, APPA_AA_3162, APPA_AA_3180, APPA_AA_3332, APPA_AA_3342, APPA_AA_3352.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Bliss 1963, CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, Kimball and Weihrauch 2000, Sperduto 2000a, Sperduto and Cogbill 1999, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

[CEGL006268] *Picea mariana / Ledum groenlandicum - Empetrum nigrum / Cladina* spp. Dwarf-shrubland

Translated Name: **Black Spruce / Bog Labrador-tea - Black Crowberry / Reindeer Lichen species Dwarf-shrubland**
Common Name: **Cold Air Talus Heathland**

USNVC CLASSIFICATION

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Picea mariana* Krummholz Alliance (A3360)

ELEMENT CONCEPT

Global Summary: This boreal heathland community develops at the base of some talus slopes in the northeastern United States and (possibly) adjacent Canada. Cold air draining to the base of the slope allows ice to persist in crevices through most of the growing season, even at these moderate elevations (215-670 m [700-2200 feet]). This creates a cold microclimate, and the vegetation features many species with affinities to boreal or higher-elevation settings. As with talus slopes in general, soil development is extremely limited, although in this type there may be some patches of peaty soils developing among the boulders. The vegetation is predominantly dwarf-shrubs and stunted shrub-like conifers, in patches among the talus, with a scattered and broken tree canopy. Herbs are sparse. The bryoid layer is typically very well-developed, with mats of reindeer lichens undulating across the talus and higher bryophyte cover than in other talus settings. The scattered trees are typically *Picea mariana, Picea rubens*, and *Betula papyrifera*. *Abies balsamea* and (in relatively southern examples) *Tsuga canadensis* are occasional. *Sorbus americana* or *Sorbus decora* may occur as scattered shrubs. Dwarf-shrubs characteristically include *Ledum groenlandicum, Gaultheria hispidula, Vaccinium angustifolium, Vaccinium myrtilloides, Vaccinium vitis-idaea, Kalmia angustifolia*, and, in the more northerly occurrences, *Vaccinium uliginosum* and *Empetrum nigrum*. Herbs may include *Polypodium virginianum* and/or *Polypodium appalachianum* and *Mitella nuda*. Typical bryoids are *Cladina* spp., *Cladonia* spp., *Hylocomium splendens, Pleurozium schreberi, Sphagnum capillifolium, Polytrichum strictum*, and *Bazzania trilobata*. The combination of setting and flora make this type distinctive.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This boreal heathland community develops at the base of some talus slopes in the northeastern United States and (possibly) adjacent Canada. Cold air draining to the base of the slope allows ice to persist in crevices through most of the growing season, even at these moderate elevations (215-670 m [700-2,200 feet]). This creates a cold microclimate, and the vegetation features many species with affinities to boreal or higher-elevation settings. As with talus slopes in

general, soil development is extremely limited, although in this type, there may be some patches of peaty soils developing among the boulders.

Global Environment: This boreal heathland community develops at the base of some talus slopes in the northeastern United States and (possibly) adjacent Canada. Cold air draining to the base of the slope allows ice to persist in crevices through most of the growing season, even at these moderate elevations (215-670 m [700-2200 feet]). This creates a cold microclimate, and the vegetation features many species with affinities to boreal or higher-elevation settings. As with talus slopes in general, soil development is extremely limited, although in this type there may be some patches of peaty soils developing among the boulders.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The vegetation is predominantly dwarf-shrubs and stunted shrub-like conifers, in patches among the talus, with a scattered and broken tree canopy. Herbs are sparse. The bryoid layer is typically very well-developed, with mats of reindeer lichens undulating across the talus and higher bryophyte cover than in other talus settings. The scattered trees are typically *Picea mariana, Picea rubens*, and *Betula papyrifera*. *Abies balsamea* and (in relatively southern examples) *Tsuga canadensis* are occasional. *Sorbus americana* or *Sorbus decora* may occur as scattered shrubs. Dwarf-shrubs characteristically include *Ledum groenlandicum, Gaultheria hispidula, Vaccinium angustifolium, Vaccinium myrtilloides, Vaccinium vitis-idaea, Kalmia angustifolia*, and, in the more northerly occurrences, *Vaccinium uliginosum* and *Empetrum nigrum*. Herbs may include *Polypodium virginianum* and/or *Polypodium appalachianum* and *Mitella nuda*. Typical bryoids are *Cladina* spp., *Cladonia* spp., *Hylocomium splendens, Pleurozium schreberi, Sphagnum capillifolium, Polytrichum strictum*, and *Bazzania trilobata*.

Global Vegetation: The vegetation is predominantly dwarf-shrubs and stunted shrub-like conifers, in patches among the talus, with a scattered and broken tree canopy. Herbs are sparse. The bryoid layer is typically very well-developed, with mats of reindeer lichens undulating across the talus and higher bryophyte cover than in other talus settings. The scattered trees are typically *Picea mariana, Picea rubens*, and *Betula papyrifera*. *Abies balsamea* and (in relatively southern examples) *Tsuga canadensis* are occasional. *Sorbus americana* or *Sorbus decora* may occur as scattered shrubs. Dwarf-shrubs characteristically include *Ledum groenlandicum, Gaultheria hispidula, Vaccinium angustifolium, Vaccinium myrtilloides, Vaccinium vitis-idaea, Kalmia angustifolia*, and, in the more northerly occurrences, *Vaccinium uliginosum* and *Empetrum nigrum*. Herbs may include *Polypodium virginianum* and/or *Polypodium appalachianum* and *Mitella nuda*. Typical bryoids are *Cladina* spp., *Cladonia* spp., *Hylocomium splendens, Pleurozium schreberi, Sphagnum capillifolium, Polytrichum strictum*, and *Bazzania trilobata*.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea mariana*, *Picea rubens*
Tree canopy	Broad-leaved deciduous tree	*Betula papyrifera*
Short shrub/sapling	Dwarf-shrub	*Empetrum nigrum*, *Ledum groenlandicum*
Nonvascular	Lichen	*Cladina* spp.

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area):
Global: *Cladina* spp., *Empetrum nigrum*, *Ledum groenlandicum*, *Picea mariana*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (1-Dec-1997).

RELATED CONCEPTS

Global Similar Types:
- Boreal Glaciere Talus Sparse Vegetation (CEGL005243)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is believed to exist in the Northern Appalachian project area, but no plot or observation point data has been collected.
Global Range: This boreal heathland community occurs in the northeastern United States and possibly adjacent Canada.
Nations: CA, US
States/Provinces: ME:S2, NB?, NH:S1, NS?, NY, QC, VT:S1
TNC Ecoregions: 60:C, 63:C, 64:C
USFS Ecoregions (1994/95): 221Bd:CCC, M212Ab:CCC, M212Ac:CCC, M212Ae:CCC, M212Af:CCC, M212B:CP, M212C:CC, M212D:CP, M212Ea:CCC, M221Aa:PPP
Federal Lands: NPS (Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SCTH
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (4 accuracy assessment points): APPA_AA_1836, APPA_AA_1939, APPA_AA_2487, APPA_AA_2934.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Eyre 1980, Gawler 2002, Gawler and Cutko 2010, Hunt 1999, Sperduto 2000a, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

A3287 *Salix herbacea / Trichophorum caespitosum - Carex bigelowii* Alpine Snowbed Alliance

Alliance Summary Description: Dwarf-shrubs such as *Vaccinium uliginosum* are often a component, but the differential species are the graminoids and forbs. *Trichophorum caespitosum, Carex scirpoidea*, and *Carex bigelowii* are the characteristic graminoids and are usually locally dominant. *Deschampsia flexuosa* and *Carex brunnescens* are also typical although less abundant. Forbs include species also found at lower elevations, such as *Campanula rotundifolia, Clintonia borealis, Platanthera dilatata, Solidago macrophylla*, and *Veratrum viride*, as well as those restricted to higher elevations (at this latitude) such as *Polygonum viviparum* and *Prenanthes boottii*. In Canada, species include *Lycopodium alpinum (= Diphasiastrum alpinum), Sibbaldia procumbens*, and the dwarf-shrubs *Salix herbacea, Harrimanella hypnoides*, and *Phyllodoce caerulea*. This herb-dominated alpine vegetation is found in moist and somewhat protected spots above 1430 m (4700 feet) elevation in the Northern Appalachians, and lower elevations northward in eastern Canada. Constant moisture is provided by nearby streams or late-melting snowbeds or snowbanks.

[CEGL006423] *Trichophorum caespitosum - Calamagrostis pickeringii* Alpine Snowbed

Translated Name: **Tufted Bulrush - Pickering's Reedgrass Alpine Snowbed**
Common Name: **Northern Appalachian Alpine Bulrush Cliff**

USNVC CLASSIFICATION

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Salix herbacea / Trichophorum caespitosum - Carex bigelowii* Alpine Snowbed Alliance (A3287)

ELEMENT CONCEPT

Global Summary: This graminoid-dominated association occurs on wet, sloping brows of alpine or subalpine cliffs in the Northern Appalachians. *Calamagrostis pickeringii* is the diagnostic and dominant herb, and *Trichophorum caespitosum* is often codominant. Dwarf-shrubs among the herbs include *Vaccinium uliginosum* and some typical bog ericads such as *Chamaedaphne calyculata, Kalmia polifolia*, and *Ledum groenlandicum*. Associated forbs include *Drosera rotundifolia, Gentiana linearis*, and *Huperzia appalachiana*. The vascular plants develop on a base of *Sphagnum* mosses, including *Sphagnum compactum* and several unusual species such as *Sphagnum lindbergii, Sphagnum tenellum*, and *Sphagnum pylaesii*. The liverwort *Scapania nemorosa* is also characteristic. Occurrences of this association may be short-lived (compared to other alpine vegetation types), as portions may become

oversaturated and slide off of the rock substrate; however, the average return interval of this major disturbance factor has been reported to be as long as 500 years. Although the graminoid dominance is characteristic of the association as a whole, it may occur as a mosaic of herb-dominated patches, shrub clusters, bryophyte carpets, and exposed bedrock.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This mixed graminoid association is uncommon in the Northern Appalachian project area and only known from one location. The occurrence is a moderate to gentle west-facing slope ranging from 780 to 800 m (2,560-2,625 feet) elevation. Soils are saturated peat.
Global Environment: Stands are found on exposed alpine or subalpine slopes (3000-4900 feet elevation), generally on cliff brows or other expanses of consolidated rock. Slope ranges from 5-35%. Water comes from runoff from higher elevations as well as local seeps.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is a mixed shrub - herbaceous wetland dominated by *Rhododendron canadense* and *Viburnum nudum var. cassinoides*, shrubby *Picea mariana* and *Picea rubens*, with *Calamagrostis pickeringii* dominating the herbaceous layer. Other shrubs present at lower cover include *Alnus viridis ssp. crispa, Amelanchier bartramiana, Chamaedaphne calyculata, Kalmia angustifolia, Ledum groenlandicum, Nemopanthus mucronatus, Photinia melanocarpa, Vaccinium myrtilloides*, and *Vaccinium oxycoccos*. Herbaceous associates include *Carex echinata, Carex pauciflora, Carex trisperma var. trisperma, Cornus canadensis, Dalibarda repens, Eriophorum virginicum, Gaultheria hispidula, Sarracenia purpurea*, and *Solidago uliginosa var. linoides*.
Global Vegetation: *Calamagrostis pickeringii* is the diagnostic and dominant herb, and *Trichophorum caespitosum* is often codominant. Dwarf-shrubs among the herbs include *Vaccinium uliginosum* and some typical bog ericads such as *Chamaedaphne calyculata, Kalmia polifolia*, and *Ledum groenlandicum*. Associated forbs include *Drosera rotundifolia, Gentiana linearis*, and *Huperzia appalachiana*. The vascular plants develop on a base of *Sphagnum* mosses, including *Sphagnum compactum* and several unusual species such as *Sphagnum lindbergii, Sphagnum tenellum*, and *Sphagnum pylaesii*. The liverwort *Scapania nemorosa* is also characteristic.
Global Dynamics: Occurrences of this association may be short-lived (compared to other alpine vegetation types), as portions may become oversaturated and slide off of the rock substrate; however, the average return interval of this major disturbance factor has been reported to be as long as 500 years. Although the graminoid dominance is characteristic of the association as a whole, it may occur as a mosaic of herb-dominated patches, shrub clusters, bryophyte carpets, and exposed bedrock.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Rhododendron canadense*, *Viburnum nudum* var. *cassinoides*
Herb (field)	Graminoid	*Calamagrostis pickeringii*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Calamagrostis pickeringii*, *Trichophorum caespitosum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Calamagrostis pickeringii*, *Carex pauciflora*, *Solidago uliginosa* var. *linoides*
Global: *Calamagrostis pickeringii*, *Trichophorum caespitosum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Calamagrostis pickeringii* (G5, NH state-imperiled), *Carex wiegandii* (G4G5, NH state-critically imperiled)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (29-Jan-2003).

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Shoal Pond in New Hampshire.
Global Range: Documented from only a few locations in the Adirondack High Peaks and the Presidential Range of the Northern Appalachians.
Nations: US
States/Provinces: NH:S1, NY:S1S2, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212A:CC, M212D:CC
Federal Lands: NPS (Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HMSF
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (3 plots; 1 accuracy assessment point): APPA.0416, APPA.0417, APPA.0418, APPA_AA_2548.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Sperduto 2000a, Sperduto and Cogbill 1999, Sperduto and Nichols 2004

[CEGL006424] *Trichophorum caespitosum - Carex scirpoidea - Carex bigelowii* Alpine Snowbed

Translated Name: **Tufted Bulrush - Northern Single-spike Sedge - Bigelow's Sedge Alpine Snowbed**
Common Name: **Alpine Herbaceous Wet Meadow**

USNVC CLASSIFICATION

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Salix herbacea / Trichophorum caespitosum - Carex bigelowii* Alpine Snowbed Alliance (A3287)

ELEMENT CONCEPT

Global Summary: This herb-dominated alpine vegetation is found in moist and somewhat protected spots above 1430 m (4700 feet) elevation in the Northern Appalachians. Constant moisture is provided by nearby streams or late-melting snowbanks. Dwarf-shrubs such as *Vaccinium uliginosum* are often a component, but the differential species are the graminoids and forbs. *Trichophorum caespitosum, Carex scirpoidea*, and *Carex bigelowii* are the characteristic graminoids, and are usually locally dominant. *Deschampsia flexuosa* and *Carex brunnescens* are also typical although less abundant. Forbs include species also found at lower elevations, such as *Veratrum viride, Solidago macrophylla, Platanthera dilatata, Clintonia borealis*, and *Campanula rotundifolia*; as well as those restricted to higher elevations (at this latitude) such as *Polygonum viviparum* and *Prenanthes boottii*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This herbaceous association occurs above treeline at elevations above 800 m (2,625 feet) on gently to steeply sloping positions with variable aspects. Sites include saturated headwalls, stream margins and snowbanks with organic soils.
Global Environment: This association occurs in moist and somewhat protected spots above 1430 m (4700 feet) elevation in the Northern Appalachians. Constant moisture is provided by nearby streams or late-melting snowbanks. The streamside or snowbank setting has been used to distinguish two subtypes.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is highly variable in in composition. It is typically herb-dominated, but some sites may have a strong shrub component. The herbaceous layer is dense and the most consistent dominants include *Deschampsia flexuosa, Geum peckii*, and

Veratrum viride. Other herbaceous associates include *Athyrium filix-femina ssp. angustum, Calamagrostis canadensis, Calamagrostis pickeringii, Carex bigelowii, Clintonia borealis, Coptis trifolia, Cornus canadensis, Houstonia caerulea, Lonicera villosa, Phegopteris connectilis, Prenanthes trifoliolata, Solidago macrophylla, Symphyotrichum puniceum var. puniceum*, and *Trichophorum caespitosum*. Shrub cover is variable and may exceed 50% total cover on some sites. Dominants include *Alnus viridis ssp. crispa, Betula nana, Salix argyrocarpa, Spiraea alba var. latifolia*, and *Vaccinium uliginosum*.

Global Vegetation: Dwarf-shrubs such as *Vaccinium uliginosum* are often a component, but the differential species are the graminoids and forbs. *Trichophorum caespitosum, Carex scirpoidea*, and *Carex bigelowii* are the characteristic graminoids, and are usually locally dominant. *Deschampsia flexuosa* and *Carex brunnescens* are also typical although less abundant. Forbs include species also found at lower elevations, such as *Veratrum viride, Solidago macrophylla, Platanthera dilatata, Clintonia borealis*, and *Campanula rotundifolia*; as well as those restricted to higher elevations (at this latitude) such as *Polygonum viviparum* and *Prenanthes boottii*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Betula nana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus viridis* ssp. *crispa*, *Salix argyrocarpa*, *Spiraea alba* var. *latifolia*, *Vaccinium uliginosum*
Herb (field)	Flowering forb	*Geum peckii*, *Veratrum viride*
Herb (field)	Graminoid	*Deschampsia flexuosa*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex bigelowii*, *Carex scirpoidea*, *Trichophorum caespitosum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Deschampsia flexuosa*, *Geum peckii*, *Houstonia caerulea*, *Vaccinium caespitosum*

Global: *Carex bigelowii*, *Carex scirpoidea*, *Trichophorum caespitosum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Arnica lanceolata* (G3, NH state-critically imperiled), *Betula minor* (G4G5Q, NH state-imperiled), *Calamagrostis pickeringii* (G5, NH state-imperiled), *Carex bigelowii* (G5, NH state-imperiled), *Geum peckii* (G2, NH state-imperiled), *Salix argyrocarpa* (G5, NH state-critically imperiled), *Salix planifolia* (G5, NH state-imperiled), *Salix uva-ursi* (G5, NH state-imperiled), *Vaccinium caespitosum* (G5, NH state-imperiled), *Veronica wormskjoldii* (G5, NH state-critically imperiled)

Global: Vulnerable Plants: *Arnica lanceolata* (G3), *Geum peckii* (G2), *Prenanthes boottii* (G2)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (29-Jan-2003).

RELATED CONCEPTS

CLASSIFICATION

Status: Standard

Classification Confidence: 3 - Weak

Global Classification Comments: Description based on Sperduto and Cogbill (1999) alpine report without reference to the actual plot data.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Mount Washington and Mount Lafayette in the Presidential Range of New Hampshire.

Global Range: Currently documented from a few locations in the Presidential Range of New Hampshire and Katahdin in Maine; may occur at suitable elevations in the Canadian portion of the Northern Appalachians (e.g., the Gaspe).

Nations: CA?, US

States/Provinces: ME, NH, NY
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ac:CCC, M212Ad:CCC
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HAWM
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (12 plots; 5 accuracy assessment points): APPA.0313, APPA.0425, APPA.0426, APPA.0429, APPA.0430, APPA.0431, APPA.0432, APPA.0435, APPA.0436, APPA.0437, APPA.0439, APPA.0440, APPA_AA_1797, APPA_AA_1835, APPA_AA_2191, APPA_AA_2749, APPA_AA_2951.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Bliss 1963, Eastern Ecology Working Group n.d., Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Sperduto and Cogbill 1999, Sperduto and Cogbill 1999*, Sperduto and Nichols 2004

A1116 *Vaccinium uliginosum* - Mixed Alpine Heath Alliance

Alliance Summary Description: This alliance includes alpine dwarf-shrublands generally characterized by *Vaccinium uliginosum*, often mixed with other dwarf-shrubs and lesser amounts of graminoids and forbs. Other species associated with this alliance include *Betula glandulosa, Empetrum nigrum, Ledum groenlandicum, Rhododendron lapponicum, Salix uva-ursi, Vaccinium vitis-idaea*, and the herbs *Carex bigelowii, Cornus canadensis, Juncus trifidus, Minuartia groenlandica, Sibbaldiopsis tridentata (= Potentilla tridentata)*, and *Solidago multiradiata*. These communities are restricted to alpine areas in the Northern Appalachian and eastern alpine regions on the Canadian Shield. Typically they occur above timberline on exposed, windswept mountain summits, ridges, and bedrock-dominated tablelands.

[CEGL006425] *Kalmia angustifolia - Chamaedaphne calyculata / Rubus chamaemorus / Cladina* spp. Dwarf-shrubland

Translated Name: **Sheep Laurel - Leatherleaf / Cloudberry / Reindeer Lichen species Dwarf-shrubland**
Common Name: **Subalpine Slope Bog**

USNVC CLASSIFICATION

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Vaccinium uliginosum* - Mixed Alpine Heath Alliance (A1116)

ELEMENT CONCEPT

Global Summary: This dwarf-shrub vegetation resembles that of a northeastern North American peat bog, but instead of a basin setting, it is on subalpine to alpine slopes, near or above treeline. While moist, the substrate is not constantly saturated as it would be in high-elevation basin bogs. The slope can range from moderate to very steep. Peat accumulation is deeper than in other alpine or subalpine heath settings, with depths of 25-80+ cm. The vegetation is dominated by a dense layer of dwarf ericaceous shrubs, with widely scattered taller shrubs or stunted trees. Herbs are sparse. The bryoid layer is very well-developed with both mosses and lichens prominent. *Kalmia angustifolia, Chamaedaphne calyculata*, and *Ledum groenlandicum* are dominant. Less abundant shrubs and small trees may include *Alnus viridis ssp. crispa, Betula papyrifera var. cordifolia, Viburnum edule, Vaccinium uliginosum*, and *Rhododendron canadense*. Krummholz-form *Picea mariana, Abies balsamea*, and, occasionally *Larix laricina* and *Thuja occidentalis* may be present. Herbs include widespread species like *Cornus canadensis* and *Coptis trifolia* along with the more restricted *Rubus chamaemorus, Geocaulon lividum*, and *Huperzia appalachiana*. The bryoid layer is dominated by *Sphagnum* spp., with abundant fruticose lichens including *Cladina rangiferina* and *Cetraria islandica*. This association is distinguished from the more widespread subalpine heath association *(Picea mariana, Abies balsamea) / Kalmia angustifolia - Ledum groenlandicum* Dwarf-shrubland (CEGL006031) by the accumulation of *Sphagnum* peat; it is distinguished from the alpine bog *Empetrum nigrum - Vaccinium uliginosum - Vaccinium oxycoccos / Rubus chamaemorus* Dwarf-shrubland (CEGL006140), which is somewhat wetter, by the paucity of graminoids and the slope as opposed to basin setting.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This dwarf-shrub association occurs at elevations >1000 m (3,280 feet) above treeline on moderate to steep slopes with variable aspects.
Global Environment: This association occurs in subalpine to alpine settings above 610 m (2000 feet) elevation, on moderate to steep slopes. Settings include talus rockslides and moist slopes near treeline.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is typically heath-dominated, but on some sites krummholz of *Picea mariana* and *Abies balsamea* may be prominent. Dominant heath species include *Chamaedaphne calyculata, Empetrum nigrum, Kalmia angustifolia*, and *Ledum groenlandicum* and may form dense thickets. Herbaceous composition is inconsistent and cover is low, but species may include *Carex brunnescens, Carex debilis, Carex gracillima, Carex gynandra, Carex trisperma, Coptis trifolia, Cornus canadensis, Cypripedium acaule, Deschampsia flexuosa*, and *Gaultheria hispidula*. The nonvascular layer is dominated by *Sphagnum* spp. and may exceed 90% cover.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Chamaedaphne calyculata*, *Kalmia angustifolia*, *Ledum groenlandicum*
Short shrub/sapling	Dwarf-shrub	*Empetrum nigrum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Empetrum nigrum*, *Ledum groenlandicum*
Global:

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Rubus chamaemorus* (G5, NH state-imperiled), *Vaccinium boreale* (G4G5, ME & NH state-imperiled)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (29-Jan-2003).

RELATED CONCEPTS

Global Similar Types:
- *Empetrum nigrum - Vaccinium uliginosum - Vaccinium oxycoccos / Rubus chamaemorus* Dwarf-shrubland (CEGL006140)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association occurs above treeline at the highest elevations of the Presidential Range in New Hampshire and Saddleback Mountain, West Peak and Joe's Hole in Maine.
Global Range: Scattered locations in the northern Appalachians, currently documented only from New Hampshire and Maine.
Nations: CA?, US
States/Provinces: ME:S1, NH:S1S2
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ac:CC?, M212Ad:CCP, M212Ae:CCC
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SSSB
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (10 plots; 1 observation point; 2 accuracy assessment points): APPA.0273, APPA.0282, APPA.0288, APPA.0291, APPA.0293, APPA.0319, APPA.0414, APPA.0415, APPA.0419, APPA.1611, APPA.1642, APPA_AA_1910, APPA_AA_3043.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Gawler 2002, Gawler and Cutko 2010, Sperduto 2000a, Sperduto and Cogbill 1999, Sperduto and Nichols 2004

[CEGL006155] *Vaccinium uliginosum - Harrimanella hypnoides - Loiseleuria procumbens* Dwarf-shrubland

Translated Name: **Bog Blueberry - Mossplant - Alpine-azalea Dwarf-shrubland**
Common Name: **Alpine Heath Snowbank**

USNVC CLASSIFICATION

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Vaccinium uliginosum* - Mixed Alpine Heath Alliance (A1116)

ELEMENT CONCEPT

Global Summary: This alpine heath snowbank community occurs at the higher elevations above treeline in alpine regions of the northern New England Appalachians. It is most typical just below the rims of alpine cirques or over the brow of alpine cliffs, where significant snow accumulates on the lee side of rocks and ledges, and is the last snow to melt in the spring. Elevations are above 1400 m (4600 feet). Soils are moderately well-drained, but thin and gravelly. The dwarf-shrub layer is dominant, with 65-90% cover. Herbs are scattered in openings among the shrubs, and may be locally abundant on rock shelves. Dominant species include the dwarf-shrubs *Vaccinium caespitosum, Vaccinium uliginosum, Ledum groenlandicum*, and *Empetrum nigrum*. Particularly characteristic, although not necessarily dominant, are *Harrimanella hypnoides, Phyllodoce caerulea*, and *Loiseleuria procumbens*. Important herbs include *Deschampsia flexuosa, Carex bigelowii*, and *Solidago macrophylla*. Lower-elevation herbs may also be present here, including *Maianthemum canadense* and *Cornus canadensis*. The particular setting and the presence of alpine species *Harrimanella hypnoides, Loiseleuria procumbens*, and *Phyllodoce caerulea* differentiate this community from other alpine heathlands and krummholz communities.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This dwarf-shrub association is known from elevations greater than 1300 m (4,265 feet) above treeline where snow accumulation is substantial.
Global Environment: This alpine heath snowbank community occurs at the higher elevations above treeline in alpine regions of the northern New England Appalachians. It is most typical just below the rims of alpine cirques or over the brow of alpine cliffs, where significant snow accumulates on the lee side of rocks and ledges, and is the last snow to melt in the spring. Elevations are above 1400 m (4600 feet). Soils are moderately well-drained, but thin and gravelly.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by low, dwarf ericaceous shrubs. Dominant species include *Ledum groenlandicum, Vaccinium uliginosum*, and *Vaccinium vitis-idaea*. The herbaceous layer may be sparse to open and dominated by the sedge *Carex bigelowii* or the liverwort *Ptilidium ciliare*. The nonvascular layer is dominated by the moss *Cetraria islandica*.
Global Vegetation: The dwarf-shrub layer is dominant, with 65-90% cover. Herbs are scattered in openings among the shrubs, and may be locally abundant on rock shelves. Dominant species include the dwarf-shrubs *Vaccinium caespitosum, Vaccinium uliginosum, Ledum groenlandicum*, and *Empetrum nigrum*. Particularly characteristic, although not necessarily dominant, are *Harrimanella hypnoides, Phyllodoce caerulea*, and *Loiseleuria procumbens*. Important herbs include *Deschampsia flexuosa, Carex bigelowii*, and *Solidago macrophylla*. Lower-elevation herbs may also be present here, including *Maianthemum canadense* and *Cornus canadensis*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Ledum groenlandicum*, *Vaccinium uliginosum*, *Vaccinium vitis-idaea*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Ledum groenlandicum*, *Vaccinium caespitosum*, *Vaccinium uliginosum*
Short shrub/sapling	Dwarf-shrub	*Empetrum nigrum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Cetraria islandica*, *Vaccinium vitis-idaea*
Global: *Harrimanella hypnoides*, *Loiseleuria procumbens*, *Phyllodoce caerulea*, *Vaccinium uliginosum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Carex bigelowii* (G5, NH state-imperiled), *Minuartia glabra* (G4, NH state-critically imperiled)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (9-Dec-1998). In the northern Appalachian Mountains there are less than 100 high-elevation bare summits which exhibit alpine conditions. Of these, probably most above 1400 m (4600 feet) have some form of this alpine snowbank community, although many may consist of very small undeveloped fragments. Examples of this association have, until the late 1990s, been inventoried as part of a more broadly defined "alpine community" by most state natural heritage programs. Work in New Hampshire and Maine detailed this type, but still the exact extent and typical size of this association are relatively unknown. Nevertheless, the combined factors of rarity, specialized conditions and the relative isolation of these communities from each other make them vulnerable conservation targets.

RELATED CONCEPTS

Global Similar Types:
- *Vaccinium uliginosum - Rhododendron lapponicum / Juncus trifidus* Dwarf-shrubland (CEGL006298)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Mount Lafayette in the Presidential Range of New Hampshire.
Global Range: This alpine heath snowbank community occurs at high elevations in alpine regions of the northern New England.
Nations: CA?, US
States/Provinces: ME, NH:S1S2, NY, QC?
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ac:CCC, M212Ad:CCC, M212B:CP, M212C:CP
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SAHM
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (2 plots; 2 accuracy assessment points): APPA.0306, APPA.0327, APPA_AA_3007, APPA_AA_3021.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Bliss 1963, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Sperduto 2000a, Sperduto and Cogbill 1999, Sperduto and Nichols 2004

[CEGL006298] *Vaccinium uliginosum - Rhododendron lapponicum / Juncus trifidus* Dwarf-shrubland

Translated Name: **Bog Blueberry - Lapland Rosebay / Highland Rush Dwarf-shrubland**
Common Name: **Alpine Heath Meadow**

USNVC Classification

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Vaccinium uliginosum* - Mixed Alpine Heath Alliance (A1116)

Element Concept

Global Summary: Alpine meadows of matted shrubs, sedges, and rushes are the dominant vegetation above treeline on the highest peaks of the northern Appalachian Mountains. Typically they occur above 1370 m (4500 feet) (occasionally lower) on exposed mountain summits, ridges, and bedrock-dominated tablelands. The substrate ranges from gravelly flats to jumbled rocks to stone pavements, with limited soils: basically well-drained gravels and stones with shallow organic accumulation. Protected spots may have continuous atmospheric moisture. The short snow-free season, frequent fog, cutting winds, and intense solar radiation are hallmarks of this environment. The vegetation is often patchy, with some areas shrub-dominated and other patches graminoid-dominated, but overall, dwarf-shrubs predominate. Shrub cover is usually 40-60%; herb cover is typically less, but may be up to 50% in some spots. Tree species may be present in shrub form in scattered, somewhat sheltered pockets. Bryophytes are very limited, but lichens may be abundant. Characteristic dwarf-shrubs are *Vaccinium uliginosum*, ubiquitous in this association, with *Vaccinium vitis-idaea, Vaccinium boreale, Betula glandulosa, Empetrum nigrum, Empetrum eamesii ssp. atropurpureum, Rhododendron lapponicum, Diapensia lapponica, Salix uva-ursi*, and *Arctostaphylos uva-ursi*. Graminoids scattered among the shrubs, and in places codominant, are primarily *Juncus trifidus* and *Carex bigelowii*. *Sibbaldiopsis tridentata (= Potentilla tridentata)* is a common forb, as is *Minuartia groenlandica*, which typically grows in the more gravelly substrates, often along trails. Herbs that are not abundant, but characteristic, include *Solidago multiradiata, Hierochloe alpina, Agrostis mertensii, Prenanthes boottii*, and *Huperzia appalachiana*. The combination of alpine heath shrubs in a mosaic with alpine graminoids is diagnostic. This is the above-treeline "matrix" type in which other, more limited and specialized alpine associations found on the more extensive summits are embedded. These include *Diapensia lapponica* Dwarf-shrubland (CEGL006322), *Vaccinium uliginosum - Harrimanella hypnoides - Loiseleuria procumbens* Dwarf-shrubland (CEGL006155), *Carex bigelowii* Alpine Meadow (CEGL006081) and *Empetrum nigrum - Vaccinium uliginosum - Vaccinium oxycoccos / Rubus chamaemorus* Dwarf-shrubland (CEGL006140).

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This dwarf-shrub association occurs in the White Mountains of New Hampshire and occasionally in Maine above treeline at elevations greater than 1,100 m (3,610 feet). Positions are summits and ridges with moderate to steep slopes.
Global Environment: Alpine meadows of matted shrubs, sedges, and rushes are the dominant vegetation above treeline on the highest peaks of the northern Appalachian Mountains. Typically they occur above 1370 m (4500 feet) (occasionally lower) on exposed mountain summits, ridges, and bedrock-dominated tablelands. The substrate ranges from gravelly flats to jumbled rocks to stone pavements, with limited soils: basically well-drained gravels and stones with shallow organic accumulation. Protected spots may have continuous atmospheric moisture. The short snow-free season, frequent fog, cutting winds, and intense solar radiation are hallmarks of this environment.

Vegetation Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is dominated by dwarf heath shrubs, including *Vaccinium uliginosum* and *Vaccinium vitis-idaea*. Other shrubs occurring at lower cover and frequency include *Diapensia lapponica, Kalmia angustifolia, Ledum groenlandicum, Ribes glandulosum, Vaccinium angustifolium*, and *Vaccinium boreale*. The herbaceous layer is open and dominated by *Carex bigelowii* and *Juncus trifidus*. Other herbaceous associates include *Cornus canadensis, Lycopodium annotinum, Minuartia glabra, Minuartia groenlandica, Sibbaldiopsis tridentata*, and *Trichophorum caespitosum*. Lichens and mosses are prominent and may have dense cover.
Global Vegetation: The vegetation is often patchy, with some areas shrub-dominated and other patches graminoid-dominated, but overall, dwarf-shrubs predominate. Shrub cover is usually 40-60%; herb cover is typically less, but may be up to 50% in some spots. Tree species may be present in shrub form in scattered, somewhat sheltered

pockets. Bryophytes are very limited, but lichens may be abundant. Characteristic dwarf-shrubs are *Vaccinium uliginosum*, ubiquitous in this association, with *Vaccinium vitis-idaea, Vaccinium boreale, Betula glandulosa, Empetrum nigrum, Empetrum eamesii ssp. atropurpureum, Rhododendron lapponicum, Diapensia lapponica, Salix uva-ursi*, and *Arctostaphylos uva-ursi*. Graminoids scattered among the shrubs, and in places codominant, are primarily *Juncus trifidus* and *Carex bigelowii*. *Sibbaldiopsis tridentata (= Potentilla tridentata)* is a common forb, as is *Minuartia groenlandica*, which typically grows in the more gravelly substrates, often along trails. Herbs that are not abundant, but characteristic, include *Solidago multiradiata, Hierochloe alpina, Agrostis mertensii, Prenanthes boottii*, and *Huperzia appalachiana*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Vaccinium uliginosum*, *Vaccinium vitis-idaea*
Herb (field)	Graminoid	*Carex bigelowii*, *Juncus trifidus*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Rhododendron lapponicum*, *Vaccinium uliginosum*
Herb (field)	Graminoid	*Carex bigelowii*, *Juncus trifidus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Juncus trifidus*, *Vaccinium vitis-idaea*
Global: *Carex bigelowii*, *Juncus trifidus*, *Rhododendron lapponicum*, *Vaccinium uliginosum*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Carex bigelowii* (G5, ME & NH state-imperiled), *Diapensia lapponica* (G4G5, ME & NH state-imperiled), *Geum peckii* (G2, NH state-imperiled), *Hierochloe alpina* (G5, ME state-critically imperiled & NH state-imperiled), *Minuartia glabra* (G4, NH state-critically imperiled), *Vaccinium boreale* (G4G5, ME & NH state-imperiled)
Global: Vulnerable Plants: *Geum peckii* (G2), *Prenanthes boottii* (G2)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (13-Nov-1997). In the northern Appalachian Mountains there are fewer than 100 high-elevation bare summits that exhibit alpine conditions. Of these, a much smaller pool have well-developed heath communities, although a systematic inventory of all the lesser peaks has not been performed. The 20 or so examples currently tracked by the state natural heritage programs range in size from 1 to about 50 acres. The larger examples in the well known Presidential Range in the White Mountains, the Katahdin region of Maine, Camels Hump area of Vermont and the Mt. Marcy region of the Adirondacks all receive considerable foot travel, and there is evidence that some trampling degradation has occurred. The combined factors of small size, rarity, and relative isolation of these communities make them vulnerable conservation targets.

RELATED CONCEPTS

Global Similar Types:
- *Vaccinium uliginosum - Harrimanella hypnoides - Loiseleuria procumbens* Dwarf-shrubland (CEGL006155)
- *Vaccinium uliginosum / Sibbaldiopsis tridentata* Sparse Vegetation (CEGL006533)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: This association includes several dominance types that have been segregated as separate communities (e.g., see Bliss 1963, Doyle et al. 1987); recent field studies show these to generally occur in a fine-scale mosaic, and they are treated here as one association.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is known from Franconia Ridge in the White Mountains of New Hampshire, as well as Saddleback Mountain and West Peak in Maine.

Global Range: This community is found above treeline on the highest peaks of the northern Appalachian Mountains from New York to Maine and possibly Quebec.
Nations: CA?, US
States/Provinces: ME, NH, NY, QC?, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212B:CC, M212Ca:CCC, M212D:CC
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: SAHM
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (15 plots; 4 observation points; 32 accuracy assessment points): APPA.0261, APPA.0267, APPA.0268, APPA.0270, APPA.0272, APPA.0296, APPA.0297, APPA.0304, APPA.0314, APPA.0325, APPA.0326, APPA.0328, APPA.0329, APPA.0441, APPA.0447, APPA.1613, APPA.1614, APPA.1619, APPA.1620, APPA_AA_1684, APPA_AA_1685, APPA_AA_1716, APPA_AA_1820, APPA_AA_1850, APPA_AA_1856, APPA_AA_1867, APPA_AA_1874, APPA_AA_1960, APPA_AA_1996, APPA_AA_2023, APPA_AA_2116, APPA_AA_2125, APPA_AA_2309, APPA_AA_2331, APPA_AA_2375, APPA_AA_2378, APPA_AA_2405, APPA_AA_2435, APPA_AA_2568, APPA_AA_2619, APPA_AA_2633, APPA_AA_2656, APPA_AA_2661, APPA_AA_2719, APPA_AA_2759, APPA_AA_2860, APPA_AA_2998, APPA_AA_3053, APPA_AA_3276, APPA_AA_3311, APPA_AA_3331.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Bliss 1963, Doyle et al. 1987, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, NAP pers. comm. 1998, Sperduto 2000a, Sperduto and Cogbill 1999, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

[CEGL006533] *Vaccinium uliginosum / Sibbaldiopsis tridentata* Sparse Vegetation

Translated Name: **Bog Blueberry / Shrubby Fivefingers Sparse Vegetation**
Common Name: **Subalpine Rock Bald**

USNVC CLASSIFICATION

Division	Eastern North American Alpine Tundra (4.B.1.Na)
Macrogroup	Eastern North American Alpine Tundra (M131)
Group	Eastern Alpine Tundra (G104)
Alliance	*Vaccinium uliginosum* - Mixed Alpine Heath Alliance (A1116)

ELEMENT CONCEPT

Global Summary: These sparsely vegetated rocky balds are found on subalpine and alpine summits of the northern Appalachian Mountains. They are on dry acidic rocky summits, ridges and outcrops composed of resistant granitic bedrock, mostly at elevations between 915 and 1525 m (3000-5000 feet), sometimes as low as 550 m (1800 feet). Soil development is minimal, with vascular vegetation confined to crevices. Expanses of bare rock with crustose lichens predominate. Vascular vegetation is usually less than 25% cover overall, although in patches coverage may approach 70%. The dominant plants are *Vaccinium uliginosum, Vaccinium vitis-idaea, Empetrum nigrum, Empetrum eamesii ssp. atropurpureum*, and *Sibbaldiopsis tridentata*. *Juncus trifidus* and, at higher elevations, *Carex bigelowii* may be present, but in far lower abundance than they are seen in alpine habitats. This association is related to the alpine *Vaccinium uliginosum - Rhododendron lapponicum / Juncus trifidus* Dwarf-shrubland (CEGL006298), but occurs at lower elevations and lacks characteristic alpine plants such as *Diapensia lapponica, Agrostis mertensii, Rhododendron lapponicum*, etc. It differs from lower elevation open summits in the presence of subalpine *Vaccinium uliginosum* (and sometimes *Juncus trifidus* or *Carex bigelowii*).

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This uncommon association is known from areas above treeline at elevations greater than 1,000 m (3,280 feet) on summits with gentle to moderate slopes.
Global Environment: These sparsely vegetated rocky balds are found on subalpine and alpine summits of the northern Appalachian Mountains. They are on dry acidic rocky summits, ridges and outcrops composed of resistant

granitic bedrock, mostly at elevations between 3000-5000 feet, sometimes as low as 1800 feet. Soil development is minimal, with vascular vegetation confined to crevices.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by an open to dense layer of dwarf ericaceous shrubs dominated by *Vaccinium uliginosum*. Few other shrub species occur, but may include *Empetrum eamesii ssp. atropurpureum* and *Vaccinium vitis-idaea*. Scattered trees including *Abies balsamea, Betula papyrifera var. cordifolia* and *Picea rubens* are common. Herbaceous cover is very low and no species have high consistency, but may include *Agrostis mertensii, Deschampsia flexuosa, Juncus trifidus, Minuartia glabra, Minuartia groenlandica, Sibbaldiopsis tridentata*, and *Solidago simplex ssp. randii*. Lichens and mosses are prominent and may have dense cover.
Global Vegetation: Expanses of bare rock with crustose lichens predominate. Vascular vegetation is usually less than 25% cover overall, although in patches coverage may approach 70%. The dominant plants are *Vaccinium uliginosum, Vaccinium vitis-idaea, Empetrum nigrum, Empetrum eamesii ssp. atropurpureum*, and *Sibbaldiopsis tridentata*. *Juncus trifidus* and, at higher elevations, *Carex bigelowii* may be present, but in far lower abundance than they are seen in alpine habitats.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Dwarf-shrub	*Vaccinium uliginosum*

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium uliginosum*
Herb (field)	Flowering forb	*Sibbaldiopsis tridentata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Vaccinium uliginosum*
Global: *Sibbaldiopsis tridentata*, *Vaccinium uliginosum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Jul-1999).

RELATED CONCEPTS

Global Similar Types:
- *Vaccinium uliginosum - Rhododendron lapponicum / Juncus trifidus* Dwarf-shrubland (CEGL006298)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Imp Mountain in New Hampshire and Avery and West peaks in Maine.
Global Range: This association is found on subalpine and alpine summits of the northern Appalachian Mountains from Maine to New York.
Nations: CA?, US
States/Provinces: ME:S3, NH:S2, NY, VT
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212B:CP, M212C:CP, M212D:CP
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: VAFB
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (6 plots; 8 accuracy assessment points): APPA.0285, APPA.0303, APPA.0420, APPA.0444, APPA.0445, APPA.0446, APPA_AA_1994,

APPA_AA_2230, APPA_AA_2332, APPA_AA_2653, APPA_AA_2689, APPA_AA_2725, APPA_AA_3248, APPA_AA_3264.

Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall

Global Description Author(s): S.C. Gawler

References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Sperduto 2000a, Sperduto and Cogbill 1999, Sperduto and Nichols 2004, Thompson and Sorenson 2000

5. Aquatic Vegetation

5.B.2. Temperate to Polar Freshwater Aquatic Vegetation

5.B.2.Na. North American Freshwater Aquatic Vegetation

M108. Eastern North American Freshwater Aquatic Vegetation

G114. Eastern North American Freshwater Aquatic Vegetation

Group Summary Description: Submergent marshes can be found across a large part of North America, ranging from boreal, interior Canada (Saskatchewan, Manitoba, Ontario) south through the Great Plains to the Gulf Coastal Plain in Texas and east to the Atlantic from Virginia to Maine. Stands in this group have rooted aquatic herbaceous vegetation, are permanently flooded with water generally less than 2 m deep, and are subject to low to moderate waves and currents. Water salinity varies from fresh to saline, with the saline and brackish sites tending to occur in the Great Plains. Submergent and floating-leaved aquatics dominate submergent marshes. Emergent vegetation has <10% total cover. Total vegetation cover ranges from sparse to dense.

A4147 *Lemna* spp. - *Wolffia* spp. - *Spirodela polyrrhiza* Aquatic Vegetation Alliance

Alliance Summary Description: This aquatic association of floating vegetation is known to occur throughout temperate eastern North America. *Lemna* spp. *Spirodela polyrrhiza*, and *Wolffia* spp. typically dominate but may be mixed with other plant taxa. These small plants may float on the water's surface or become stranded and possibly rooted during drawdown periods. The composition of examples varies across this wide distributional range. Associated rooted floating aquatics include *Potamogeton* spp., *Sagittaria* spp., or *Polygonum* spp. While these latter species are rooted submerged species, and technically not part of the strictly floating community, they do intermingle. Biomass can be abundant under eutrophic conditions. This alliance occupies wetlands that are permanently, semipermanently or seasonally flooded. Water chemistry is fresh. The standing water habitat is relatively shallow, generally less than 2-4 m and occurs as ponds, lakes, ditches, stock ponds, and backwater sloughs of river and stream channels. Standing water for much or most of the growing season is characteristic. Depth of the water is of no consequence to floating plants; they occur where the wind pushes them.

[CEGL005451] *Lemna* spp. Eastern North American Aquatic Vegetation

Translated Name: **Duckweed species Eastern North American Aquatic Vegetation**
Common Name: **Eastern North America Duckweed Pond**

USNVC Classification

Division	North American Freshwater Aquatic Vegetation (5.B.2.Na)
Macrogroup	Eastern North American Freshwater Aquatic Vegetation (M108)
Group	Eastern North American Freshwater Aquatic Vegetation (G114)
Alliance	*Lemna* spp. - *Wolffia* spp. - *Spirodela polyrrhiza* Aquatic Vegetation Alliance (A4147)

Element Concept

Global Summary: This aquatic association of floating vegetation is known to occur throughout temperate eastern North America. *Lemna* spp. typically dominate but may be mixed with other plant taxa floating on the water surface. *Lemna*-dominated aquatic vegetation occupies wetlands that are permanently, semipermanently or seasonally flooded. These small plants may float on the water's surface or become stranded and possibly rooted during drawdown periods. Water chemistry is fresh. The standing water habitat is relatively shallow, generally less than 2-4 m (6.6-13.1 feet) and occurs as ponds, lakes, ditches, stock ponds, and backwater sloughs of river and stream channels. Standing water for much or most of the growing season is characteristic. Depth of the water is of no consequence to floating plants; they occur where the wind pushes them. The composition of examples varies across this wide distributional range. *Lemna* taxa that may be present in eastern North America include *Lemna*

aequinoctialis (southwest U.S. as well as southeast U.S.), *Lemna minor* (widespread across temperate North America), *Lemna minuta* (widespread across southern U.S.), *Lemna obscura* (eastern-southeastern U.S.), *Lemna perpusilla* (eastern U.S.), *Lemna trisulca* (widespread temperate and boreal, but not southeast U.S.), *Lemna turionifera* (widespread temperate and boreal, but not southeast U.S.), and *Lemna valdiviana* (southeast U.S., and spotty in the southwest U.S.). Other species present may include *Spirodela polyrrhiza* (widespread temperate U.S.), *Spirodela punctata* (southeastern U.S.), *Azolla mexicana, Azolla filiculoides, Wolffiella lingulata* (rare), *Wolffiella oblonga* (extreme southwest and southeast U.S.), *Wolffiella gladiata* (southeast coastal plain), *Wolffia brasiliensis* (eastern temperate U.S.), *Wolffia borealis* (west coast temperate and eastern temperate U.S., but not coastal plain), *Wolffia globosa* (eastern temperate U.S.), and *Wolffia columbiana* (eastern temperate U.S.), as well as *Riccia* spp. (aquatic liverworts). Associated rooted floating aquatics include *Potamogeton* spp., *Sagittaria* spp., or *Polygonum* spp. may also be present s. While these latter species are rooted submerged species, and technically not part of the strictly floating community, they do intermingle. Biomass can be abundant under eutrophic conditions.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This aquatic vegetation occurs in ponds.
Global Environment: *Lemna*-dominated aquatic vegetation occupies wetlands that are permanently flooded, semi-permanently flooded to seasonally flooded. Water chemistry is fresh. The standing water habitat is relatively shallow, generally less than 2-4 m (6.6-13.1 feet) and occurs as ponds, lakes, ditches, stock ponds, and backwater sloughs of river and stream channels. Standing water for much or most of the growing season is characteristic. Depth of the water is of no consequence to floating plants; they occur where the wind pushes them. Community composition may change hour to hour, yet the environment, only the top few centimeters of water, is homogeneous. Biomass can be abundant under eutrophic conditions.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Lemna* spp. are dominant.
Global Vegetation: The composition of examples varies across the wide distributional range of this community. *Lemna* taxa that may be present in eastern North America include *Lemna aequinoctialis* (southwest and southeast U.S.), *Lemna minor* (widespread across temperate North America), *Lemna minuta* (widespread across southern U.S.), *Lemna obscura* (eastern-southeastern U.S.), *Lemna perpusilla* (eastern U.S.), *Lemna trisulca* (widespread temperate and boreal, but not southeast U.S.), *Lemna turionifera* (widespread temperate and boreal, but not southeast U.S.), and *Lemna valdiviana* (southeast U.S., and spotty in southwest U.S.). Other species present may include *Spirodela polyrrhiza* (widespread temperate U.S.), *Spirodela punctata* (southeastern U.S.), *Azolla mexicana, Azolla filiculoides, Wolffiella lingulata* (rare), *Wolffiella oblonga* (extreme southwest and southeast U.S.), *Wolffiella gladiata* (southeast coastal plain), *Wolffia brasiliensis* (eastern temperate U.S.), *Wolffia borealis* (west coast temperate and eastern temperate U.S., but not coastal plain), *Wolffia globosa* (eastern temperate U.S.), and *Wolffia columbiana* (eastern temperate U.S.).
Global Dynamics: Because the biomass of floating organisms is generally not great, they do not have an important influence on the accumulation of organic matter on the pond bottom. However, a study comparing Rocky Mountain with Illinois pond communities found that similar types in Illinois ponds have twice the number of species and biomass found in Colorado ponds (Fuller 1930).

Most Abundant Species

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Lemna* spp.

Global

Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Lemna aequinoctialis*, *Lemna minor*, *Lemna minuta*, *Lemna obscura*, *Lemna perpusilla*, *Lemna trisulca*, *Lemna turionifera*, *Lemna valdiviana*

Characteristic Species

Appalachian National Scenic Trail (Central Appalachian Project Area): *Lemna* spp.
Global: *Lemna aequinoctialis*, *Lemna minor*, *Lemna minuta*, *Lemna obscura*, *Lemna perpusilla*, *Lemna trisulca*, *Lemna turionifera*, *Lemna valdiviana*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (11-Jul-2013). If this community is widespread across eastern North America, it is ranked G5. Even if it is subdivided into "division-level" subunits, and it is likely to be secure.

RELATED CONCEPTS

Global Similar Types:

- *Lemna minor* Aquatic Vegetation (CEGL003305)
- *Lemna* spp. North American Boreal Aquatic Vegetation (CEGL005452)
- *Lemna* spp. Western North American Aquatic Vegetation (CEGL005450)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: It is possible that a coastal plain *Lemna* association could be recognized based on the restricted distribution of many *Lemna* spp. *Lemna* and other characteristic wetland taxa that comprise floating, submerged and aquatic rooted associations are not well-reported in the literature, but they are known to occur in the field. *Lemna* and *Azolla* will be easy to distinguish from each other; some *Lemna* taxa may be less easy to distinguish from *Spirodela, Wolffiella*, and *Wolffia*.

ELEMENT DISTRIBUTION

Global Range: This aquatic association of floating vegetation is known to occur throughout temperate eastern North America.
Nations: CA, US
States/Provinces: AL, AR, CT, DE, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, ND, NE, NH, NJ, NY, OH, OK, ON, PA, QC, RI, SC, SD, TN, TX, VA, VT, WV
TNC Ecoregions: 31:C, 32:C, 33:C, 34:C, 35:C, 36:C, 37:C, 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:C, 51:C, 52:C, 53:C, 54:C, 55:C, 56:C, 57:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions (1994/95): 212A:CC, 212B:CC, 212C:CC, 212D:CC, 212E:CC, 212F:CC, 212G:CC, 212H:CC, 212I:CC, 212J:CC, 212K:CC, 212L:CC, 212M:CC, 212N:CC, 212O:CC, 212P:CC, 221Ae:CCC, 221B:CC, 221C:CC, 221D:CC, 221E:CC, 221F:CC, 221H:CC, 221I:CC, 221J:CC, 222A:CC, 222C:CC, 222D:CC, 222E:CC, 222F:CC, 222G:CC, 222H:CC, 222Ib:CCC, 222J:CC, 222K:CC, 222L:CC, 222M:CC, 222N:CC, 222O:CC, 222P:CC, 222Q:CC, 231A:CC, 231B:CC, 231C:CC, 231D:CC, 231E:CC, 231F:CC, 231G:CC, 232A:CC, 232B:CC, 232C:CC, 232D:CC, 232E:CC, 232F:CC, 232G:CC, 234A:CC, 251A:CC, 251B:CC, 251C:CC, 251D:CC, 251E:CC, 251F:CC, 251G:CC, 255A:CC, 255B:CC, 255C:CC, 255D:CC, 411A:CC, M212A:CC, M212B:CC, M212C:CC, M212D:CC, M212E:CC, M212F:CC, M221A:CC, M221B:CC, M221C:CC, M221D:CC, M222A:CC, M231A:CC
Federal Lands: NPS (Appalachian Trail [Central Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HEDP
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 accuracy assessment points): APPA_AA_1035.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo
Global Description Author(s): D. Faber-Langendoen
References: Edinger et al. 2002, Edinger et al. 2007, Owns et al. 2004, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, Windell et al. 1986

A4064 *Nymphaea odorata - Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance

Alliance Summary Description: This alliance, common throughout most of the eastern and central United States and adjacent Canadian provinces, contains vegetation which may occur in a variety of slow-moving waterbodies, including rivers, millponds, streams, shallow ponds or lakes, or on shores of deeper waterbodies including freshwater tidal areas. Stands are dominated by hydromorphic-rooted aquatic plants, typically *Nuphar* spp., with or without *Nymphaea odorata* and *Nymphoides aquatica*. Emergent vegetation is less than 25%, and typically plant species diversity is low. Other species present may include *Utricularia* spp., *Potamogeton* spp., and others. In the north, *Brasenia schreberi* may be locally dominant. Other characteristic northern species include *Nymphaea tetragona* and *Potamogeton amplifolius*. Associates found in the Midwest include *Polygonum amphibium*. Stands of this alliance are permanently to semipermanently flooded, and water depth is generally greater than 0.5 m and up to 2 m.

[CEGL002386] *Nuphar advena - Nymphaea odorata* Aquatic Vegetation

Translated Name: **Broadleaf Pond-lily - American White Water-lily Aquatic Vegetation**
Common Name: **Water-lily Aquatic Wetland**

USNVC Classification

Division	North American Freshwater Aquatic Vegetation (5.B.2.Na)
Macrogroup	Eastern North American Freshwater Aquatic Vegetation (M108)
Group	Eastern North American Freshwater Aquatic Vegetation (G114)
Alliance	*Nymphaea odorata - Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance (A4064)

Element Concept

Global Summary: This rooted aquatic or open marsh community occupies shallow-water depressions, oxbow ponds, backwater sloughs of river floodplains, slow-moving streams, ponds, and small lakes throughout the central and eastern United States. It is dominated by rooted, floating-leaved aquatic species, with both submergent and emergent aquatics also present. *Nuphar advena (= Nuphar lutea ssp. advena)* and *Nymphaea odorata* are dominants, either in combination together, or each singly. Other species present include *Brasenia schreberi*, various *Potamogeton* and *Stuckenia* spp., *Eleocharis robbinsii* and other *Eleocharis* spp., *Polygonum amphibium, Polygonum amphibium var. emersum (= Polygonum coccineum), Sparganium americanum, Lemna* spp., *Spirodela polyrrhiza, Typha latifolia*, and *Saururus cernuus*. Submerged aquatics more common in the southern part of the range include *Cabomba caroliniana, Ceratophyllum demersum*, and *Heteranthera dubia*.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This aquatic pond vegetation occurs in a basin setting in Parker Lake in New Jersey. Another site is a lagoon off of the Connecticut River in Norwich, Vermont. Both examples are permanently flooded with very poorly drained muck soil and standing water. No evidence of disturbance was reported at either site.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This uncommon association was only sampled in the Northern Appalachian project area from Jones Pond at 400 m (1,310 feet) elevation. The site is beaver-influenced and permanently flooded. Soils are organic muck.
Global Environment: This community occupies shallow-water depressions, oxbow ponds, sluggish streams, and backwater sloughs of river floodplains, ponds (natural and artificial), and small lakes. In pools and slow-flowing stretches of river, at Obed River (TN), *Nuphar advena* is rooted in sandy substrate (Schmalzer and DeSelm 1982).

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: Dominant species include submerged macrophytes or floating-leaved pondweeds. *Brasenia schreberi, Lemna minor, Nuphar variegata (= Nuphar lutea ssp. variegata)*, and *Potamogeton natans* are the most common species.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only sampled occurrence of this association is dominated by the floating aquatic species *Nuphar variegata (= Nuphar lutea ssp. variegata)*. *Potamogeton natans* and *Utricularia* sp. are also present at lower cover.
Global Vegetation: This community is dominated by rooted, floating-leaved aquatic species, with both submergent and emergent aquatics also present. *Nuphar advena (= Nuphar lutea ssp. advena)* and *Nymphaea odorata* are dominants, either in combination together, or each singly. Other species present include *Brasenia schreberi*, various

Potamogeton and *Stuckenia* spp., *Eleocharis robbinsii* and other *Eleocharis* spp., *Polygonum amphibium, Polygonum amphibium var. emersum (= Polygonum coccineum), Sparganium americanum, Lemna* spp., *Spirodela polyrrhiza, Typha latifolia*, and *Saururus cernuus* (Anderson 1982, G. Fleming pers. comm.). Submerged aquatic species more common in the southern part of the range include *Cabomba caroliniana, Ceratophyllum demersum*, and *Heteranthera dubia*. This broadly conceived type may include ponds, or zones of ponds, dominated by *Nymphaea odorata*, with or without *Nuphar advena*.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Brasenia schreberi*, *Lemna minor*, *Nuphar variegata*, *Potamogeton natans*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Nuphar variegata*

Global

Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Nuphar advena*, *Nymphaea odorata*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Nuphar variegata*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Nuphar variegata*
Global: *Nuphar advena*, *Nymphaea odorata*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (15-Oct-2002). The dominant species in stands of this vegetation are widespread across the eastern and central United States and adjacent Canada. This is not a rare or imperiled vegetation type, even though its occurrence is poorly documented. Stands may occur in natural lakes and ponds or in artificial impoundments.

RELATED CONCEPTS

Global Similar Types:
- *Equisetum fluviatile - (Eleocharis palustris)* Marsh (CEGL005258)
- *Nuphar advena* Tidal Marsh (CEGL004472)
- *Nuphar polysepala* Aquatic Vegetation (CEGL002001)
- Semipermanent Impoundment (CEPS006581)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: The Vermont example consists primarily of standing water with low vegetation cover. *Nuphar variegata* is the only species present and it covers less than 2% of the site.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Can occur in mostly natural ponded wetlands as well as artifactual ones such as borrow pits. On the Conecuh National Forest (Alabama), vegetation of this association occurs in Gum Pond and Open Pond as a mix of *Nymphaea odorata* and *Nuphar advena*.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled at Parker Lake in New Jersey and along the Connecticut River in Windsor County, Vermont.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only sampled from Jones Pond in Maine. It is likely far more common but undersampled.
Global Range: This rooted aquatic community occupies shallow, quiet waters throughout the central and eastern United States, extending from Maine to Ontario and Minnesota, south to Oklahoma and east to Georgia.
Nations: CA, US

States/Provinces: AL, AR, CT, DE, FL, GA, IA:SU, IL, IN, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, NH:S4S5, NJ:S4, NY, OH, OK, ON, PA:S4, RI, SC, TN, TX, VA:SU, VT, WI, WV
TNC Ecoregions: 31:C, 32:P, 36:C, 37:C, 39:C, 40:P, 41:C, 42:C, 43:C, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:C, 51:C, 52:C, 53:C, 55:P, 56:C, 57:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212Aa:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCP, 212Dc:CCC, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 212Hb:CPP, 212Ja:CCP, 212Jb:CCP, 212Jc:CCP, 212Je:CCP, 212Jf:CCP, 212Jj:CCP, 212Jl:CCP, 212Jm:CCC, 212Ka:CPP, 221Aa:CCP, 221Ab:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Am:CCC, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Ea:CCC, 221Ed:CC?, 221Ef:CCC, 221Fa:CCC, 221Hc:CCC, 221He:CCC, 222Ch:CCC, 222Db:CCC, 222Gc:C??, 222Ha:CCC, 222Ja:CCC, 222Jb:CCC, 222Ji:CCC, 222Jj:CCC, 222Kf:CCC, 222Kg:CCC, 222Kh:CCC, 222Kj:CCC, 222L:CC, 231Bc:CCC, 231Bd:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Bf:CCC, 232C:CC, 232D:CC, 232Eb:CCC, 234Aa:CCC, 234Ac:CCC, 234Ad:CCC, 234Af:CCC, 234Ag:CCC, 234Ai:CCC, 234Al:CCC, 234Am:CCC, 234An:CCC, 251Cf:CCC, 251Dd:CCC, 251Dg:CCC, 251Eb:CCC, M212Af:CCC, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CCP, M212Eb:CCP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Da:CCC, M221Dc:CCC
Federal Lands: DOD (Fort Benning); NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], C&O Canal, Carl Sandburg Home, Cuyahoga Valley, Effigy Mounds, George Washington Parkway, Indiana Dunes, Jean Lafitte, Minute Man, Natchez Trace, Obed River, Ozark Riverways, Saint Croix, Saint-Gaudens, Shiloh); USFS (Angelina, Chequamegon, Chequamegon-Nicolet, Conecuh, Davy Crockett, Kisatchie, Nicolet, Ocala, Ozark, Sabine, Sam Houston?, Talladega, Talladega (Oakmulgee), Talladega (Talladega)); USFWS (Back Bay, Erie, Great Swamp, Monomoy, Patuxent, Reelfoot)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HAFV, XBMV
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 observation points; 8 accuracy assessment points): APPA.1372, APPA.1736, APPA_AA_2052, APPA_AA_2067, APPA_AA_2168, APPA_AA_2333, APPA_AA_2570, APPA_AA_2684, APPA_AA_3149, APPA_AA_3154.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 observation point; 18 accuracy assessment points): APPA.1628, APPA_AA_1703, APPA_AA_1769, APPA_AA_1921, APPA_AA_2017, APPA_AA_2099, APPA_AA_2186, APPA_AA_2190, APPA_AA_2312, APPA_AA_2357, APPA_AA_2395, APPA_AA_2601, APPA_AA_2649, APPA_AA_2901, APPA_AA_2989, APPA_AA_3047, APPA_AA_3086, APPA_AA_3093, APPA_AA_3222.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): D. Faber-Langendoen, C.W. Nordman, S.C. Gawler and M. Pyne
References: Ambrose 1990a, Anderson 1982, Breden et al. 2001, Chapman et al. 1989, Chastain et al. 2006, Clancy 1996, Coxe 2009, Edinger et al. 2002, Eichelberger 2011a, FNAI 1990, Faber-Langendoen 2001, Fike 1999, Fleming 2007, Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming et al. 2001, Foti et al. 1994, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Gawler et al. 2005, Harrison 2004, Harrison 2011, Hoagland 2000, Homoya et al. 1988, Hop et al. 2005, Hop et al. 2009, INAI n.d., LNHP 2009, Lubinski et al. 2003, MNNHP 1993, Metzler and Barrett 2006, Midwestern Ecology Working Group n.d.*, NAP pers. comm. 1998, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1985, Nelson 2010, Nordman et al. 2011, ONHD unpubl. data, Peet et al. unpubl. data, Penfound 1953, Rawinski 1984a, Schafale 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Schotz pers. comm., Smith 1996a, Sperduto and Nichols 2004, Swain and Kearsley 2001, TDNH unpubl. data, TNHS unpubl. data, Thompson and Jenkins 1992, Thompson and Sorenson 2000, WNHI unpubl. data, White 2003, White and Madany 1978, Zanoni et al. 1979, Zimmerman et al. 2012

A4066 *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Aquatic Vegetation Alliance

Alliance Summary Description: This alliance is widespread in the eastern United States and adjacent Canada from the western tallgrass prairies to the Atlantic Coast. Submergent vegetation dominates. Typical dominants are *Potamogeton* spp., including *Potamogeton natans, Potamogeton zosteriformis*, and *Potamogeton richardsonii*; *Ceratophyllum* spp., including *Ceratophyllum demersum*; *Elodea* spp., including *Elodea canadensis*; and *Myriophyllum* spp., including *Myriophyllum verticillatum*. Other associated species include emergents such as *Zizania palustris, Utricularia macrorhiza, Nuphar* spp., *Ranunculus longirostris, Chara* spp., *Lemna* spp., *Spirodela polyrrhiza*, and *Vallisneria americana*. This common alliance is found in permanently flooded wetlands with water usually less than 2 m deep.

[CEGL006431] *Elodea canadensis - Potamogeton* spp. Eastern Aquatic Vegetation

Translated Name: **Canadian Waterweed - Pondweed species Eastern Aquatic Vegetation**
Common Name: **Eastern Waterweed - Pondweed Aquatic Vegetation**

USNVC Classification

Division	North American Freshwater Aquatic Vegetation (5.B.2.Na)
Macrogroup	Eastern North American Freshwater Aquatic Vegetation (M108)
Group	Eastern North American Freshwater Aquatic Vegetation (G114)
Alliance	*Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Aquatic Vegetation Alliance (A4066)

Element Concept

Global Summary: This is a broadly conceived type that encompasses northeastern aquatic vegetation found in higher pH waters. The dominants are usually submerged macrophytes or floating-leaved pondweeds. Indicator species include *Elodea canadensis, Potamogeton robbinsii, Potamogeton vaseyi, Stuckenia filiformis, Potamogeton friesii*, and *Potamogeton strictifolius*. *Vallisneria americana* is often present. *Nymphaea odorata* and *Nuphar* spp. are often present but are not abundant. This vegetation is found in quiet waters at 0.5-2 m depth. In Maine, alkalinity is relatively high for ponds of the glaciated Northeast, with conductivity readings usually exceeding 50 uMHOs/cm. More intensive sampling that extends over a broader geographic range is needed to determine if particular associations within this concept should be segregated.

Environmental Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: The spring-fed pond is a shallow artificial millpond occurring within a presettlement karst feature. The water is derived from high-volume limestone springs within and above the pond so the pH is high. There is a dam at one end and the pond is used for fishing.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: No local data were collected.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This aquatic vegetation of occurs in ponds with circumneutral water.
Global Environment: This vegetation is found in quiet waters at 0.5-2 m depth. Alkalinity is relatively high for ponds of the glaciated Northeast, with conductivity readings usually exceeding 50 uMHOs/cm.

Vegetation Description

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The floating-leaved aquatic vegetation on the pond is dominated by *Elodea canadensis* and *Potamogeton crispus*. *Myriophyllum* spp. are also present.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: No local data were collected.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: *Nymphaea odorata* and *Nuphar* spp. are often present but not abundant. Submerged macrophytes or floating-leaved pondweeds dominate, including *Elodea canadensis, Potamogeton robbinsii, Potamogeton vaseyi, Stuckenia filiformis, Potamogeton friesii*, and *Potamogeton strictifolius; Vallisneria americana* is often present.
Global Vegetation: The dominants are usually submerged macrophytes or floating-leaved pondweeds. Indicator species include *Elodea canadensis, Potamogeton robbinsii, Potamogeton vaseyi, Stuckenia filiformis, Potamogeton*

friesii, and *Potamogeton strictifolius*. *Vallisneria americana* is often present. *Nymphaea odorata* and *Nuphar* spp. are often present but are not abundant. This vegetation is found in quiet waters at 0.5-2 m depth.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Submerged aquatic	Aquatic herb	*Elodea canadensis*, *Potamogeton crispus*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Submerged aquatic	Aquatic herb	*Elodea canadensis*, *Potamogeton friesii*, *Potamogeton robbinsii*, *Potamogeton strictifolius*, *Potamogeton vaseyi*, *Stuckenia filiformis*

Global

Stratum	Lifeform	Species
Submerged aquatic	Aquatic herb	*Elodea canadensis*, *Potamogeton friesii*, *Potamogeton robbinsii*, *Potamogeton strictifolius*, *Potamogeton vaseyi*, *Stuckenia filiformis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Potamogeton crispus*
Appalachian National Scenic Trail (Lower New England Project Area):
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Elodea canadensis*, *Potamogeton friesii*, *Potamogeton robbinsii*, *Potamogeton strictifolius*, *Potamogeton vaseyi*, *Stuckenia filiformis*
Global: *Elodea canadensis*, *Potamogeton friesii*, *Potamogeton robbinsii*, *Potamogeton strictifolius*, *Potamogeton vaseyi*, *Stuckenia filiformis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Potamogeton crispus* (Medium)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (29-Jan-2003).

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: *Utricularia* spp. were not observed in the pond.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This association was observed by the UMESC during mapping reconnaissance in south-central New York.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: In error, the Maine type forming the basis for this was originally cross-referenced to *Potamogeton* spp. - *Ceratophyllum demersum* - *Crassula aquatica* Aquatic Vegetation (CEGL006340); that is incorrect as that type is a freshwater tidal association.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was observed at Children's Pond, Boiling Springs, Pennsylvania.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This association was observed during mapping reconnaissance in south-central New York.
Global Range: This association is found in the Northern Appalachian - Boreal region south to the Central Appalachians of northeastern North America.
Nations: CA?, US
States/Provinces: ME, NH?, NY, PA, VT?

TNC Ecoregions: 59:C, 63:C
USFS Ecoregions (1994/95): 212Ab:CCC, 212Da:CCC, 212Dc:CCC, 212E:C?, M212Ab:CCC, M212Af:CCC, M212B:C?, M212C:C?, M212D:C?
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: HAFV, XBMV
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: This community was not sampled, but was observed by the UMESC mapping team and Pennsylvania Natural Heritage ecologist during map reconnaissance in the summer of 2011.
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This association was observed by UMESC during mapping reconnaissance in south-central New York and during accuracy assessment.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: None.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 accuracy assessment points): APPA_AA_1677, APPA_AA_2182, APPA_AA_3001, APPA_AA_3068.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): E. Largay and M. Russo
Global Description Author(s): S.C. Gawler
References: Cameron 2000, Eastern Ecology Working Group n.d.*, Gawler 2002, Gawler and Cutko 2010

6. Open Rock Vegetation

6.B.1. Temperate & Boreal Cliff, Scree & Other Rock Vegetation

6.B.1.Na. Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation

M111. Eastern North American Cliff & Rock Vegetation

G840. Appalachian Cliff & Rock Vegetation
Group Summary Description:

A2071 Appalachian Acidic Cliff Alliance
Alliance Summary Description: This alliance is made up of sparse, patchy vascular vegetation with variable nonvascular cover occurring on cliff faces of acidic rock types in the southeastern U.S. north to the Central Appalachians. Mosses and lichens are often abundant. Vascular plants are generally confined to crevices and cover is generally less than 10% over all, but can be patchy and reach up to 25% cover in areas. Characteristic plants include species of *Asplenium, Dryopteris*, and other ferns, as well as scattered shrubs such as *Kalmia latifolia, Rhododendron* spp., *Hydrangea arborescens*, and forbs such as *Silene rotundifolia, Mitchella repens, Eurybia divaricata*, and others.

[CEGL004980] *Asplenium montanum - Heuchera villosa* Felsic Cliff Sparse Vegetation
Translated Name: **Mountain Spleenwort - Hairy Alumroot Felsic Cliff Sparse Vegetation**
Common Name: **Appalachian Felsic Cliff**

USNVC Classification

Division	Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Appalachian Cliff & Rock Vegetation (G840)
Alliance	Appalachian Acidic Cliff Alliance (A2071)

Element Concept

Global Summary: This community occurs in the Blue Ridge and upper Piedmont of Georgia, North Carolina, South Carolina, Tennessee, and Virginia. It includes vertical rock faces associated with felsic, metamorphic and igneous geologies. This community generally has little vegetative cover, often with 90% of the rock surface unvegetated. Mosses (e.g., *Thuidium* spp., *Fissidens* spp., *Campylium* sp., *Bryoandersonia* sp., *Plagiomnium* sp.) and lichens can have moderate coverage, and vascular plants occur on ledges and rooted in cracks. *Asplenium montanum* and *Heuchera villosa* are characteristic components. Other typical species include *Agrostis perennans, Arisaema triphyllum, Aristolochia macrophylla, Asplenium trichomanes, Eurybia divaricata (= Aster divaricatus), Cystopteris protrusa, Dryopteris marginalis, Hydrangea arborescens, Parthenocissus quinquefolia, Polypodium appalachianum*, and *Rubus canadensis*. These cliffs are typically dry, although small seepages may occur. They are usually shaded by trees rooted on ledges and by the surrounding forest.

Environmental Description

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: Set of dry, exposed, vertical, short, southern aspect cliffs on the summit of Blood Mountain in Georgia.
Global Environment: This community includes vertical rock faces associated with felsic, metamorphic and igneous geologies. Some occurrences attributed to this type appear to be on subcalcareous substrates. These cliffs are typically dry, although small seepages may occur. They are usually shaded by trees rooted on ledges and by the surrounding forest.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: Very sparse vegetation including *Hypericum buckleii* and *Diervilla sessilifolia* with scattered *Deschampsia flexuosa*. Lichens, including *Umbilicaria mammulata*, are abundant. *Kalmia latifolia, Rhododendron catawbiense*, and *Vaccinium corymbosum* are scattered shrubs.
Global Vegetation: This community has little vegetative cover, often with 90% of the rock surface unvegetated. Mosses (e.g., *Thuidium* spp., *Fissidens* spp., *Campylium* sp., *Bryoandersonia* sp., *Plagiomnium* sp.) and lichens can have moderate coverage, and vascular plants occur on ledges and rooted in cracks. *Asplenium montanum* and *Heuchera villosa* are characteristic components. Other typical species include *Agrostis perennans, Arisaema triphyllum, Aristolochia macrophylla, Asplenium trichomanes, Eurybia divaricata (= Aster divaricatus), Cystopteris protrusa, Dryopteris marginalis, Hydrangea arborescens, Parthenocissus quinquefolia, Polypodium appalachianum*, and *Rubus canadensis*. An example of a shaded rock outcrop from the Chattahoochee National Forest (Georgia) which is assigned here contains low coverages of the woody plants *Hydrangea arborescens, Kalmia latifolia, Vaccinium arboreum*, and *Vaccinium simulatum*, along with the herbs *Campanula divaricata, Dryopteris marginalis, Galax urceolata, Iris cristata, Muhlenbergia tenuiflora, Polygonatum biflorum, Silene stellata*, and *Solidago sphacelata*. An example in Great Smoky Mountains National Park (Tennessee) consisted of *Heuchera villosa, Pilea pumila, Impatiens pallida, Sedum ternatum*, and various moss species but did not contain *Asplenium montanum*.
Global Dynamics: These cliffs are typically dry, although small seepages may occur. They are usually shaded by trees rooted on ledges and by the surrounding forest.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Diervilla sessilifolia*
Short shrub/sapling	Dwarf-shrub	*Hypericum buckleii*
Herb (field)	Graminoid	*Deschampsia flexuosa*
Nonvascular	Lichen	*Umbilicaria mammulata*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Heuchera villosa*
Herb (field)	Fern (Spore-bearing forb)	*Asplenium montanum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Deschampsia flexuosa*, *Diervilla sessilifolia*, *Hypericum buckleii*, *Umbilicaria mammulata*
Global: *Asplenium montanum*, *Heuchera villosa*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Hypericum buckleii* (G3)
Global: Vulnerable Plants: *Cardamine clematitis* (G3), *Hymenophyllum tayloriae* (G2), *Hypericum buckleii* (G3), *Krigia montana* (G3), *Micranthes careyana* (G3), *Micranthes caroliniana* (G3), *Shortia galacifolia* var. *galacifolia* (G3T2T3); **Other Plants**: *Trichomanes intricatum* (G4G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (4-Jan-1998).

RELATED CONCEPTS

Global Similar Types:
- Piedmont Acidic Cliff Sparse Vegetation (CEGL003979)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This community was observed on the summit of Blood Mountain in Georgia.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was observed on the summit of Blood Mountain in Georgia.
Global Range: This community occurs in the Blue Ridge and upper Piedmont of Georgia, North Carolina, South Carolina, Tennessee, and Virginia.
Nations: US
States/Provinces: GA, NC, SC, TN, VA?
TNC Ecoregions: 51:C, 52:C
USFS Ecoregions (1994/95): 231Aa:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, George Washington, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 observation point; 2 accuracy assessment points): APPA.0538, APPA_AA_0396, APPA_AA_1276.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): E. Largay
Global Description Author(s): K.D. Patterson
References: NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 1998b, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, TDNH unpubl. Data

A3991 Appalachian Lichen Boulderfield Alliance

Alliance Summary Description: This alliance consists of large, dry, lichen-dominated boulderfields with little or no vascular vegetation, occurring in the eastern U.S. It occurs on a variety of sedimentary, metasedimentary and metamorphic substrates, including quartzite, sandstone and metabasalt. The dominant taxa vary across the range of the alliance. Some common combinations of lichens include *Lasallia papulosa* and *Lasallia pensylvanica* (either singly or together), *Lasallia papulosa* and *Umbilicaria caroliniana*, and *Umbilicaria mammulata*. Some other examples are dominated by *Umbilicaria muehlenbergii, Lasallia papulosa*, and *Melanelia stygia*. These are some of the most abundant and conspicuous lichens found in examples. Individual occurrences can be as large as an acre. Vascular plants are generally sparse or absent. In moister examples, trees of adjacent forest communities often shade the outcrop community for much of the day.

[CEGL004142] *Lasallia (papulosa, pensylvanica) - Dimelaena oreina - (Melanelia culbersonii)* Nonvascular Vegetation

Translated Name: **(Toadskin Lichen, Pennsylvania Toadskin Lichen) - Golden Moonglow Lichen - Culberson's Black-parmelia**
Nonvascular Vegetation
Common Name: **Central Appalachian Acidic Boulderfield**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Appalachian Cliff & Rock Vegetation (G840)
Alliance	Appalachian Lichen Boulderfield Alliance (A3991)

ELEMENT CONCEPT

Global Summary: This association is widely but locally distributed from the western Piedmont foothills in Maryland and Virginia through the Blue Ridge and Ridge and Valley portions of the Central Appalachians, north at least to the Delaware Water Gap in Pennsylvania and New Jersey. It occurs primarily on fully exposed, minimally weathered quartzite and sandstone boulderfields at elevations from about 300 to 1000 m (1000-3300 feet). On the largest occurrences, vascular plants are generally absent and lichens dominate these habitats. *Lasallia papulosa* and *Lasallia pensylvanica*, either singly or in combination, are generally abundant and conspicuous. *Dimelaena oreina* abundantly covers many dry, exposed rock surfaces that are not covered with *Lasallia* spp. and larger foliose lichens. Although of scattered occurrence, *Melanelia culbersonii* has been found across the full elevation range of

the type and is a good diagnostic species, as it appears to be restricted mostly to siliciclastic rocks (and occasionally coarse-grained, quartz-rich granites that are nearly devoid of dark minerals) in this region. A variety of other foliose, crustose and fruticose lichen species are associated. Smaller, more marginal occurrences have sparse vascular plant cover, primarily stunted trees of *Betula lenta, Sassafras albidum*, and *Quercus prinus*, ericaceous shrubs, and scrambling vines of *Parthenocissus quinquefolia*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This nonvascular vegetation occurs on fully exposed, minimally-weathered quartzite and sandstone boulderfields at elevations from about 300 to 1,000 m (1,000-3,300 feet). It was sampled at four locations in Maryland in the Central Appalachian project area. Sites include gentle, southwest-facing lower and steep, west-facing upper slopes of quartzite talus from the Everton Formation with rapidly drained soils. The unvegetated surface is dominated by large rocks with small amounts of leaf litter, downed wood, small rocks, and bare soil. No evidence of disturbance was reported other than a small presence of exotic plants.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: Quartzite and sandstone boulderfields covered with lichens. Occurs at elevations from about 300 to 1,000 m (1,000-3,300 feet); restricted to Delaware Water Gap National Recreation Site within the Lower New England project area.
Global Environment: This association occurs primarily on fully exposed, minimally weathered quartzite and sandstone boulderfields at low and middle elevations of the Northern Blue Ridge, Ridge and Valley, and adjacent foothills of the upper Piedmont. A few occurrences have also been noted on boulderfields composed of acidic granitic rocks (e.g., on Old Rag Mountain in Shenandoah National Park). The known elevation range is from about 300 to 1000 m (1000-3300 feet). Aspect is variable among sites, but slopes are typically steep to very steep (often >30°). Block size is highly variable, from relatively small and loose stones (<1 m in diameter) to large, stable boulders (>1 m in diameter). Although this association is most extensive on boulder deposits, it may also occur on outcrops associated with the boulderfields, or on very large, exposed cliffs. There is little or no available soil except for occasional small deposits of organic matter in crevices.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Lasallia papulosa* and/or *Lasallia pensylvanica* are abundant and conspicuous along with *Dimelaena oreina* and *Xanthoparmelia* spp. Stunted *Betula lenta* may sometimes be present in very low numbers.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: Dominated by *Lasallia papulosa* and/or *Lasallia pensylvanica* either singly or together along with *Dimelaena oreina*; *Melanelia culbersonii* is diagnostic; stunted *Betula lenta* sometimes present in very low numbers.
Global Vegetation: On the largest occurrences, vascular plants are generally absent and lichens dominate. Maximum patch size is about ten acres, but most patches are considerably smaller. *Lasallia papulosa* and *Lasallia pensylvanica*, either singly or in combination, are generally abundant and conspicuous. *Dimelaena oreina* abundantly covers many dry, exposed rock surfaces that are not covered with *Lasallia* spp. and larger foliose lichens. Although of scattered occurrence, *Melanelia culbersonii* has been found across the full elevation range of the type and is a good diagnostic species, as it appears to be restricted mostly to siliciclastic rocks (and occasionally coarse-grained, quartz-rich granites that are nearly devoid of dark minerals) in this region. Other minor umbilicate and foliose species include *Hypogymnia physodes, Physcia subtilis, Umbilicaria muehlenbergii, Xanthoparmelia conspersa*, and *Xanthoparmelia plittii*. Many crustose species occur, including *Aspicilia cinerea, Fuscidea recensa, Lecanora* spp., *Lepraria* spp., *Rhizocarpon obscuratum (= Rhizocarpon reductum)*, and *Sarcogyne clavus*. Flat surfaces and interstices that have thin deposits of organic matter often support a variety of fruticose lichens, including *Cladina rangiferina, Cladonia uncialis (= Cladina uncialis), Cladonia crispata, Cladonia macilenta, Cladonia ochrochlora*, and *Cladonia squamosa*. In the upper elevation range, boreal lichens such as *Melanelia stygia* and *Arctoparmelia centrifuga* are present, but they are not abundant. Along the edges of the boulderfields, scattered individuals of *Parthenocissus quinquefolia, Vaccinium* spp., and other vascular plants may occur in transition zones with forests or woodlands. Smaller, more marginal occurrences frequently have sparse vascular plant cover, primarily stunted trees of *Betula lenta, Sassafras albidum, Quercus prinus, Quercus coccinea, Quercus velutina, Carya glabra*, and *Carya ovalis*. Widely scattered shrubs may include *Kalmia latifolia* and other ericads. Herbs are usually absent, but *Dicentra eximia* is known from some occurrences.
Global Dynamics: The exposed rock surfaces supporting this community are subject to fluctuating, daily extremes of temperature, humidity, and moisture saturation during the growing season, as well as to low temperatures, high winds, and frequent ice during the winter. Boulderfield habitats have resulted from periglacial phenomena and the collapse of resistant strata from weathering and erosion of weaker underlying rocks. Most Central Appalachian

boulderfields are well-weathered and now support woodland or forest vegetation. Relatively few remain fully exposed and support wholly nonvascular communities.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Nonvascular	Lichen	*Dimelaena oreina*, *Lasallia papulosa*, *Lasallia pensylvanica*

Global

Stratum	Lifeform	Species
Nonvascular	Lichen	*Dimelaena oreina*, *Lasallia papulosa*, *Lasallia pensylvanica*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Dimelaena oreina*, *Lasallia papulosa*, *Lasallia pensylvanica*, *Melanelia culbersonii*
Appalachian National Scenic Trail (Lower New England Project Area):
Global: *Dimelaena oreina*, *Lasallia papulosa*, *Lasallia pensylvanica*, *Melanelia culbersonii*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Melanelia culbersonii* (G2G4); **Invasive/Exotic Plants**: *Rumex acetosella* (Medium/Low)
Global: Vulnerable Plants: *Melanelia culbersonii* (G2G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (23-May-2011). Although aggregate acreage is not large, there are probably several hundred occurrences of this association in Virginia alone, with many more known from or likely in adjacent states. Habitats are typically remote, extremely steep and difficult to traverse, minimizing potential human threats.

RELATED CONCEPTS

Global Similar Types:

- *Lasallia papulosa - Lasallia pensylvanica* Nonvascular Vegetation (CEGL004385) of quartzite cliffs in the western North Carolina Piedmont.
- *Lasallia papulosa - Stereocaulon glaucescens - Chrysothrix chlorina* Nonvascular Vegetation (CEGL004143) occurs on mafic (metabasaltic) boulderfields of the northern Blue Ridge.
- *Umbilicaria muehlenbergii - Lasallia papulosa - (Melanelia stygia)* Nonvascular Vegetation (CEGL004389) occurs at higher elevations in the same region and has different dominant species.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Plots were sampled in Maryland; however, classification of this association is based primarily on geographically limited lichen inventories in Shenandoah National Park, but it is believed to be widely applicable to similar boulderfields that are characteristic of Central Appalachian siliciclastic ridges.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community is included in the Delaware Water Gap National Recreation Area vegetation classification. While outside the APPA corridor, this community may be identified during APPA accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: Classification of this association is based on geographically limited lichen inventories in Shenandoah National Park, but it is believed to be widely applicable to similar boulderfields that are characteristic of Central Appalachian siliciclastic ridges. In the park inventory, lichens were mass-collected from boulderfield and outcrop habitats on different geologic substrates, and specimens were identified by Richard Harris (New York Botanical Garden), Don Flenniken (author of Macrolichens of West Virginia), and James Lawry (George Mason University). Classification of lichen communities in eastern North America is currently difficult and tentative because inventory and data are generally lacking. The classification of this type versus *Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland (CEGL006565) can be tricky where there is a continuous

gradation of vegetation cover (as at Delaware Water Gap), but generally this is applied where there is less than 25% vascular vegetation and nonvascular species are dominant.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled at Black Rock and Devil's Racecourse in Maryland. It is also known to occur along the AT corridor in Shenandoah National Park in Virginia.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community is included in the Delaware Water Gap National Recreation Area vegetation classification. While outside the APPA corridor, this community may be identified during APPA accuracy assessment.
Global Range: This association is widely but locally distributed from the western Piedmont foothills in Maryland (e.g., Sugarloaf Mountain) and Virginia (e.g., Bull Run Mountain) through the Blue Ridge and Ridge and Valley portions of the Central Appalachians, north at least to the Delaware Water Gap in Pennsylvania and New Jersey. The type is fairly common on the siliciclastic western flank of the Northern Blue Ridge and throughout the Ridge and Valley in west-central and northwestern Virginia. It is also frequent in the Ridge and Valley region of Pennsylvania (T. Smith pers. comm.) but may be restricted to the northeastern tier of counties in West Virginia. The potential range of this association covers a much larger geographic area.
Nations: US
States/Provinces: MD, NJ, PA, VA:S4, WV
TNC Ecoregions: 52:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Da:CCC, 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Catoctin Mountain, Delaware Water Gap, Harpers Ferry, Shenandoah); USFS (George Washington, Jefferson, Monongahela?)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: VCAB
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community is included in the Delaware Water Gap National Recreation Area vegetation classification.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (4 plots; 6 accuracy assessment points): APPA.1140, APPA.1141, APPA.1142, APPA.1143, APPA_AA_0017, APPA_AA_0072, APPA_AA_0435, APPA_AA_1003, APPA_AA_1222, APPA_AA_1345.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d., Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Fleming et al. 2007a, Fleming et al. 2007a*, Flenniken 1999, Perles et al. 2007, Smith, T. pers. comm., Young et al. 2009

[CEGL004143] *Lasallia papulosa - Stereocaulon glaucescens - Chrysothrix chlorina* Nonvascular Vegetation

Translated Name: **Toadskin Lichen - Snow Lichen - Sulphur Dust Lichen Nonvascular Vegetation**
Common Name: **Central Appalachian Mafic Boulderfield**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Appalachian Cliff & Rock Vegetation (G840)
Alliance	Appalachian Lichen Boulderfield Alliance (A3991)

ELEMENT CONCEPT

Global Summary: This association is known only from four counties on the northern Virginia Blue Ridge, where it occurs on fully exposed, minimally weathered metabasalt boulderfields at elevations from about 670 to 1160 m (2200-3800 feet). Vascular plants are generally absent and lichens dominate these habitats. *Lasallia papulosa* and *Stereocaulon glaucescens* are generally abundant and conspicuous in variable combinations. Although not abundant, *Chrysothrix chlorina* is scattered on sheltered boulder faces and in grottoes and is a good diagnostic species as it appears to be absent from siliciclastic boulderfields in this region. A variety of other foliose, crustose and fruticose lichen species are associated, including several characteristic arctic-boreal species at higher elevations.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This nonvascular vegetation occurs on fully exposed, minimally-weathered metabasalt boulderfields at elevations from about 670 to 1,160 m (2,200-3,800 feet) in the northern Virginia Blue Ridge.

Global Environment: This association occurs on fully exposed, minimally weathered metabasalt boulderfields at middle and high elevations of the northern Blue Ridge. The known elevation range is from about 670 to 1160 m (2200-3800 feet), with the majority of acreage located above 915 m (3000 feet). Aspect is variable among sites, but slopes are typically steep to very steep (often >30°). Block size is typically <1 m, with the surficial boulders in the field somewhat loose. Although this association is most extensive on boulder deposits, it may also occur on fully exposed outcrops associated with the boulderfields.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: *Lasallia papulosa* and *Stereocaulon glaucescens* are abundant and conspicuous in variable combinations; *Chrysothrix chlorina* is scattered on sheltered boulder faces.

Global Vegetation: Vascular plants are generally absent and lichens dominate. Maximum patch size is about one acre, and many patches are much smaller. *Lasallia papulosa* and *Stereocaulon glaucescens* are generally abundant and conspicuous in variable combinations. Although not abundant, *Chrysothrix chlorina* is a good diagnostic species as it appears to be absent from siliciclastic and granitic boulderfields in this region; it is scattered on sheltered boulder faces and in grottoes, often with *Psilolechia lucida, Usnea halei*, and *Ramalina intermedia*. Other minor umbilicate and foliose species include *Flavoparmelia baltimorensis, Parmelia sulcata*, and *Umbilicaria muehlenbergii*. Many crustose species occur, including *Aspicilia cinerea, Diploschistes scruposus, Fuscidea recensa, Lepraria* spp., *Porpidia* spp., *Rhizocarpon rubescens*, and *Trapeliopsis granulosa*. Flat surfaces and interstices that have thin deposits of organic matter often support a variety of fruticose lichens, including *Cladina rangiferina, Cladina stellaris, Cladonia crispata, Cladonia furcata, Cladonia pleurota*, and *Cladonia squamosa*. At higher elevations, a number of characteristic arctic-boreal lichens occur, including *Cladonia coccifera, Melanelia stygia, Microcalicium arenarium, Parmelia omphalodes, Porpidia tuberculosa, Rhizocarpon geographicum*, and *Umbilicaria caroliniana*. Along the edges of the boulderfields, scattered individuals or patches of *Polypodium appalachianum, Hylotelephium telephioides*, and other vascular plants may occur in transition zones with forests or woodlands.

Global Dynamics: The exposed rock surfaces supporting this community are subject to fluctuating, daily extremes of temperature, humidity, and moisture saturation during the growing season, as well as to low temperatures, high winds, and frequent ice during the winter. Boulderfield habitats have resulted from periglacial phenomena and the collapse of resistant strata from weathering and erosion of weaker underlying rocks. Most Central Appalachian boulderfields are well-weathered and now support woodland or forest vegetation. In this region, metabasalt underlies much less acreage than quartzite and sandstone and is less resistant to weathering. Consequently, exposed metabasalt boulderfields are quite rare.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Nonvascular	Lichen	*Lasallia papulosa*, *Stereocaulon glaucescens*

Global

Stratum	Lifeform	Species
Nonvascular	Lichen	*Lasallia papulosa*, *Stereocaulon glaucescens*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Chrysothrix chlorina*, *Lasallia papulosa*, *Stereocaulon glaucescens*
Global: *Chrysothrix chlorina*, *Lasallia papulosa*, *Stereocaulon glaucescens*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Vulnerable Plants: *Stereocaulon glaucescens* (G3)
Global: Vulnerable Plants: *Cladonia coccifera* (G5, VA state-rare), *Melanelia stygia* (G5, VA state-rare), *Parmelia omphalodes* (G5, VA state-rare), *Porpidia lowiana* (G2G3), *Porpidia tuberculosa* (G2G4, VA state-rare), *Stereocaulon glaucescens* (G3, VA state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1? (7-Dec-2006). As currently defined, this association has an extremely narrow geographic range, with fewer than 20 known discrete patches covering an aggregate area of less than 10 acres. Although well-weathered, forested talus of metabasalt and similar mafic rocks are locally common in the Central Appalachians, fully exposed, minimally weathered boulderfields of these substrates are extremely rare in the region.

RELATED CONCEPTS

Global Similar Types:
- *Lasallia (papulosa, pensylvanica) - Dimelaena oreina - (Melanelia culbersonii)* Nonvascular Vegetation (CEGL004142) occurs on low- to middle-elevation siliciclastic boulderfields of the same region, has a different species composition, and has different relative abundances of shared species.
- *Umbilicaria muehlenbergii - Lasallia papulosa - (Melanelia stygia)* Nonvascular Vegetation (CEGL004389) occurs on high-elevation siliciclastic rocks of the Ridge and Valley and Allegheny Mountains.

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Classification of this association is based on geographically limited lichen inventories in Shenandoah National Park.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Global Classification Comments: Classification of this association is based on geographically limited lichen inventories in Shenandoah National Park. In the park inventory, lichens were mass-collected from boulderfield and outcrop habitats on different geologic substrates and specimens were identified by Richard Harris (New York Botanical Garden), Don Flenniken (author of Macrolichens of West Virginia), and James Lawry (George Mason University). Classification of lichen communities in eastern North America is currently difficult and tentative because inventory and data are generally lacking. Because *Stereocaulon glaucescens* and many other species in this association have northern or arctic-boreal ranges, related boulderfield communities are most likely to be found north of Virginia.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This rare mafic nonvascular type occurs in Shenandoah National Park in Virginia.
Global Range: This association is known only from metabasalt districts in four counties on the northern Virginia Blue Ridge. The potential range is larger, but suitable habitat (i.e., mafic substrates at higher elevations) are not known to occur elsewhere in the Central Appalachians.
Nations: US
States/Provinces: VA:S1
TNC Ecoregions: 59:C
USFS Ecoregions (1994/95): M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Shenandoah)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: VCMB
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: This community is known to occur along the AT corridor in Shenandoah National Park in Virginia. It was observed during accuracy assessment.

Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (4 accuracy assessment points): APPA_AA_0151, APPA_AA_0176, APPA_AA_0861, APPA_AA_1340.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): G.P. Fleming
References: Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2006, Fleming et al. 2007a*, Flenniken 1999, Southeastern Ecology Working Group n.d., Young et al. 2009

A4229 Appalachian-Northeastern Acidic Talus Alliance

Alliance Summary Description:

[CEGL006422] *Juniperus virginiana / Corydalis sempervirens* Cliff Sparse Vegetation

Translated Name: **Eastern Red-cedar / Rock Harlequin Cliff Sparse Vegetation**
Common Name: **Eastern Temperate Acidic Cliff**

USNVC Classification

Division	Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Appalachian Cliff & Rock Vegetation (G840)
Alliance	Appalachian-Northeastern Acidic Talus Alliance (A4229)

Element Concept

Global Summary: This sparsely vegetated cliff association occurs in the oak - pine - hemlock forest region of the northeastern U.S. The setting is dry vertical exposures of resistant acidic bedrock such as granite, quartzite, sandstone, shale or schist, with little or no soil development. These cliffs are mostly dry but may contain small areas of seepy conditions, with associated floristic variation. The patchy vegetation is restricted to cracks and crevices and can vary from well-vegetated to barren across the cliff face. In most cases, overall cover averages less than 25%. The association presents itself as a mixture of open rock, scrubby trees and shrubs, herbaceous plants, and bryoids. Typical tree species include *Juniperus virginiana, Fraxinus americana, Acer rubrum*, and *Betula papyrifera*; none usually grow very large. Individuals of additional tree species from the surrounding forest may also be present; these include *Tsuga canadensis, Quercus* spp., and *Carya* spp. *Rubus odoratus, Rubus allegheniensis*, and *Rhus copallinum* are representative shrubs. Woody vines include *Vitis aestivalis* and *Parthenocissus quinquefolia*. Herbaceous composition varies; typical species include *Deschampsia flexuosa, Danthonia spicata, Campanula rotundifolia, Aquilegia canadensis, Corydalis sempervirens, Saxifraga virginiensis*, and *Woodsia ilvensis*. *Adlumia fungosa* may be found in these habitats; *Opuntia humifusa* occurs in some of the most southerly occurrences of this association.

Environmental Description

Appalachian National Scenic Trail (Lower New England Project Area) Environment: This community is found on cliff faces developed on resistant acidic bedrock such as granite, quartzite, sandstone, shale or schist, with little or no soil development. The outcrops are typically vertical to near-vertical. Exposure varies, and moisture regime likewise varies from dry on the exposed faces to moist on more protected or seepy areas.
Global Environment: This community is found on cliff faces developed on resistant acidic bedrock such as granite, quartzite, sandstone, shale or schist, with little or no soil development. The outcrops are typically vertical to near-vertical. Exposure varies, and moisture regime likewise varies from dry on the exposed faces to moist on more protected or seepy areas. These cliffs may contain small areas of seepage vegetation among the generally dry substrate. [For extensive seepage cliffs, see the cliff seep association *Drosera rotundifolia - Viola* spp. Cliff Sparse Vegetation (CEGL006429).]

Vegetation Description

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The patchy vegetation is restricted to cracks and crevices and can vary from well-vegetated to barren across the cliff face. In most cases, overall cover averages less than 25%. The association presents itself as a mixture of open rock, scrubby trees and shrubs, herbaceous plants, and bryoids. Typical tree species include *Juniperus virginiana, Fraxinus americana, Acer rubrum*, and *Betula papyrifera*; none usually grow very large. Individuals of additional tree species from the

surrounding forest may also be present; these include *Tsuga canadensis, Quercus* spp., and *Carya* spp. *Rubus odoratus, Rubus allegheniensis*, and *Rhus copallinum* are representative shrubs. Woody vines include *Vitis aestivalis* and *Parthenocissus quinquefolia*. Herbaceous composition varies; typical species include *Deschampsia flexuosa, Danthonia spicata, Campanula rotundifolia, Aquilegia canadensis, Corydalis sempervirens, Saxifraga virginiensis*, and *Woodsia ilvensis*. *Opuntia humifusa* occurs in some of the most southerly occurrences of this association.
Global Vegetation: The patchy vegetation is restricted to cracks and crevices and can vary from well-vegetated to barren across the cliff face. In most cases, overall cover averages less than 25%. The association presents itself as a mixture of open rock, scrubby trees and shrubs, herbaceous plants, and bryoids. Typical tree species include *Juniperus virginiana, Fraxinus americana, Acer rubrum*, and *Betula papyrifera*; none usually grow very large. Individuals of additional tree species from the surrounding forest may also be present; these include *Tsuga canadensis, Quercus* spp., and *Carya* spp. *Rubus odoratus, Rubus allegheniensis*, and *Rhus copallinum* are representative shrubs. Woody vines include *Vitis aestivalis* and *Parthenocissus quinquefolia*. Herbaceous composition varies; typical species include *Deschampsia flexuosa, Danthonia spicata, Campanula rotundifolia, Aquilegia canadensis, Corydalis sempervirens, Saxifraga virginiensis*, and *Woodsia ilvensis*. *Opuntia humifusa* occurs in some of the most southerly occurrences of this association.
Global Dynamics: This community consists of drought-tolerant species that take advantage of thin layers of soil that form on narrow ledges or in bedrock crevices (Podniesinski 2005). The successional stages of this type vary with resource availability from bare rock outcrops with no vegetation, to outcrops with lichen cover, to outcrops with lichen and moss cover, to outcrops with grass cover, and eventually to rock outcrops with stunted woodland or forest cover. These stages overlap in time and space, depending on resource availability (Collins and Anderson 1994). Species composition is variable given the limited habitat to support vegetation and the unpredictable nature of plant colonization and establishment. Trees are typically absent from this community, but when present, they are usually stunted and less than 10 m in height (Podniesinski 2005). Tree roots may straddle boulders or run horizontally over rock surfaces as they cannot penetrate the rock surface (Collins and Anderson 1994).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tall shrub/sapling	Needle-leaved tree	*Juniperus virginiana*
Tall shrub/sapling	Broad-leaved deciduous tree	*Acer rubrum*, *Betula papyrifera*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus allegheniensis*
Herb (field)	Liana	*Parthenocissus quinquefolia*

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Needle-leaved tree	*Juniperus virginiana*
Tall shrub/sapling	Broad-leaved deciduous tree	*Betula lenta*
Short shrub/sapling	Broad-leaved deciduous tree	*Acer rubrum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus allegheniensis*
Herb (field)	Liana	*Parthenocissus quinquefolia*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Aquilegia canadensis*, *Corydalis sempervirens*, *Danthonia spicata*, *Deschampsia flexuosa*, *Juniperus virginiana*, *Rhus copallinum*, *Rubus odoratus*
Global: *Aquilegia canadensis*, *Campanula rotundifolia*, *Corydalis sempervirens*, *Danthonia spicata*, *Deschampsia flexuosa*, *Juniperus virginiana*, *Rhus copallinum*, *Rubus odoratus*, *Woodsia ilvensis*

OTHER NOTEWORTHY SPECIES

Global: Other Plants: *Vitis aestivalis* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (22-Jun-2006). This community is considered relatively common in at least two of the states where it occurs (state conservation rank of S4).

RELATED CONCEPTS

Global Similar Types:
- Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation (CEGL006435) species composition is different due to ecoregional differences.
- Piedmont Acidic Cliff Sparse Vegetation (CEGL003979) occurs primarily in the Southeast, within topographically low settings such as river bluffs that are not subject to flood scouring.
- *Polypodium (virginianum, appalachianum)* Cliff Sparse Vegetation (CEGL006528) is similar in physiognomy and in that both occur on acidic cliffs. They are different in that this type represents a warmer climate, more typical of Lower New England than Northern Appalachians.
- Sandstone Midwest Dry Cliff Sparse Vegetation (CEGL002045) occurs in the Midwest and the species composition is different.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community was observed by UMESC during their summer 2012 mapping reconnaissance.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was observed by UMESC in New York during their summer 2012 mapping reconnaissance.
Global Range: This type is documented from Massachusetts, New Hampshire, Vermont, New Jersey, and Pennsylvania; southward and westward extent has not been determined.
Nations: US
States/Provinces: CT, MA, NH:S4, NJ, NY, PA:S3, VT
TNC Ecoregions: 60:C, 61:C, 63:C
USFS Ecoregions (1994/95): 212E:CC, 212Fc:CCC, 221Ah:CCC, 221Ai:CCC, 221Am:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, M212B:CC, M212C:CC
Federal Lands: NPS (Appalachian Trail [Lower New England], Delaware Water Gap, Upper Delaware)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: VEAC
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This community was observed by UMESC in New York during their summer 2012 mapping reconnaissance and during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 accuracy assessment points): APPA_AA_1873, APPA_AA_2257.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): S.C. Gawler and G.S. Podniesinski
References: Anderson 1996, Collins and Anderson 1994, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Metzler and Barrett 2004, Perles et al. 2007, Perles et al. 2008, Podniesinski 1999, Podniesinski 2005, Podniesinski and Kunsman 1999, Sneddon and Menard 2002, Sperduto 1992, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2000, Swain and Kearsley 2001, Thompson and Sorenson 2000

[CEGL006534] *Polypodium (virginianum, appalachianum)* / Lichens Nonvascular Vegetation

Translated Name: **(Rock Polypody, Appalachian Polypody) / Lichens Nonvascular Vegetation**
Common Name: **Northern Lichen Talus Barrens**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Appalachian Cliff & Rock Vegetation (G840)
Alliance	Appalachian-Northeastern Acidic Talus Alliance (A4229)

ELEMENT CONCEPT

Global Summary: This sparsely vegetated, open talus slope of the northern Appalachian Mountains region is characterized by large boulder talus dominated by lichen cover. Soil is confined to shallow accumulations in rock pockets, and higher plant growth is limited by both lack of nutrients and dry conditions. Little data are available on the dominant lichens, but they can include *Umbilicaria* spp., as well as other common foliose and crustose species. Vascular plants are a variable mix of scattered individuals of *Picea rubens, Betula papyrifera var. cordifolia, Betula papyrifera var. papyrifera, Betula alleghaniensis, Acer spicatum, Sorbus americana* and/or *Sorbus decora, Polypodium virginianum, Polypodium appalachianum, Deschampsia flexuosa*, and *Parthenocissus quinquefolia*. In more southern examples of this community, *Betula populifolia, Tsuga canadensis, Ostrya virginiana, Juniperus virginiana*, and *Quercus rubra* may be present. The community provides denning sites for small mammals and snakes.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: Sites are very steep, lichen-covered talus slopes and boulderfields occurring at mid elevations of 300 to 900 m (984-2,953 feet) with little to no soil accumulation.

Global Environment: This sparsely vegetated, open talus slope of the northern Appalachian Mountains region is characterized by large boulder talus dominated by lichen cover. Soil is confined to shallow accumulations in rock pockets, and higher plant growth is limited by both lack of nutrients and dry conditions.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: *Cladina* spp. and *Cladonia* spp. are characteristic of this community. Scattered and isolated patches of stunted vegetation are possible at low cover (≤10%) and include, but not are limited to, *Picea rubens, Betula papyrifera var. cordifolia*, dwarf ericads such as *Vaccinium* spp., and *Polypodium* spp.

Global Vegetation: Little data are available on the dominant lichens, but they can include *Umbilicaria* spp., as well as other common foliose and crustose species. Vascular plants are a variable mix of scattered individuals of *Picea rubens, Betula papyrifera var. cordifolia, Betula papyrifera var. papyrifera, Betula alleghaniensis, Acer spicatum, Sorbus americana* and/or *Sorbus decora, Polypodium virginianum, Polypodium appalachianum, Deschampsia flexuosa*, and *Parthenocissus quinquefolia*. In more southern examples of this community, *Betula populifolia, Tsuga canadensis, Ostrya virginiana, Juniperus virginiana*, and *Quercus rubra* may be present.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Fern (Spore-bearing forb)	*Polypodium* spp.
Nonvascular	Lichen	*Cladina* spp., *Cladonia* spp.

Global

Stratum	Lifeform	Species
Herb (field)	Fern (Spore-bearing forb)	*Polypodium appalachianum*, *Polypodium virginianum*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Cladina* spp., *Cladonia* spp., *Polypodium* spp.

Global: *Polypodium appalachianum*, *Polypodium virginianum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Jul-1999).

RELATED CONCEPTS

Global Similar Types:

- Eastern Boreal & Laurentian Granite - Metamorphic Talus Vegetation (CEGL002409)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: This association displays some compositional variation north to south, and may be divisible into "boreal" versus "temperate" associations with additional study and documentation.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: No data are available.
Global Range: This community is known from northern New England and adjacent Canada.
Nations: CA, US
States/Provinces: ME, NB, NH, NS, NY, QC, VT
TNC Ecoregions: 61:C, 63:C
USFS Ecoregions (1994/95): 212Cb:CCC, 212D:CP, 221A:PP, M212Ab:CCC, M212Ac:CCC, M212Ad:CCC, M212Af:CCC, M212B:CP, M212C:CP, M212D:CP
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: VNBC
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): E. Largay and M. Russo
Global Description Author(s): Northern Appalachian Ecology Group (Anderson et al. 1997)
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, Nichols 1918, Northern Appalachian Ecology Working Group 2000, Sperduto 2000a, Sperduto and Nichols 2004, Thompson and Sorenson 2000

G839. LAURENTIAN-ACADIAN-GREAT LAKES CLIFF & ROCK VEGETATION

Group Summary Description: This structurally and floristically variable group is found in the Great Lakes region of the U.S. and Canada, and northern New England on both alkaline and acidic cliffs. Overall, vegetation varies from sparse nonvascular vegetation to open-treed or shrubby communities. Acidic cliffs include igneous, metamorphic, or sedimentary rock. Woody acidic cliff species may include *Juniperus communis, Amelanchier* spp., stunted individuals of *Betula papyrifera, Picea rubens, Pinus banksiana, Pinus resinosa, Pinus strobus*, and *Quercus rubra*. Shrubs may include *Alnus viridis ssp. crispa (= Alnus crispa), Arctostaphylos uva-ursi, Diervilla lonicera, Juniperus communis, Physocarpus opulifolius*, and *Vaccinium angustifolium*. Common herbs include *Athyrium filix-femina, Campanula rotundifolia, Cystopteris fragilis, Danthonia spicata, Deschampsia caespitosa, Dryopteris carthusiana, Dryopteris fragrans, Dryopteris marginalis, Euthamia graminifolia, Fragaria virginiana, Phegopteris connectilis (= Thelypteris phegopteris), Poa compressa, Polypodium appalachianum, Rubus pubescens*, and *Sibbaldiopsis tridentata (= Potentilla tridentata)*. Cliff faces include acidic igneous or metamorphic rock (gneiss, schist, granite, and quartzite). Soils are largely absent, confined to cracks and crevices. Extensive cliff formations occur on the shores of the Great Lakes and other large waterbodies; inland locations often support extensive talus slopes at their bases as a result of weathering and rockslides.

Alkaline cliff vegetation varies from sparse nonvascular vegetation to open-treed or shrubby communities. Nonvascular alkaline cliff plants (lichens, mosses, and liverworts) are common on the exposed cliff face, but vascular plant cover is sparse and patchy, confined to cracks or between boulders at the base of the slope where thin soils accumulate beneath talus. Overhanging trees from the ridgetop may include *Acer saccharum, Thuja occidentalis*, and *Abies balsamea*, and stunted individuals of *Betula papyrifera* may occur on the cliff face. Other woody plants may include *Shepherdia canadensis, Diervilla lonicera, Acer spicatum*, and others. Common herbs may include *Asplenium trichomanes, Geranium robertianum, Maianthemum canadense, Pellaea glabella, Polypodium virginianum, Pteridium aquilinum*, and *Trientalis borealis*. The bedrock may consist of alkaline igneous, metamorphic, or sedimentary rocks. Alkaline rocky cliffs are predominantly dolostone when associated with the Niagaran Escarpment along the northern Lake Michigan and Lake Huron shorelines, perhaps best developed on Drummond Island and adjacent Ontario islands. Alkaline basalts characterize these systems along portions of the Lake Superior shoreline, with a generally distinguishable flora from those on dolostone.

A4007 Laurentian-Acadian-Great Lakes Acidic Cliff Alliance

Alliance Summary Description: This acidic cliff alliance of the Great Lakes and New England portion of the U.S. and adjacent Canada occurs on acidic igneous, metamorphic, or sedimentary rock. Vegetation varies from sparse nonvascular vegetation to open-treed or shrubby communities. Vascular vegetation is sparse and largely confined to crevices. Woody species may include *Juniperus communis, Amelanchier* spp., stunted individuals of *Betula papyrifera, Picea rubens, Pinus banksiana, Pinus resinosa, Pinus strobus*, and *Quercus rubra*. Shrubs may include *Alnus viridis ssp. crispa (= Alnus crispa), Arctostaphylos uva-ursi, Diervilla lonicera, Juniperus communis, Physocarpus opulifolius*, and *Vaccinium angustifolium*. Common herbs include *Athyrium filix-femina, Campanula rotundifolia, Cystopteris fragilis, Danthonia spicata, Deschampsia caespitosa, Dryopteris carthusiana, Dryopteris fragrans, Dryopteris marginalis, Euthamia graminifolia, Fragaria virginiana, Phegopteris connectilis (= Thelypteris phegopteris), Poa compressa, Polypodium appalachianum, Rubus pubescens*, and *Sibbaldiopsis tridentata (= Potentilla tridentata)*.

[CEGL006429] *Drosera rotundifolia - Viola* spp. Cliff Sparse Vegetation

Translated Name: **Roundleaf Sundew - Violet species Cliff Sparse Vegetation**
Common Name: **Northern Appalachian Cliff Seep**

USNVC Classification

Division	Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Laurentian-Acadian-Great Lakes Cliff & Rock Vegetation (G839)
Alliance	Laurentian-Acadian-Great Lakes Acidic Cliff Alliance (A4007)

Element Concept

Global Summary: This vegetation develops on cliff faces where seepage or other water maintains wet conditions over a large area. Vascular plants are sparse overall although they may be locally abundant; bryophytes are often abundant. Because mineral composition of the substrate can differ over small distances, nutrient regime (including pH) and species composition can vary across the cliff. Typical species of more acidic areas include *Viola cucullata, Viola macloskeyi ssp. pallens, Oclemena acuminata (= Aster acuminatus), Drosera rotundifolia, Chrysosplenium americanum, Cinna latifolia*, and *Rubus pubescens*. In areas of higher pH, calciphiles such as *Dasiphora fruticosa ssp. floribunda, Saxifraga virginiensis, Cystopteris bulbifera*, and *Packera schweinitziana (= Senecio robbinsii)* can occur. These cliff seeps of the northeastern U.S. have been poorly studied and may encompass more than one association.

Environmental Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association has only been sampled from Pinkham Notch on a steep, seepy slope at 180 m (590 feet) elevation.
Global Environment: Vertical or near-vertical cliff faces kept wet by interstitial water emerging from the rock face or, in some cases, by flow from above. The protected and wet setting creates a cool microclimate.

Vegetation Description

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by sparse to open herbaceous vegetation. Typical species include *Calamagrostis canadensis, Cystopteris tenuis, Glyceria borealis, Gymnocarpium dryopteris, Oclemena acuminata, Oxalis montana*, and *Phegopteris connectilis*. Shrubs may be present but at sparse cover.
Global Vegetation: Vascular plants are sparse overall although they may be locally abundant; bryophytes are often abundant. Because mineral composition of the substrate can differ over small distances, nutrient regime (including pH) and species composition can vary across the cliff. Typical species of more acidic areas include *Viola cucullata, Viola macloskeyi ssp. pallens, Oclemena acuminata (= Aster acuminatus), Drosera rotundifolia, Chrysosplenium americanum, Cinna latifolia*, and *Rubus pubescens*. In areas of higher pH, calciphiles such as *Dasiphora fruticosa ssp. floribunda, Saxifraga virginiensis, Cystopteris bulbifera*, and *Packera schweinitziana (= Senecio robbinsii)* can occur.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Oclemena acuminata*, *Oxalis montana*
Herb (field)	Fern (Spore-bearing forb)	*Gymnocarpium dryopteris*, *Phegopteris connectilis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Cystopteris tenuis*, *Glyceria borealis*
Global: *Drosera rotundifolia*, *Viola cucullata*, *Viola macloskeyi* ssp. *pallens*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): Vulnerable Plants: *Dryopteris fragrans* (G5, NH state-imperiled)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (29-Jan-2003).

RELATED CONCEPTS

Global Similar Types:

- *Carex scirpoidea* Alkaline Cliff Sparse Vegetation (CEGL006526) This can be associated with CEGL006528, even confluent on the same cliff system, but is distinguished by being an extensive area (>1/2 acre) of seepy rather than dry cliff.
- *Polypodium (virginianum, appalachianum)* Cliff Sparse Vegetation (CEGL006528) This can be associated with CEGL006526, even confluent on the same cliff system, but is distinguished by being an extensive area (>1/2 acre) of seepy rather than dry cliff.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from Pinkham Notch in New Hampshire, but is likely more common and undersampled.
Global Range: These cliff seeps are known from the northeastern U.S., but are poorly documented. Additional data are needed to clarify the range.
Nations: US
States/Provinces: ME, NH:S3S4
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212A:CP, M212B:CC, M212C:C?, M212D:C?
Federal Lands: NPS (Appalachian Trail [Northern Appalachians]); USFS (White Mountain)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: N/A
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (3 plots): APPA.0187, APPA.0188, APPA.0189.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Gawler and Cutko 2010, Sperduto 2000a, Sperduto 2000b, Sperduto and Nichols 2004

[CEGL006528] *Polypodium (virginianum, appalachianum)* Cliff Sparse Vegetation

Translated Name: **(Rock Polypody, Appalachian Polypody) Cliff Sparse Vegetation**
Common Name: **Northern Appalachian Acidic Cliff**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Laurentian-Acadian-Great Lakes Cliff & Rock Vegetation (G839)
Alliance	Laurentian-Acadian-Great Lakes Acidic Cliff Alliance (A4007)

ELEMENT CONCEPT

Global Summary: This sparsely vegetated cliff association occurs in the spruce-fir forest region of northern New England and New York, and adjacent Canadian provinces. The setting is dry vertical exposures of resistant acidic bedrock such as granite, quartzite, sandstone or schist, with little or no soil development. These cliffs are mostly dry, but may contain small areas of seepy conditions, with associated floristic variation. The patchy vegetation is restricted to cracks and crevices, and can vary from well-vegetated to barren across the cliff face. The association presents itself as a mixture of open rock, scrubby trees and shrubs, herbaceous plants, and bryoids. Typical woody species include *Picea rubens, Abies balsamea, Sorbus decora, Sorbus americana, Betula papyrifera var. papyrifera, Betula papyrifera var. cordifolia, Diervilla lonicera, Ribes triste, Acer rubrum, Acer spicatum*, and *Alnus viridis*. The herbaceous component may feature graminoids such as *Deschampsia flexuosa, Danthonia spicata*, or *Carex brunnescens*; wiry ferns, such as *Polypodium virginianum, Polypodium appalachianum, Cystopteris fragilis, Dryopteris marginalis, Dennstaedtia punctilobula*, and *Woodsia ilvensis*; and herbs, such as *Solidago simplex var. randii, Campanula rotundifolia*, and *Sibbaldiopsis tridentata (= Potentilla tridentata)*. *Paronychia argyrocoma* occurs on some cliffs. Bryoids are not well documented, but the lichen flora often includes *Umbilicaria* spp. This association differs from other northeastern cliff vegetation types by the absence of calciphiles and the characteristically sub-boreal flora, lacking *Quercus* spp. and *Juniperus virginiana*, and with little or no *Tsuga canadensis*. Cliffs intermediate between the acidic versus calcareous substrate and sub-boreal versus temperate setting do occur.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This sparsely vegetation herbaceous association occurs on very steep south-facing cliffs and escarpments at elevation ranging from 650 to 1,200 m (2,130-3,940 feet). The non-vegetated substrate is >90% bedrock.

Global Environment: This sparsely vegetated cliff association occurs in the spruce-fir forest region of northern New England and New York, and adjacent Canadian provinces. The setting is dry vertical exposures of resistant acidic bedrock such as granite, quartzite, sandstone or schist, with little or no soil development. These cliffs are mostly dry, but may contain small areas of seepy conditions, with associated floristic variation.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: This association is characterized by sparse herbaceous vegetation with no clear dominants. Species have low consistency among sites and may include *Agrostis scabra, Carex brunnescens, Carex debilis, Carex lucorum, Danthonia spicata, Dennstaedtia punctilobula, Doellingeria umbellata, Dryopteris campyloptera, Maianthemum canadense, Oclemena acuminata, Polygonum cilinode, Polypodium virginianum*, and *Solidago simplex ssp. randii var. randii*. Tree saplings of species, including *Abies balsamea, Betula alleghaniensis, Picea rubens*, and *Sorbus americana*, are common.

Global Vegetation: The patchy vegetation is restricted to cracks and crevices, and can vary from well-vegetated to barren across the cliff face. The association presents itself as a mixture of open rock, scrubby trees and shrubs, herbaceous plants, and bryoids. Typical woody species include *Picea rubens, Abies balsamea, Sorbus decora, Sorbus americana, Betula papyrifera var. papyrifera, Betula papyrifera var. cordifolia, Diervilla lonicera, Ribes triste, Acer rubrum, Acer spicatum*, and *Alnus viridis*. The herbaceous component may feature graminoids such as *Deschampsia flexuosa, Danthonia spicata*, or *Carex brunnescens*; wiry ferns, such as *Polypodium virginianum, Polypodium appalachianum, Cystopteris fragilis, Dryopteris marginalis, Dennstaedtia punctilobula*, and *Woodsia ilvensis*; and herbs, such as *Solidago simplex var. randii, Campanula rotundifolia*, and *Sibbaldiopsis tridentata (= Potentilla tridentata)*. *Paronychia argyrocoma* occurs on some cliffs. Bryoids are not well documented, but the lichen flora often includes *Umbilicaria* spp.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Oclemena acuminata*
Herb (field)	Graminoid	*Agrostis scabra*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Agrostis scabra*
Global: *Polypodium appalachianum*, *Polypodium virginianum*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Jul-1999).

RELATED CONCEPTS

Global Similar Types:
- Basalt - Diabase Great Lakes Shore Cliff Sparse Vegetation (CEGL005191)
- Boreal Inland Acidic Cliff Sparse Vegetation (CEGL002564)
- *Carex scirpoidea* Alkaline Cliff Sparse Vegetation (CEGL006526)
- *Drosera rotundifolia* - *Viola* spp. Cliff Sparse Vegetation (CEGL006429)
- Eastern Boreal & Laurentian Dry Acidic Cliff Vegetation (CEGL002300)
- Granite - Metamorphic Great Lakes Shore Cliff Sparse Vegetation (CEGL005244)
- *Juniperus virginiana / Corydalis sempervirens* Cliff Sparse Vegetation (CEGL006422)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: Cliff vegetation in the Northeast has not been well studied, and comparative work is needed across the Northeast, upper Midwest, and adjacent Canada.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association has only been sampled from Carter Notch and Kinsman Notch in New Hampshire. It is likely more common throughout the Northern Appalachian project area but undersampled.
Global Range: This type is found in northern New England, the Adirondacks, and adjacent Canadian provinces.
Nations: CA, US
States/Provinces: ME:S4, NH:S5, NY, QC:S3?, VT
TNC Ecoregions: 63:C, 64:C
USFS Ecoregions (1994/95): 212Cb:CCC, 212Dc:CCC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212B:CC, M212C:CC, M212D:CC, M212F:CP
Federal Lands: NPS (Acadia, Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: VNBC
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (3 plots; 4 accuracy assessment points): APPA.0470, APPA.0785, APPA.0789, APPA_AA_1849, APPA_AA_2498, APPA_AA_2603, APPA_AA_2690.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: CDPNQ unpubl. data, Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Lubinski et al. 2003, Sperduto 1994, Sperduto 2000a, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

A4006 Laurentian-Acadian-Great Lakes Alkaline Cliff Alliance

Alliance Summary Description: Overall, vegetation varies from sparse nonvascular vegetation to open-treed or shrubby communities. Nonvascular plants (lichens, mosses, and liverworts) are common on the exposed cliff face, but vascular plant cover is sparse and patchy, confined to cracks or between boulders at the base of the slope where thin soils accumulate beneath talus. Overhanging trees from the ridgetop may include *Acer saccharum, Thuja occidentalis*, and *Abies balsamea*, and stunted individuals of *Betula papyrifera* may occur on the cliff face. Other woody plants may include *Shepherdia canadensis, Diervilla lonicera, Acer spicatum*, and others. Common herbs may include *Asplenium trichomanes, Geranium robertianum, Maianthemum canadense, Pellaea glabella, Polypodium virginianum, Pteridium aquilinum*, and *Trientalis borealis*. This alliance is found in the Great Lakes region of the U.S. and Canada east to northern New England where exposed bedrock dominates the cliff face. The bedrock may consist of alkaline igneous, metamorphic, or sedimentary rocks. Alkaline rocky cliffs are predominantly dolostone when associated with the Niagaran Escarpment along the northern Lake Michigan and Lake Huron shorelines, perhaps best developed on Drummond Island and adjacent Ontario islands. Alkaline basalts characterize these systems along portions of the Lake Superior shoreline, with a generally distinguishable flora from those on dolostone.

[CEGL006526] *Carex scirpoidea* Alkaline Cliff Sparse Vegetation

Translated Name: **Northern Single-spike Sedge Alkaline Cliff Sparse Vegetation**
Common Name: **Near-Boreal Alkaline Cliff**

USNVC CLASSIFICATION

Division	Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Laurentian-Acadian-Great Lakes Cliff & Rock Vegetation (G839)
Alliance	Laurentian-Acadian-Great Lakes Alkaline Cliff Alliance (A4006)

ELEMENT CONCEPT

Global Summary: This sparsely vegetated cliff association occurs in sub-boreal settings of northern New England, New York, and adjacent Canadian provinces, where weathering of calcium-bearing rock creates calcareous conditions. It is usually found above 305 m (1000 feet) elevation. The vertical cliffs may be composed of alkaline bedrock such as limestone, but this vegetation can also be found on cliffs where the matrix rock is acidic (e.g., schists or even granite), either where local inclusions weather to more nutrient-rich conditions or where fractures conduct more nutrient-rich seepage waters. These cliffs are mostly dry, but may contain small areas of seepy conditions, with associated floristic variation. The patchy vegetation is restricted to cracks and crevices, and can vary from well-vegetated to barren across the cliff face. It is a mixture of scrubby trees and shrubs, herbaceous plants, and bryoids. Characteristic woody plants include *Thuja occidentalis, Alnus viridis, Picea rubens, Acer spicatum, Betula papyrifera, Betula alleghaniensis, Ribes triste, Rubus odoratus, Sambucus racemosa (= Sambucus pubens)*, and *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)*. Herbs include some assortment of *Carex scirpoidea, Carex eburnea, Carex brunnescens, Trichophorum caespitosum (= Scirpus cespitosus), Aralia racemosa, Primula mistassinica, Primula laurentiana, Lobelia kalmii, Arabis lyrata, Saxifraga virginiensis, Saxifraga paniculata (= Saxifraga aizoon), Saxifraga oppositifolia, Saxifraga aizoides, Draba breweri var. cana (= Draba lanceolata), Pinguicula vulgaris*, and *Rhodiola rosea (= Sedum rosea)*. Characteristic ferns include *Cryptogramma stelleri, Asplenium trichomanes, Asplenium trichomanes-ramosum, Dryopteris fragrans, Cystopteris bulbifera, Cystopteris fragilis, Gymnocarpium dryopteris, Woodsia ilvensis*, and *Woodsia glabella*. *Dryopteris fragrans* and *Woodsia ilvensis* are more constant than the other vascular species. The bryoid flora can be diverse but is little documented outside of New Hampshire. Noted in the New Hampshire study were the calciphiles *Distichium capillaceum, Gymnostomum aeruginosum*, and *Tortella tortuosa*, and the circumneutral indicators *Amphidium mougeotii* (the most frequent of the indicators), *Diplophyllum apiculatum, Mnium thomsonii, Myurella sibirica*, and *Polytrichastrum alpinum (= Pogonatum alpinum)*. This association is differentiated from other northeastern cliff associations by the combination of a sub-boreal setting (as evidenced by the woody plants within and surrounding this vegetation: *Picea rubens, Alnus viridis, Acer spicatum*, etc.) and the presence of calciphiles such as *Dryopteris fragrans, Dasiphora fruticosa ssp. floribunda*, and *Campanula rotundifolia*.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: The only known occurrence of this association is found on a steep abrupt slope in a midslope position at 850 m (2,790 feet) elevation. The substrate is rapidly drained and consists mostly of bedrock.

Global Environment: This sparsely vegetated cliff association occurs in sub-boreal settings of northern New England and New York, and adjacent Canadian provinces, where weathering of calcium-bearing rock creates calcareous conditions. It is usually found above 305 m (1000 feet) elevation. The vertical cliffs may be composed of alkaline bedrock such as limestone, but this vegetation can also be found on cliffs where the matrix rock is acidic (e.g., schists or even granite), either where local inclusions weather to more nutrient-rich conditions or where fractures conduct more nutrient-rich seepage waters. These cliffs are mostly dry, but may contain small areas of seepy conditions, with associated floristic variation.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only known occurrence of this association consists of an open canopy of *Thuja occidentalis*. Canopy cover does not exceed 20%. The shrub layer consists of scattered tree saplings, including *Acer pensylvanicum, Acer pensylvanicum, Betula papyrifera var. cordifolia, Prunus pensylvanica, Sorbus americana*, and *Sorbus decora*. The herbaceous layer is open with no clear dominants. Species include *Carex communis, Carex peckii, Cystopteris tenuis, Eurybia macrophylla, Euthamia graminifolia, Maianthemum canadense, Oclemena acuminata, Solidago canadensis*, and *Solidago rugosa*.

Global Vegetation: The patchy vegetation is restricted to cracks and crevices, and can vary from well-vegetated to barren across the cliff face. It is a mixture of scrubby trees and shrubs, herbaceous plants, and bryoids. Characteristic woody plants include *Thuja occidentalis, Alnus viridis, Picea rubens, Acer spicatum, Betula papyrifera, Ribes triste, Rubus odoratus, Sambucus racemosa (= Sambucus pubens)*, and *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)*. Herbs include some assortment of *Carex scirpoidea, Carex eburnea, Carex brunnescens, Trichophorum caespitosum (= Scirpus cespitosus), Aralia racemosa, Primula mistassinica, Primula laurentiana, Lobelia kalmii, Arabis lyrata, Saxifraga virginiensis, Saxifraga paniculata (= Saxifraga aizoon), Saxifraga oppositifolia, Saxifraga aizoides, Draba breweri var. cana (= Draba lanceolata), Pinguicula vulgaris*, and *Rhodiola rosea (= Sedum rosea)*. Characteristic ferns include *Cryptogramma stelleri, Asplenium trichomanes-ramosum, Dryopteris fragrans, Cystopteris bulbifera, Cystopteris fragilis, Gymnocarpium dryopteris, Woodsia ilvensis*, and *Woodsia glabella*. The bryoid flora can be diverse but is little documented.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Thuja occidentalis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Northern Appalachian Project Area): *Thuja occidentalis*
Global: *Carex scirpoidea*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Jul-1999).

RELATED CONCEPTS

Global Similar Types:

- Basalt - Diabase Great Lakes Shore Cliff Sparse Vegetation (CEGL005191)
- Boreal Inland Alkaline Cliff Sparse Vegetation (CEGL002565)
- *Drosera rotundifolia* - *Viola* spp. Cliff Sparse Vegetation (CEGL006429)
- *Pellaea atropurpurea* Cliff Sparse Vegetation (CEGL006527)
- *Polypodium (virginianum, appalachianum)* Cliff Sparse Vegetation (CEGL006528)
- *Trichophorum caespitosum* - *Saxifraga (foliolosa, paniculata, rivularis)* Alpine Cliff (CEGL006428)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: Cliff vegetation in the Northeast has not been well studied, and comparative work is needed across the Northeast, upper Midwest, and adjacent Canada.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: The only known occurrence of this association in the Northern Appalachian project area occurs near Sugarloaf Mountain, Maine.
Global Range: This sparsely vegetated cliff association occurs in sub-boreal settings of northern New England and New York, and adjacent Canadian provinces.
Nations: US
States/Provinces: ME, NH:S2S3, NY, VT:S2
TNC Ecoregions: 63:C
USFS Ecoregions (1994/95): M212Ab:CCC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ba:CCC, M212Ca:CCC, M212D:CP
Federal Lands: NPS (Appalachian Trail [Northern Appalachians])

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: VBAC
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 plot; 1 accuracy assessment point): APPA.0708, APPA_AA_1998.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Gawler 2002, Gawler and Cutko 2010, Sperduto 1994, Sperduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000

7. Agricultural & Developed Vegetation

7.A.2. Forest Plantation & Agroforestry

7.A.2.1. FOREST PLANTATION

CGR007. Temperate & Boreal Plantation

CSG005. EASTERN NORTH AMERICAN TEMPERATE FOREST PLANTATION
Group Summary Description:

CTY014 Exotic Northern Conifer Plantation Cultural Type
Alliance Summary Description:

[CST007167] *Picea abies* Forest Plantation
Translated Name: **Norway Spruce Forest Plantation**
Common Name: **Norway Spruce Plantation**

USNVC CLASSIFICATION

Division	Forest Plantation (7.A.2.1.)
Macrogroup	Temperate & Boreal Plantation (CGR007)
Group	Eastern North American Temperate Forest Plantation (CSG005)
Alliance	Exotic Northern Conifer Plantation Cultural Type (CTY014)

ELEMENT CONCEPT

Global Summary: These plantation forests are dominated by the exotic species *Picea abies*, which makes up 70-100% of the canopy. The understory is typically sparse with little, if any, spruce regeneration. Hardwood regeneration and herbaceous species composition tend to reflect the pre-plantation forest types. In the Southeast this occurs as experimental plantations.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: No data are available.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: Spruce plantations are found on gentle to moderate slopes and summits. Soils include mesic somewhat poorly drained silt loam and dry-mesic well-drained sandy loam and loam. The unvegetated surface consists of leaf litter, with small amounts of exposed bedrock, large rocks and/or downed wood. Evidence of disturbance includes managed tree plantings and the presence of exotic plants.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: This association is currently known from one location on a flat at the base of a low slope. Soils are mesic and somewhat poorly drained.
Global Environment: This community represents vegetation that has been planted in its current location by humans.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: Spruce plantations are dominated by *Picea abies* and/or any combination of spruce species. A successional understory may be present with *Prunus serotina, Acer rubrum, Rubus* spp., *Dennstaedtia punctilobula*, and others.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: The canopy is dominated by *Picea abies* and at one site, *Picea glauca*. A successional understory may be present with *Prunus serotina, Acer pensylvanicum, Rubus* spp., *Dennstaedtia punctilobula, Dryopteris intermedia*, and others.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The only known location for this association is characterized by an open mixed evergreen/deciduous canopy dominated by *Picea abies* and *Fraxinus pennsylvanica*. The understory is a dense mix of regenerating trees. The herbaceous layer is dominated by *Solidago canadensis* along with other various herbaceous species.

Global Vegetation: These plantation forests are dominated by the exotic species *Picea abies*, which makes up 70-100% of the canopy. The understory is typically sparse with little, if any, spruce regeneration. Hardwood regeneration and herbaceous species composition tend to reflect the pre-plantation forest types.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea abies*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Picea abies*
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Prunus serotina*
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus allegheniensis*
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris intermedia*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea abies*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus pennsylvanica*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea abies*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Picea abies*
Appalachian National Scenic Trail (Lower New England Project Area): *Picea abies*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Picea abies*
Global: *Picea abies*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Picea abies*
Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Berberis vulgaris* (Medium/Low), *Euonymus alatus* (Low), *Frangula alnus* (High/Medium), *Picea abies*
Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Picea abies* (exotic/invasive)
Global: Invasive/Exotic Plants: *Picea abies*

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (cultural) (8-Aug-2000). This community represents vegetation which has been planted in its current location by humans and/or is treated with annual tillage, a modified conservation tillage, or other intensive management or manipulation. It is not a conservation priority and does not receive a conservation rank.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: Found in south-central PA in the area around Michaux State Forest. Clearly something planted by the PA forestry commission.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: One site in Shrewsbury (Rutland County, VT) was once an apple orchard; the stand is currently a "botanical desert" with only *Thelypteris noveboracensis*.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: The only observation point representing this association is not a confident attribution as the spruce trees do not appear to be planted.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: No data are available.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Massachusetts at Beartown State Forest, Bald Top, and Mount Williams Reservoir.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This association is only known from one location on the Kennebec River in Maine.
Global Range: These plantations are known from the northeastern United States extending south to North Carolina and west to Ohio.
Nations: US
States/Provinces: DE, ME, NC, NJ, NY, OH, PA, VA?, VT
TNC Ecoregions: 48:C, 49:C, 51:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212Ab:CCC, 221Ae:CCC, 221Bc:CCC, 221Fa:CCC, 222Ib:CCC, 232Ac:CCC, M212Ba:CCC, M221D:CC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], C&O Canal, Cuyahoga Valley, George Washington Parkway, Great Smoky Mountains, Marsh-Billings-Rockefeller, Saratoga); USFWS (Aroostook, Erie, Iroquois, Supawna Meadows)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: CMCP
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: None.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (4 observation points; 6 accuracy assessment points): APPA.1464, APPA.1474, APPA.1502, APPA.1721, APPA_AA_2440, APPA_AA_2868, APPA_AA_2947, APPA_AA_2963, APPA_AA_3348, APPA_AA_3351.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: (1 observation point; 2 accuracy assessment points): APPA.1636, APPA_AA_2530, APPA_AA_2783.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): E. Largay and M. Russo
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Allard 1990, Coxe 2009, Edinger et al. 2002, Edinger et al. 2007, NRCS 2004a, Southeastern Ecology Working Group n.d.*

[CST006313] *Pinus* spp. Forest Plantation

Translated Name: **Pine species Forest Plantation**
Common Name: **Mixed Pine Conifer Plantation**

USNVC CLASSIFICATION

Division	Forest Plantation (7.A.2.1.)
Macrogroup	Temperate & Boreal Plantation (CGR007)
Group	Eastern North American Temperate Forest Plantation (CSG005)
Alliance	Exotic Northern Conifer Plantation Cultural Type (CTY014)

ELEMENT CONCEPT

Global Summary: These plantations consist of mature *Pinus strobus* or *Pinus sylvestris*, with other conifers sometimes present in smaller amounts, planted in post-agricultural fields and pastures. Associated canopy conifers include *Pinus resinosa, Picea abies, Picea pungens*, or *Larix decidua*. The understory varies widely in its degree of development and may be virtually absent. Northern hardwoods dominate the sapling and seedling layers in some areas; *Juniperus virginiana* is common in others. Cover is proportional to the degree of canopy break-up or opening that has occurred. Common hardwoods include *Prunus serotina, Acer rubrum*, and *Fraxinus americana*. A tall-shrub layer may be present; common species (aside from smaller individuals of the hardwood saplings) include *Crataegus* spp., *Hamamelis virginiana*, and *Lindera benzoin*. Common short shrubs include *Viburnum recognitum, Vaccinium pallidum, Rubus hispidus*, and *Rubus flagellaris*. The species composition and abundance of the herbaceous layer vary widely due to variation in canopy tree species composition, stand stocking, and soil drainage. Herbaceous species include *Ageratina altissima (= Eupatorium rugosum), Dryopteris intermedia, Dryopteris carthusiana, Oxalis stricta, Potentilla simplex, Mitchella repens, Galium aparine, Galium asprellum, Brachyelytrum*

erectum, Veronica officinalis, Polystichum acrostichoides, Maianthemum canadense, Trientalis borealis, Lycopodium clavatum, and *Lycopodium digitatum (= Diphasiastrum digitatum)*. Graminoid and forb species associated with disturbed areas, such as *Agrostis stolonifera, Dichanthelium clandestinum (= Panicum clandestinum), Dennstaedtia punctilobula*, and *Hypericum perforatum*, are often dominant in these communities. Vines such as *Toxicodendron radicans, Smilax glauca, Smilax rotundifolia, Vitis* spp., and *Parthenocissus quinquefolia* may be present, but not abundant, in these plantations. Disturbance from silvicultural treatments and landscape fragmentation leaves these communities prone to invasion by exotic species, including *Lonicera tatarica, Berberis vulgaris, Rosa multiflora, Celastrus orbiculata, Microstegium vimineum*, and *Alliaria petiolata*, which are locally abundant.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: This mixed conifer plantation was sampled once in Cumberland County, Pennsylvania, on a flat, dry summit with sandy loam soil. The unvegetated surface is dominated by leaf litter with some downed wood. Evidence of disturbance includes managed tree plantings and the presence of exotic plant species.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: These plantations of mixed pines or pine mixed with other non-native conifers have been planted in post-agricultural fields and pastures. They are common throughout the Northeast.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: These mature plantations are planted in post-agricultural fields and pastures. The trees are typically even-aged and regularly-spaced. Soils are usually moderately well-drained to well-drained and vary from sandy to loamy.
Global Environment: These mature plantations are planted in post-agricultural fields and pastures. The trees are typically even-aged and regularly-spaced. Soils are usually moderately well-drained to well-drained and vary from sandy to loamy.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: These successional or planted forests are dominated by a mixture of pines (and/or other planted conifers) in canopy, mainly *Picea abies* and *Pinus strobus*. Dominant shrubs include *Gaylussacia baccata, Pinus strobus*, and *Vaccinium pallidum*. Herbs are nearly absent due to the dense canopy.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: Multiple *Pinus* species can make up the canopy; other conifers are sometimes present in smaller amounts. In uncommon instances, *Tsuga canadensis* may be the sole dominant.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: These plantations consist of mature *Pinus strobus* or *Pinus sylvestris*, with other conifers sometimes present in smaller amounts, planted in post-agricultural fields and pastures. Associated canopy conifers include *Pinus resinosa, Picea abies, Picea pungens*, or *Larix decidua*. The understory varies widely in its degree of development and may be virtually absent. Northern hardwoods dominate the sapling and seedling layers in some areas; *Juniperus virginiana* is common in others. Cover is proportional to the degree of canopy break-up or opening that has occurred. Common hardwoods include *Prunus serotina, Acer rubrum*, and *Fraxinus americana*. A tall-shrub layer may be present; common species (aside from smaller individuals of the hardwood saplings) include *Crataegus* spp., *Hamamelis virginiana*, and *Lindera benzoin*. Common short shrubs include *Viburnum recognitum, Vaccinium pallidum, Rubus hispidus*, and *Rubus flagellaris*. The species composition and abundance of the herbaceous layer vary widely due to variation in canopy tree species composition, stand stocking, and soil drainage. Herbaceous species include *Ageratina altissima (= Eupatorium rugosum), Dryopteris intermedia, Dryopteris carthusiana, Oxalis stricta, Potentilla simplex, Mitchella repens, Galium aparine, Galium asprellum, Brachyelytrum erectum, Veronica officinalis, Polystichum acrostichoides, Maianthemum canadense, Trientalis borealis, Lycopodium clavatum*, and *Lycopodium digitatum (= Diphasiastrum digitatum)*. Graminoid and forb species associated with disturbed areas, such as *Agrostis stolonifera, Dichanthelium clandestinum (= Panicum clandestinum), Dennstaedtia punctilobula*, and *Hypericum perforatum*, are often dominant in these communities. Vines such as *Toxicodendron radicans, Smilax glauca, Smilax rotundifolia, Vitis* spp., and *Parthenocissus quinquefolia* may be present, but not abundant, in these plantations. Disturbance from silvicultural treatments and landscape fragmentation leaves these communities prone to invasion by exotic species, including *Lonicera tatarica, Berberis vulgaris, Rosa multiflora, Celastrus orbiculata, Microstegium vimineum*, and *Alliaria petiolata*, which are locally abundant.
Global Vegetation: These plantations consist of mature *Pinus strobus* or *Pinus sylvestris*, with other conifers sometimes present in smaller amounts, planted in post-agricultural fields and pastures. Associated canopy conifers include *Pinus resinosa, Picea abies, Picea pungens*, or *Larix decidua*. The understory varies widely in its degree of

development and may be virtually absent. Northern hardwoods dominate the sapling and seedling layers in some areas; *Juniperus virginiana* is common in others. Cover is proportional to the degree of canopy break-up or opening that has occurred. Common hardwoods include *Prunus serotina, Acer rubrum*, and *Fraxinus americana*. A tall-shrub layer may be present; common species (aside from smaller individuals of the hardwood saplings) include *Crataegus* spp., *Hamamelis virginiana*, and *Lindera benzoin*. Common short shrubs include *Viburnum recognitum, Vaccinium pallidum, Rubus hispidus*, and *Rubus flagellaris*. The species composition and abundance of the herbaceous layer vary widely due to variation in canopy tree species composition, stand stocking, and soil drainage. Herbaceous species include *Ageratina altissima (= Eupatorium rugosum), Dryopteris intermedia, Dryopteris carthusiana, Oxalis stricta, Potentilla simplex, Mitchella repens, Galium aparine, Galium asprellum, Brachyelytrum erectum, Veronica officinalis, Polystichum acrostichoides, Maianthemum canadense, Trientalis borealis, Lycopodium clavatum*, and *Lycopodium digitatum (= Diphasiastrum digitatum)*. Graminoid and forb species associated with disturbed areas, such as *Agrostis stolonifera, Dichanthelium clandestinum (= Panicum clandestinum), Dennstaedtia punctilobula*, and *Hypericum perforatum*, are often dominant in these communities. Vines such as *Toxicodendron radicans, Smilax glauca, Smilax rotundifolia, Vitis* spp., and *Parthenocissus quinquefolia* may be present, but not abundant, in these plantations. Disturbance from silvicultural treatments and landscape fragmentation leaves these communities prone to invasion by exotic species, including *Lonicera tatarica, Berberis vulgaris, Rosa multiflora, Celastrus orbiculata, Microstegium vimineum*, and *Alliaria petiolata*, which are locally abundant.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Picea abies*, *Pinus strobus*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata*, *Vaccinium pallidum*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Pinus sylvestris*, *Tsuga canadensis*
Herb (field)	Flowering forb	*Trientalis borealis*, *Veronica officinalis*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Pinus sylvestris*
Herb (field)	Flowering forb	*Maianthemum canadense*, *Trientalis borealis*, *Veronica officinalis*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*, *Pinus sylvestris*
Herb (field)	Flowering forb	*Maianthemum canadense*, *Trientalis borealis*, *Veronica officinalis*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area):
Appalachian National Scenic Trail (Lower New England Project Area): *Pinus strobus*, *Pinus sylvestris*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Pinus strobus*, *Pinus sylvestris*, *Veronica officinalis*
Global: *Pinus strobus*, *Pinus sylvestris*, *Veronica officinalis*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): Invasive/Exotic Plants: *Picea abies*
Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Pinus sylvestris* (Medium/Low), *Veronica officinalis* (invasive/exotic); **Other Plants**: *Maianthemum canadense* (G5)
Appalachian National Scenic Trail (Northern Appalachian Project Area): Invasive/Exotic Plants: *Pinus sylvestris* (Medium/Low), *Veronica officinalis*
Global: Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Berberis vulgaris* (Medium/Low), *Celastrus orbiculata* (High/Medium), *Hypericum perforatum* (High/Medium), *Lonicera tatarica* (High/Medium), *Microstegium vimineum* (High/Medium), *Picea abies*, *Pinus sylvestris* (Medium/Low), *Rosa multiflora* (Medium/Low), *Veronica officinalis*

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (cultural) (1-Dec-2004).

RELATED CONCEPTS

Global Similar Types:

- *Pinus strobus* Forest Plantation (CST007178) monotypic white pine.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This association is a plantation and is thus not of high conservation concern.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: None.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This is a planted community that occurs along the entire length of the trail, but was observed and documented in New Jersey and Vermont by the UMESC mapping team. One site in Vermont is a *Tsuga canadensis* plantation.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: This type is intended for plantations of mixed pines or pine mixed with other non-native planted conifers.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled in Cumberland County, Pennsylvania. It is likely more common along the trail.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This is a planted community that occurs along the entire length of the trail, but was observed and documented in New Jersey and Vermont by the UMESC mapping team during reconnaissance in the summer of 2012.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This community is known to occur along the trail, but no plots or observation points were collected.
Global Range: Mixed pine plantations are common throughout the northeastern United States.
Nations: US
States/Provinces: NJ, NY, PA, VT
TNC Ecoregions: 48:C, 49:C, 59:C, 60:C, 61:C
USFS Ecoregions (1994/95): 212Fc:CCC, 221Ae:CCC, 221Bd:CCC, 221Fa:CCC, 222Ib:CCC, M212Ba:CCC
Federal Lands: NPS (Allegheny Portage Railroad, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Delaware Water Gap, Fort Necessity, Friendship Hill, Johnstown Flood, Marsh-Billings-Rockefeller, Upper Delaware); USFWS (Erie, Iroquois)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: CMCP
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This is a planted community that occurs along the entire length of the trail, but was observed and documented in New Jersey and Vermont by the UMESC mapping team and during accuracy assessment. One site in Vermont is a *Tsuga canadensis* plantation.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: (1 observation point; 3 accuracy assessment points): APPA.1303, APPA_AA_0728, APPA_AA_0801, APPA_AA_1356.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (2 accuracy assessment points): APPA_AA_1772, APPA_AA_3326.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: None.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Global Description Author(s): S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2002, Perles et al. 2006a, Perles et al. 2006b, Perles et al. 2006d, Perles et al. 2006e, Perles et al. 2007, Perles et al. 2008

CTY009 Native Northern Pine Plantation Cultural Type

Alliance Summary Description:

[CST007177] *Pinus resinosa* Forest Plantation

Translated Name: **Red Pine Forest Plantation**
Common Name: **Red Pine Plantation**

USNVC CLASSIFICATION

Division	Forest Plantation (7.A.2.1.)
Macrogroup	Temperate & Boreal Plantation (CGR007)
Group	Eastern North American Temperate Forest Plantation (CSG005)
Alliance	Native Northern Pine Plantation Cultural Type (CTY009)

ELEMENT CONCEPT

Global Summary: Plantations of *Pinus resinosa* occur in various settings and soil types. *Pinus resinosa* makes up 80-100% of the canopy. In older stands, or in canopy gaps, native regeneration includes hardwoods such as *Acer rubrum, Acer saccharum*, and *Fagus grandifolia*, as well as the conifers *Pinus strobus, Picea rubens*, and/or *Tsuga canadensis*. *Acer pensylvanicum* may be present as a small tree. Shrubs and herbs are typically few.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Environment: Red pine plantations occur in various settings and soil types.
Global Environment: Plantations of *Pinus resinosa* occur in various settings and soil types.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: These are plantations of *Pinus resinosa*. Native regeneration, including *Acer rubrum, Acer saccharum*, and *Fagus grandifolia*, as well as the conifers *Pinus strobus, Picea rubens*, and/or *Tsuga canadensis,* is present in older stands or in canopy gaps.
Global Vegetation: *Pinus resinosa* makes up 80-100% of the canopy. In older stands, or in canopy gaps, native regeneration includes hardwoods such as *Acer rubrum, Acer saccharum*, and *Fagus grandifolia*, as well as the conifers *Pinus strobus, Picea rubens*, and/or *Tsuga canadensis*. *Acer pensylvanicum* may be present as a small tree. Shrubs and herbs are typically few.

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus resinosa*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus resinosa*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): *Pinus resinosa*
Global: *Pinus resinosa*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (cultural) (8-Aug-2000). This community represents vegetation which has been planted in its current location by humans and/or is treated with annual tillage, a modified conservation tillage, or other intensive management or manipulation. It is not a conservation priority and does not receive a conservation rank.

RELATED CONCEPTS

Global Similar Types:
- *Pinus resinosa / Menziesia pilosa / Polypodium appalachianum* Forest (CEGL006108)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This red pine plantation was observed by the UMESC mapping team in VT.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: None.
Global Classification Comments: In the southern portion of the range, these plantations are known from the Laurel Fork area of the Warm Springs Ranger District; in New England, they are scattered and generally small.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Lower New England Project Area) Range: This red pine plantation was observed along the Connecticut River in CT.
Global Range: These plantations occur throughout the Northeast from North Carolina north through Maine. In New England, they are scattered and generally small.
Nations: US
States/Provinces: DE, MD, ME, MN, NC, NY, OH, VA, VT, WV
TNC Ecoregions: 51:C, 59:C, 61:C, 63:C
USFS Ecoregions (1994/95): 212Ab:CCC, 221Ae:CCC, 221Db:CCC, M212Ba:CCC, M221Aa:CCC, M221Ba:CCC
Federal Lands: NPS (Appalachian Trail [Lower New England], Cuyahoga Valley, Marsh-Billings-Rockefeller, Mississippi); USFS (George Washington, Monongahela); USFWS (Aroostook, Moosehorn)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: CMCP
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: This red pine plantation was observed by the UMESC mapping team in VT and during accuracy assessment.
Appalachian National Scenic Trail (Lower New England Project Area) Plots: (3 accuracy assessment points): APPA_AA_2251, APPA_AA_2292, APPA_AA_2907.
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): E. Largay
Global Description Author(s): S.C. Gawler
References: Allard 1990, Coxe 2009, Edinger et al. 2002, Fleming and Coulling 2001, Fleming and Moorhead 1996, Southeastern Ecology Working Group n.d.*

[CST007178] *Pinus strobus* Forest Plantation

Translated Name: **Eastern White Pine Forest Plantation**
Common Name: **Eastern White Pine Plantation**

USNVC CLASSIFICATION

Division	Forest Plantation (7.A.2.1.)
Macrogroup	Temperate & Boreal Plantation (CGR007)
Group	Eastern North American Temperate Forest Plantation (CSG005)
Alliance	Native Northern Pine Plantation Cultural Type (CTY009)

ELEMENT CONCEPT

Global Summary: This eastern white pine plantation type is found throughout the northeastern and midwestern United States and adjacent Canada. Stands contain plantations of *Pinus strobus* that are maintained for the extraction of forest products. Some have been planted as reclamation projects (e.g., following strip-mining). At maturity, the tree canopy is usually dense and contains a monospecific layer of *Pinus strobus*. *Pinus resinosa* or *Pinus virginiana* is occasionally present in small amounts. In older stands or gaps, regenerating trees may include *Fagus grandifolia, Acer saccharum, Acer rubrum*, and *Prunus serotina*; *Robinia pseudoacacia* and *Betula lenta* are occasionally present. *Acer pensylvanicum* and *Ostrya virginiana* are common small trees. The shrub layer is typically sparse and mostly consists of smaller individuals of the tree species. The field layer varies from sparse to absent; it may be locally well-developed in small openings, with variable composition. In some stands, mosses may be abundant. Susceptibility to a variety of pests or diseases, including white pine blister rust (*Cronartium ribicola*) and southern pine beetle (*Dendroctonus frontalis*), has had some impact on its commercial use.

ENVIRONMENTAL DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Environment: White pine plantations were sampled once in Cumberland County, Pennsylvania, in the Central Appalachian project area. The site is a dry moderate, northwest-facing upper slope at about 600 m elevation. The unvegetated surface is dominated by leaf litter. Evidence of disturbance includes managed tree plantings and the presence of exotic plant species.
Appalachian National Scenic Trail (Lower New England Project Area) Environment: This old white pine plantation is now a naturalized white pine forest. The site is a mesic alluvial flat with well-drained soil. The unvegetated surface consists of leaf litter, with a small amount of downed wood. Evidence of disturbance includes managed tree plantings and the presence of exotic plant species.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Environment: Stands contain plantations of *Pinus strobus* that are maintained for the extraction of forest products. The type does well on a variety of soils. Some have been planted on strip-mine reclamation sites.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Environment: White pine plantations were sampled infrequently along the Appalachian Trial. The one site sampled in the Southern Blue Ridge occurs in Georgia on a somewhat steep, southwest-facing slope with dry-mesic, well-drained loam soil. Leaf litter, downed wood, and large rocks are common. Evidence of disturbance includes past logging, managed tree plantings, dogwood anthracnose, and fire suppression.
Global Environment: Stands contain plantations of *Pinus strobus* that are maintained for the extraction of forest products. The type does well on a variety of soils. Some have been planted on strip-mine reclamation sites.

VEGETATION DESCRIPTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Vegetation: The very dense (80-90% cover) canopy is dominated by even-aged (clearly planted) *Pinus strobus*, which also dominates the subcanopy and shrub layers. Shrub layers are relatively sparse due to the dense canopy but may include *Gaylussacia baccata, Kalmia latifolia, Vaccinium angustifolium*, and *Vaccinium pallidum*. An herbaceous layer is nearly absent.
Appalachian National Scenic Trail (Lower New England Project Area) Vegetation: This community is comprised of planted and successional, even-aged *Pinus strobus*, usually with a sparse understory. Shrubs are nearly absent. *Arisaema triphyllum, Dryopteris intermedia*, and *Mitchella repens* are present herbs.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Vegetation: The tree canopy at maturity is usually dense and contains a monospecific layer of *Pinus strobus*. *Pinus resinosa* or *Pinus virginiana* is occasionally present in small amounts. In older stands or gaps, regenerating trees may include *Fagus grandifolia, Acer saccharum, Acer rubrum*, and *Prunus serotina*; *Robinia pseudoacacia* and *Betula lenta* are occasionally present. *Acer pensylvanicum* and *Ostrya virginiana* are common small trees. The shrub layer is typically sparse and mostly consists of smaller individuals of the tree species. The field layer varies from sparse to absent; it may be locally well-developed in small openings, with variable composition. In some stands, mosses may be abundant.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Vegetation: The dense evergreen canopy of these planted, even-aged forests is dominated exclusively by *Pinus strobus*. The subcanopy is made up of *Acer rubrum, Liriodendron tulipifera, Oxydendrum arboreum, Pinus strobus*, and *Quercus velutina*. The sparse shrub layers include saplings of subcanopy species along with *Kalmia latifolia, Sassafras albidum, Symplocos tinctoria, Vaccinium stamineum*, and *Vaccinium hirsutum*. Herbs are very sparse and include *Galax urceolata*.
Global Vegetation: The tree canopy at maturity is usually dense and contains a monospecific layer of *Pinus strobus*. *Pinus resinosa* or *Pinus virginiana* is occasionally present in small amounts. In older stands or gaps, regenerating trees may include *Fagus grandifolia, Acer saccharum, Acer rubrum*, and *Prunus serotina*; *Robinia pseudoacacia* and *Betula lenta* are occasionally present. *Acer pensylvanicum* and *Ostrya virginiana* are common small trees. The shrub layer is typically sparse and mostly consists of smaller individuals of the tree species. The field layer varies from sparse to absent; it may be locally well-developed in small openings, with variable composition. In some stands, mosses may be abundant.
Global Dynamics: *Pinus strobus* is susceptible to a variety of pests and diseases, including white pine blister rust (*Cronartium ribicola*) and southern pine beetle (*Dendroctonus frontalis*), which have had some impact on its commercial use. Blister rust was a problem on young plantations but is not much of a problem in larger trees in the east (P. Manion pers. comm. 2001).

MOST ABUNDANT SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*

Appalachian National Scenic Trail (Lower New England Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*

Appalachian National Scenic Trail (Northern Appalachian Project Area)

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*

Appalachian National Scenic Trail (Southern Blue Ridge Project Area)

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus strobus*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus*

CHARACTERISTIC SPECIES

Appalachian National Scenic Trail (Central Appalachian Project Area): *Pinus strobus*
Appalachian National Scenic Trail (Lower New England Project Area): *Pinus strobus*
Appalachian National Scenic Trail (Northern Appalachian Project Area): *Pinus strobus*
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): *Kalmia latifolia*, *Pinus strobus*, *Vaccinium hirsutum*
Global: *Pinus strobus*

OTHER NOTEWORTHY SPECIES

Appalachian National Scenic Trail (Lower New England Project Area): Invasive/Exotic Plants: *Berberis thunbergii* (High/Medium)
Appalachian National Scenic Trail (Southern Blue Ridge Project Area): Vulnerable Plants: *Vaccinium hirsutum* (G3)
Global: Vulnerable Plants: *Rhus aromatica* var. *arenaria* (G5T3Q)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (cultural) (8-Aug-2000). This community represents vegetation which has been planted in its current location by humans and/or is treated with annual tillage, a modified conservation tillage, or other intensive management or manipulation. It is not a conservation priority and does not receive a conservation rank.

RELATED CONCEPTS

Global Similar Types:
- *Pinus* spp. Forest Plantation (CST006313)
- *Pinus strobus* Ruderal Forest (CEGL007944)

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Appalachian National Scenic Trail (Central Appalachian Project Area) Classification Comments: This association is a plantation and is thus not of high conservation concern.
Appalachian National Scenic Trail (Central Appalachian Project Area) Other Comments: Because this is an easily identifiable ruderal community, it was only sampled a few times in the park.
Appalachian National Scenic Trail (Lower New England Project Area) Classification Comments: This community represents vegetation which has been planted in its current location by humans and/or is treated with annual tillage, a modified conservation tillage, or other intensive management or manipulation. It is not a conservation priority.
Appalachian National Scenic Trail (Lower New England Project Area) Other Comments: Because this is an easily identifiable ruderal community, it was only sampled a few times in the park.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Classification Comments: This community is known to occur along the trail, but no plots or observation points were collected.

Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Classification Comments: This community was sampled in Chattahoochee National Forest, Georgia, but occurs throughout the Southern Blue Ridge section of the Appalachian Trail.
Global Classification Comments: There was a lot of planting of eastern white pine from the 1930s into the 1950s, but there has been very little planting since then (P. Manion pers. comm. 2001). On the Daniel Boone National Forest of Kentucky, *Pinus strobus* plantings are of limited extent and are related to wildlife plantings. In the southern part of this type's range, there has been some damage from southern pine beetle (*Dendroctonus frontalis*). These plantations have been observed in the Peters Mountain area (James River Ranger District) and various other sites in the George Washington and Jefferson national forests.

ELEMENT DISTRIBUTION

Appalachian National Scenic Trail (Central Appalachian Project Area) Range: This community was sampled in Cumberland County, Pennsylvania, in the Central Appalachian project area. It is probably more common along the trail.
Appalachian National Scenic Trail (Lower New England Project Area) Range: This community was sampled in Connecticut.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Range: This community is known to occur along the trail, but no plots or observation points were collected.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Range: This community was sampled in Chattahoochee National Forest, Georgia, but occurs throughout the Southern Blue Ridge section of the Appalachian Trail.
Global Range: This white pine plantation is found throughout the northeastern and midwestern United States and adjacent Canada.
Nations: CA, US
States/Provinces: CT, DE, GA, IN, KY, MD, NC, NH, NJ, NY, OH, PA, SC, TN, VA, VT, WV
TNC Ecoregions: 47:C, 48:C, 51:C, 52:C, 59:C, 61:C, 62:C, 63:C
USFS Ecoregions (1994/95): 212:C, 221Ae:CCC, 221Ai:CCC, 221Bc:CCC, 221Db:CCC, 221He:CCC, 222Jj:CCC, 232Ab:CCC, 232Ac:CCC, M212Ba:CCC, M221Aa:CCC, M221Bb:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: BIA (Eastern Band of Cherokee); NPS (Antietam, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Booker T. Washington, C&O Canal, Catoctin Mountain, Chattahoochee River, Chickamauga-Chattanooga, Cuyahoga Valley, Indiana Dunes, Marsh-Billings-Rockefeller, Mississippi, Monocacy, New River Gorge, Saratoga, Valley Forge); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, George Washington, Jefferson, Monongahela, Nantahala, Pisgah, Sumter, Sumter (Mountains)); USFWS (Chesapeake Marshlands, E.B. Forsythe, Supawna Meadows)

ELEMENT SOURCES

Appalachian National Scenic Trail Map-Class Code: CMCP
Appalachian National Scenic Trail (Central Appalachian Project Area) Inventory Notes: White pine plantations were sampled infrequently along the Appalachian Trial because they are ruderal vegetation that has been well-described in the USNVC. Data were collected primarily to provide signature information for vegetation mapping.
Appalachian National Scenic Trail (Lower New England Project Area) Inventory Notes: White pine plantations were sampled infrequently along the Appalachian Trial because they are ruderal vegetation that has been well-described in the USNVC. Data were collected primarily to provide signature information for vegetation mapping.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Inventory Notes: White pine plantations were sampled infrequently along the Appalachian Trial because they are ruderal vegetation that has been well-described in the USNVC. Data were collected primarily to provide signature information for vegetation mapping.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Inventory Notes: White pine plantations were sampled infrequently along the Appalachian Trial because they are ruderal vegetation that has been well-described in the USNVC. Data were collected primarily to provide signature information for vegetation mapping.
Appalachian National Scenic Trail (Central Appalachian Project Area) Plots: 1 observation point; 3 accuracy assessment points): APPA.1302, APPA_AA_0846, APPA_AA_1355, APPA_AA_1571.

Appalachian National Scenic Trail (Lower New England Project Area) Plots: (1 accuracy assessment point): APPA_AA_2337.
Appalachian National Scenic Trail (Northern Appalachian Project Area) Plots: None.
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Plots: (1 observation point; 1 accuracy assessment point): APPA.0536, APPA_AA_1152.
Appalachian National Scenic Trail (Central Appalachian Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Lower New England Project Area) Description Author(s): M. Russo, mod. E. Largay
Appalachian National Scenic Trail (Northern Appalachian Project Area) Description Author(s): M.E. Hall
Appalachian National Scenic Trail (Southern Blue Ridge Project Area) Description Author(s): M. Russo, mod. E. Largay
Global Description Author(s): D. Faber-Langendoen and S.C. Gawler
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Appendix D: Field Key to Vegetation Associations

Field Key to Vegetation Associations

This appendix is a field key to vegetation associations (plant communities) of the Appalachian National Scenic Trail (APPA; also referred to as the "AT corridor" for Appalachian Trail corridor). The vegetation associations in this vegetation field key represent a subset of the U.S. National Vegetation Classification (USNVC) and were initially identified from field data collected for the APPA vegetation mapping project of the National Park Service Vegetation Mapping Inventory Program. For each vegetation association in the vegetation field key, the common name for the association in the USNVC is given followed by the Community Element Global code (CEGL00####). The scientific name for the association also is given in brackets. At the onset of the APPA vegetation mapping project, conifer forest plantations were listed in the natural (including ruderal) portion the USNVC. Toward the close of the vegetation mapping project, conifer forest plantations were moved to the cultural portion of the USNVC; however, those forest plantations remain in this vegetation field key and are identified by their Cultural Subtype code (CST00####).

Guidance on Using the Vegetation Field Key

The vegetation field key consists mostly of dichotomous options that ultimately lead to a USNVC association; in a few cases, a lead goes to three, rather than two, options. The vegetation field key quickly separates into four main field keys, one for each of the four APPA project areas. The four APPA project areas and corresponding field keys are as follows: (1) Southern Blue Ridge (SBR), (2) Central Appalachian (CAP), (3) Lower New England (LNE), and (4) Northern Appalachian (NAP). Each of these four field keys provides a narrowing focus on vegetation associations existing within their respective APPA project area, rather than a broad view of the entire AT corridor. Several vegetation associations exist in more than one APPA project area, especially when associations exist near convergence of those project areas. Some vegetation associations exist in all four APPA project areas and are included in each project area field key.

To determine which field key by APPA project area to classify from, use the "Key to Field Keys by Project Area." A map showing the extent of each APPA project area (SBR, CAP, LNE, and NAP) is provided on pages D-8–D-11. The field key for each of the four APPA projects is divided into sub-keys to narrow the focus toward groupings of vegetation associations having similar characteristics (e.g., vegetation physiognomy, vegetation dominance, hydrology, and disturbance).

The classification of a stand of vegetation should first be undertaken assuming that it is a natural community, unless the species composition or landscape has obvious evidence of being disturbed. If a reasonable answer is not obtained as a natural community, then the classification of the stand as a disturbed or ruderal community should be attempted.

The USNVC global association names are provided for each vegetation association in the vegetation field key. These global association names reflect the general presentation of an association across its global range, but neglect local variation. Thus, vegetation associations that exist along the AT corridor may not have all the plant species present in the global association name and will probably have many other additional plant species present. The local condition of the vegetation association is described within the relevant couplet in the vegetation field key and should be the ultimate descriptor for keying vegetation.

For best results, all assessments of vegetation associations in the field should be done on a defined area of homogeneous (uniform) vegetation (i.e., a single vegetation association). For vegetation associations that are larger scale (greater than 0.5 hectare [ha]), a half hectare area (5,000 square meters [m]) is used, which is equivalent to a 40-m radius around a center point or to a 50- by 100-m rectangle. For vegetation associations that are smaller scale (0.25–0.5 ha), a quarter ha area (2,500 square m) is used, which is equivalent to a 28-m radius around a center point or to a 50- by 50-m square. For vegetation associations at the smallest scale (0.125–0.25 ha), an eighth ha area (1,250-m squared) is used, which is equivalent to a 20-m radius around a center point or to a 35- by 35-m square.

Each of the four APPA project area field keys provides guidance to the scale that vegetation associations were mapped to for the APPA vegetation mapping project; these scales were determined by the minimum mapping unit (MMU) of the map classes that represents the vegetation associations. Some vegetation associations exist only as small-scale patches and may not be mappable (e.g., subcanopy seeps in forests); however, all associations are included in the vegetation field key regardless of their mappable status.

"Appendix C: Descriptions of Vegetation Associations" in this report for the APPA vegetation mapping project is recommended to complement this vegetation field key to determine a correct assessment of vegetation classification.

Page Reference to Field Keys

Page

Key to Field Keys by Project Area D-7

Field Key to Vegetation Associations of the Southern Blue Ridge Project Area D-12

Notes about Scale for the Southern Blue Ridge Project Area D-12

Key to Keys for the Southern Blue Ridge Project Area D-12

1. Alluvial Vegetation D-15

2. Forested Seeps D-16

3. Bogs and Fens D-17

4. Successional and Ruderal Vegetation (forested and non-forested) D-19

5. Sparse Woodlands, Balds, Glades, Barrens, Rocky Summits, Cliffs, and Granite Domes D-23

6. Mesophytic Hardwoods and Rich Mesic Forests D-28

7. Spruce and Fir Forests D-33

8. Dry - Subxeric Forests and Woodlands D-35

9. Dry-Mesic Forests D-40

10. Acidic Mesic and Rich Forests D-45

Field Key to Vegetation Associations of the Central Appalachian Project Area D-48

Notes about Scale for the Central Appalachian Project Area D-48

Key to Keys for the Central Appalachian Project Area D-48

1. Alluvial Forest, Woodland, Shrubland, and Herbaceous Vegetation D-51

2. Forested Swamps, Seeps, Vernal Pools, and Aquatic Vegetation D-56

3. Shrub Swamps, Bogs, and Non-Alluvial Herbaceous Wetlands D-58

4. Non Forested Barrens, Glades, Rocky Outcrops, Boulderfields, and Talus Slopes D-60

5. Upland Deciduous Woodlands D-64

6. Pine and Mixed Pine-Deciduous Forests and Woodlands D-68

7. Hemlock - White Pine, Hemlock - Hardwood, Hemlock - Oak, Mesophytic Hardwood, and Acidic Cove Forests D-72

8. Oak / Heath Forests D-79

9. Mixed Oak and Oak / Hickory Forests D-82

10. Rich Cove and Rich Boulderfield Forests D-86

Page Reference to Field Keys (continued)

Page

11. Successional and Ruderal Vegetation D-92

Field Key to Vegetation Associations of the Lower New England Project Area D-97

Notes about Scale for the Lower New England Project Area D-97

Key to Keys for the Lower New England Project Area D-97

1. Alluvial Forest, Woodland, Shrubland and Herbaceous Vegetation D-100

2. Forested Basin Swamps, Forested Seeps, and Vernal Pools D-105

3. Shrub Swamps, Fens, and Bogs D-113

4. Herbaceous Wetlands and Aquatic Vegetation D-117

5. Woodlands, Stunted Forests, Barrens, Rocky Outcrops and Cliffs D-124

6. Spruce-Fir Forests D-131

7. Hemlock and Mixed Hemlock Forests D-133

8. Northern Hardwood Forests D-136

9. Pine and Mixed Pine Shrublands, Woodlands and Forests D-145

10. Mixed Oak-Conifer, Mixed Oak, and Oak-Hickory Forests D-148

11. Successional and Ruderal Vegetation, including plantations D-158

Field Key to Vegetation Associations of the Northern Appalachian Project Area D-164

Notes about Scale for the Northern Appalachian Project Area D-164

Key to Keys for the Northern Appalachian Project Area D-164

1. Alluvial Vegetation D-167

2. Forested and Wooded Wetlands D-170

3. Shrub Swamps, Shrub Bogs, and Fens D-175

4. Herbaceous Wetlands and Aquatic Vegetation D-179

5. Open Alpine and Subalpine Vegetation, Lower Elevation Balds, Barrens, Cliffs, and Sparse Vegetation D-183

6. Upland Woodlands D-190

7. Spruce and/or Fir Upland Woodlands and Forests D-193

8. Hemlock, Mixed Hemlock, Pine, and Mixed Pine Upland Forests D-197

9. Northern Hardwood Upland Forests D-201

10. Successional and Ruderal Vegetation D-208

Key to Field Keys by Project Area

1.a. APPA lands south of the Delaware River (Pennsylvania-New Jersey State line along Interstate 80). 2
1.b. APPA land north of the Delaware River (Pennsylvania-New Jersey State line along Interstate 80). 3

2.a. APPA lands between the southern terminus of the AT corridor on Springer Mountain in Georgia and Dickey Gap in Virginia (Corners Creek Road near State Highway 16). See Figure D–1. ....**Field Key to Vegetation Associations of the Southern Blue Ridge Project Area (p. D-12)**
2.b. APPA lands between Dickey Gap in Virginia (Corners Creek Road near State Highway 16) and the Delaware River (Pennsylvania-New Jersey State line along Interstate 80). See Figure D–2. .... **Field Key to Vegetation Associations of the Central Appalachian Project Area (p. D-48)**

3.a. APPA lands between the Delaware River (Pennsylvania-New Jersey State line along Interstate 80) and the Connecticut River (Vermont-New Hampshire State line between Norwich, Vermont, and Hanover, New Hampshire). See Figure D–3. .... **Field Key to Vegetation Associations of the Lower New England Project Area (p. D-97)**
3.b. APPA lands between the Connecticut River (Vermont-New Hampshire State line between Norwich, Vermont, and Hanover, New Hampshire) and the northern terminus of the AT corridor on Baxter Peak of Mount Katahdin in Maine. See Figure D–4. .... **Field Key to Vegetation Associations of the Northern Appalachian Project Area (p. D-164)**

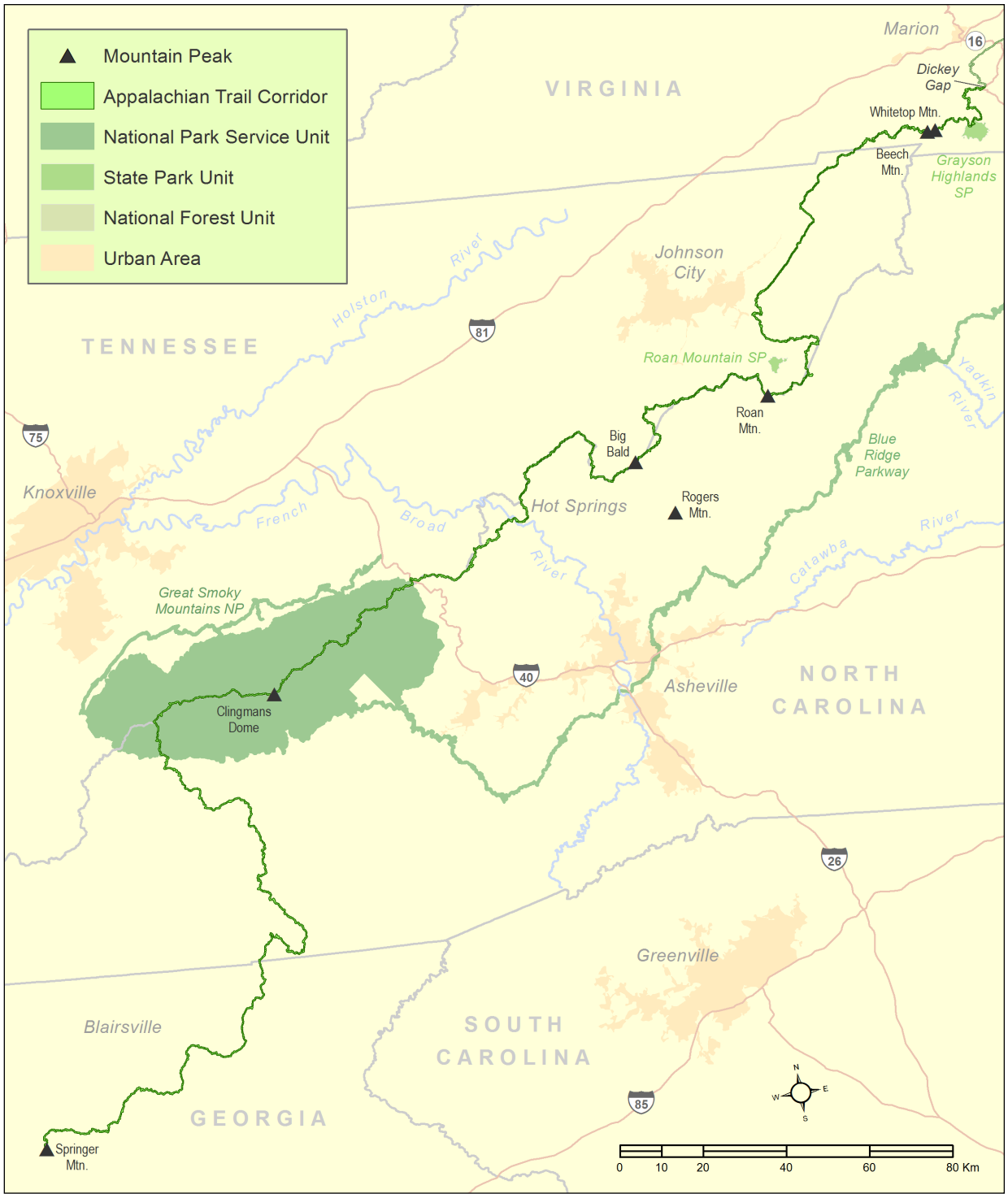


Figure D–1. The Southern Blue Ridge project area for the Appalachian National Scenic Trail vegetation mapping project.



Figure D–2. The Central Appalachian project area for the Appalachian National Scenic Trail vegetation mapping project.



Figure D–3. The Lower New England project area for the Appalachian National Scenic Trail vegetation mapping project.



Figure D–4. The Northern Appalachian project area for the Appalachian National Scenic Trail vegetation mapping project.

Field Key to Vegetation Associations of the Southern Blue Ridge Project Area

This field key provides classification to USNVC associations that were identified during the APPA vegetation mapping project for the SBR project area (see Figure D–1 in the "Key to Field Keys by Project Area"). The SBR project area includes APPA lands between the southern terminus of the AT corridor on Springer Mountain in Georgia and Dickey Gap in Virginia (Corners Creek Road near State Highway 16).

Notes about Scale for the Southern Blue Ridge Project Area

All forest associations were mapped to a 0.5-ha MMU (a circle with a 40-m radius) and all nonforest associations were mapped to a 0.25-ha MMU (a circle with a 28-m radius). Some of the smaller-scale associations mapped to a MMU of 0.25 ha include: CEGL003752, CEGL003814, CEGL003818, CEGL003819, CEGL003849, CEGL003882, CEGL003890, CEGL003891, CEGL003892, CEGL003893, CEGL003895, CEGL003913, CEGL004094, CEGL004184, CEGL004242, CEGL004732, CEGL004819, CEGL007443, CEGL007690, and CEGL007876.

Key to Keys for the Southern Blue Ridge Project Area

1a. Wetland Vegetation (alluvial and non-alluvial). **2**
1b. Upland Vegetation. **4**

2a. Alluvial vegetation occurring along banks or channels of rivers and streams and adjacent levees, at least occasionally flooded. Also includes beaver pond areas that are part of larger alluvial systems. ..... **Alluvial Vegetation (Key #1, p. D–15)**
2b. Non-alluvial (palustrine) vegetation; site is seepage-fed, rarely if ever flooded by alluvial waters; includes seepage-fed beaver pond and man-made impoundments and seepage-fed boulderfields and coves. **3**

3a. Forested sites and sites generally with overhanging canopy of trees. Canopies vary widely depending upon elevation, fertility, and rockiness, but all examples have rich, diverse herbaceous layers. ..... **Forested Seeps (Key #2, p. D-16)**
3b. Non-forested sites, herb- and forb-dominated, with deep soils and nearly completely vegetated (does not include seepy rock outcrops). ..... **Bogs and Fens (Key #3, p. D-17)**

4a. Vegetation (dominated by trees, shrubs, forbs, grasses, and/or vines) strongly altered by recent human disturbance, dominated by disturbance-oriented (ruderal) native species and/or non-native species, (e.g., *Paulownia tomentosa* (princesstree), *Ailanthus altissima* (tree of heaven)) or certain disturbance-oriented (ruderal) native species, often in monotypic stands [e.g., *Pinus virginiana* (Virginia pine), *Liriodendron tulipifera* (tuliptree), *Betula alleghaniensis* (yellow birch), *Acer rubrum* (red maple), *Robinia pseudoacacia* (black locust), *Juglans nigra* (black walnut)]; possibly in mixed and highly variable stands. Many examples of these are near to or associated with roads, former fields, former human settlements, etc. ..... **Successional and Ruderal Vegetation (Key #4, p. D-19)**
4b. Naturally occurring vegetation, dominated by native trees, shrubs, forbs, grasses, and/or vines; structure and/or composition determined by a spontaneously growing set of primarily native plant species shaped by ecological processes; includes forested and non-forested vegetation communities. **5**

5a. Non-forested vegetation (canopy trees over 6 m absent or sparse, covering less than 25% of the assessment area); sparse woodlands, shrublands, grasslands, nonvascular vegetation, or bare rock; some associated with very shallow soils or rock outcrops, others without substantial areas of exposed rock, including grass and shrub balds and successional vegetation; also includes savanna-like areas and glades with widely spaced, open-grown trees (or small clumps of trees) over otherwise herbaceous vegetation. **6**
5b. Forest and woodland vegetation with canopy trees over 6 m tall covering at least 25%, and usually above 60% of the assessment area; understory varies. **8**

6a. Sparse woodlands (10-25% tree canopy cover), shrublands, grasslands, or bare rock; associated with very shallow soils or rock outcrops. ..... **Sparse Woodlands, Glades, Barrens, Rocky Summits, Cliffs, and Granite Domes (Key #5, p. D-23)**
6b. Shrublands or grasslands without substantial areas of exposed rock. **7**

7a. Successional or altered (ruderal) shrubland or grassland vegetation resulting from human disturbance. ..... **Successional and Ruderal Vegetation (Key #4, p. D-19)**
7b. Natural or ruderal shrubland or grassland vegetation; either shrub or grass-dominant (typically above 1,525 m [5,000 feet]). ..... **Sparse Woodlands, Glades, Barrens, Rocky Summits, Cliffs, and Granite Domes (Key #5, p. D-23)**

8a. Forest vegetation occurring at or above 1,220 m (4,000 feet) elevation (e.g., Spruce-Fir Forests, Northern Hardwoods, Dry-Subxeric Pine Forests, High-elevation Oak Forests). **9**
8b. Forest vegetation occurring below 1,220 m (4,000 feet) elevation, but occurring up to 1,370 m (4,500 feet) in some exceptions. **11**

9a. Canopy dominated by deciduous trees (at least 50% deciduous), including *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Fraxinus americana* (white ash), *Aesculus flava* (yellow buckeye), and *Acer saccharum* (sugar maple). ..... **Mesophytic Hardwoods and Rich Mesic Forests (Key #6, p. D-28)**
9b. Canopy dominated by coniferous species (at least 50% coniferous) including *Picea rubens* (red spruce), *Abies fraseri* (Fraser fir), and *Pinus* (pine) spp. **10**

10a. Spruce and/or fir dominate ..... **Spruce and Fir Forests (Key #7, p. D-33)**
10b. Pine dominates. ..... **Dry - Subxeric Forests and Woodlands (Key #8, p. D-35)**

11a. Deciduous, evergreen, or mixed dry and subxeric forests; **either** dominated by evergreen trees of dry habitats (e.g., *Pinus pungens* (table mountain pine), *Pinus rigida* (pitch pine), *Pinus virginiana* (Virginia pine), *Tsuga caroliniana* (Carolina hemlock)) **or** these codominant with deciduous trees of dry habitats (*Quercus coccinea* (scarlet oak) and *Quercus prinus* (chestnut oak)); **or** dominated by a mixture of dry to dry-mesic oak species (*Quercus coccinea* (scarlet oak) and *Quercus prinus* (chestnut oak) over *Kalmia latifolia* (mountain laurel) and occurring on exposed ridges and upper slopes. Also occasionally includes mesic slopes with traditionally dry-habitat canopy trees (*Tsuga caroliniana* (Carolina hemlock), *Quercus prinus* (chestnut oak)) over a dense shrub layer of *Kalmia latifolia* (mountain laurel). Mixed *Pinus strobus* (eastern white pine) - dry *Quercus* (oak) stands should be keyed here as well [see CEGL007519 at Sect. 8, 6a; and Sect. 9, 2b]. ..... **Dry - Subxeric Forests and Woodlands (Key #8, p. D-35)**

11b. Primarily deciduous mesic and dry-mesic forests, although *Tsuga canadensis* (eastern hemlock) and/or *Pinus strobus* (eastern white pine), may be present in some examples; dominated by **either** mesophytic species, e.g., *Tilia americana* (American basswood; including var. *heterophylla*), *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Fraxinus americana* (white ash), and/or *Liriodendron tulipifera* (tuliptree) with (*Tsuga canadensis* (eastern hemlock), *Pinus strobus* (eastern white pine), **or** dry-mesic tree species, e.g., *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), and/or *Quercus alba* (white oak). **12**

12a. Stands dominated by dry-mesic to mesic oaks (e.g., *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus alba* (white oak), dry to subxeric oaks (*Quercus coccinea* (scarlet oak) or *Quercus falcata* (southern red oak)), or codominant with other dry-mesic trees including *Carya glabra* (pignut hickory), as well as *Liriodendron tulipifera* (tuliptree). .... **Dry-Mesic Forests (Key #9, p. D-40)**

12b. Stands dominated by mesophytic tree species [e.g., *Acer saccharum* (sugar maple), *Tilia americana* (American basswood; including var. *heterophylla*), *Fraxinus americana* (white ash), and/or *Liriodendron tulipifera* (tuliptree)], dominated or codominated by *Tsuga canadensis* (eastern hemlock) or *Pinus strobus* (eastern white pine) in some cases..... **13**

13a. Forest canopy codominated by deciduous mesophytic trees and variable amounts of *Tsuga canadensis* (eastern hemlock) or *Pinus strobus* (eastern white pine) **and** usually with high abundance of *Rhododendron maximum* (great laurel). Some associations may not have *Tsuga canadensis* (eastern hemlock) but are of acidic composition and **lack** an abundance of canopy species indicative of nutrient-rich substrates (e.g., *Tilia americana* (American basswood; including var. *heterophylla*), *Fraxinus americana* (white ash), *Aesculus flava* (yellow buckeye), and *Acer saccharum* (sugar maple)]. ..... **Acidic Mesic and Rich Forests (Key #10, p. D-45)**

13b. Forest canopy of most associations dominated by deciduous trees indicative of nutrient-rich substrates *Tilia americana* (American basswood) including var. *heterophylla, Fraxinus* (ash) spp., *Aesculus flava* (yellow buckeye), and *Acer saccharum* (sugar maple); usually without substantial *Tsuga canadensis* (eastern hemlock) and *Rhododendron maximum* (great laurel)..... ..... **Mesophytic Hardwoods and Rich Mesic Forests (Key #6, p. D-28)**

1. Alluvial Vegetation

1a. Forested vegetation communities, usually with greater than 60% tree canopy coverage, possibly as low as 40% in examples with damage to canopy trees from flooding and debris transport. Canopy typically dominated by *Platanus occidentalis* (American sycamore), *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Betula lenta* (sweet birch), and *Betula alleghaniensis* (yellow birch). Evergreen tree species few to none. Shrub layer often dense with *Rhododendron maximum* (great laurel) and *Leucothoe fontanesiana* (highland doghobble). Other shrubs may include *Alnus serrulata* (hazel alder), *Xanthorhiza simplicissima* (yellowroot), *Corylus americana* (American hazelnut), *Cornus amomum* (silky dogwood), *Hamamelis virginiana* (American witch-hazel), *Euonymus americanus* (bursting-heart), and *Hydrangea arborescens* (wild hydrangea). Vine species such as *Parthenocissus quinquefolia* (Virginia creeper), *Aristolochia macrophylla* (pipevine), *Smilax glauca* (cat greenbrier), and *Smilax rotundifolia* (roundleaf greenbrier). Sites associated with narrow, rocky floodplains and islands in medium-sized rivers. [A "rich" variant of this may have a canopy with *Acer saccharum* (sugar maple), *Betula lenta* (sweet birch), *Acer rubrum* (red maple), *Tilia americana* var. *heterophylla* (Appalachian basswood), and *Carya cordiformis* (bitternut hickory). Shrubs include *Carpinus caroliniana* (American hornbeam) and *Lindera benzoin* (northern spicebush).] ..... **Appalachian Montane Alluvial Forest (CEGL004691)**
[*Platanus occidentalis - Liriodendron tulipifera - (Betula alleghaniensis) / Alnus serrulata - Leucothoe fontanesiana* Floodplain Forest]

1b. Shrublands on rocky or gravelly substrates along narrow river margins. Characteristic species are *Alnus serrulata* (hazel alder) and *Xanthorhiza simplicissima* (yellowroot), but these may not always be dominant. Other species may include *Arundinaria gigantea* (giant cane), *Diervilla sessilifolia* (southern bush-honeysuckle), *Salix nigra* (black willow), *Salix sericea* (silky willow), *Rhododendron arborescens* (smooth azalea), *Rhododendron viscosum* (swamp azalea), *Rhododendron maximum* (great laurel), *Rhododendron periclymenoides* (pink azalea), *Kalmia latifolia* (mountain laurel), *Leucothoe fontanesiana* (highland doghobble), *Cornus foemina* (stiff dogwood), *Cornus amomum* (silky dogwood), *Physocarpus opulifolius* (common ninebark), *Itea virginica* (Virginia sweetspire), and *Viburnum nudum* var. *cassinoides* (withe-rod). .... **Rocky Bar and Shore (Alder - Yellowroot Type) (CEGL003895)**
[*Alnus serrulata - Xanthorhiza simplicissima* Wet Shrubland]

2. Forested Seeps[16]

1a. Found on slopes above 1,100 m (3,600 feet) elevation; primarily open seep, small patch in matrix of rich coves and rich northern hardwood forests from 1,100 to 1,525 m (3,600-5,000 feet) elevation. Herbaceous layer dominated by forbs including *Impatiens pallida* (pale touch-me-not), *Monarda didyma* (scarlet beebalm), and *Rudbeckia laciniata* (cutleaf coneflower). ..... **Rich Montane Seep (High-Elevation Type) (CEGL004293)**
[*Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata* var. *humilis* Herbaceous Seep]

1b. Found on slopes and some flat areas; best developed below 1,100 m (3,600 feet) elevation, some apparent examples may occur higher; more-or-less forested seep (typically under closed canopy). **2**

2a. Canopy dominated by *Nyssa sylvatica* (blackgum), understory dominated by *Rhododendron maximum* (great laurel); streamhead swales on broad ridges on sandy, saturated soils derived from shales and sandstones. ..... **Appalachian Forested Acidic Seep (CEGL007443)**
[*Acer rubrum* var. *trilobum - Nyssa sylvatica / Osmunda cinnamomea - Carex intumescens / Sphagnum lescurii* Seep Forest]

2b. Herbaceous seep vegetation abundant. **3**

3a. Sedge-dominated, seepage slopes scattered throughout the high elevations (>1524 m [5,000 feet]) of the Southern Blue Ridge; well-developed sphagnum mats present; characteristic species include *Carex gynandra* (nodding sedge), *Carex ruthii* (Ruth's sedge), *Carex atlantica* (prickly bog sedge), and *Carex debilis* var. *rudgei* (white edge sedge). ..... **Southern Blue Ridge High-Elevation Seep (Sedge Type) (CEGL007697)**
[*Carex gynandra - Platanthera clavellata - Drosera rotundifolia - Carex ruthii / Sphagnum* spp. Herbaceous Seep]

3b. Sedges may be present to common but not dominant. **4**

4a. Seepage on mid and lower slopes in matrix of cove forests. Usually canopy either partially or fully covered by cove forest trees from adjacent communities. Characteristic species include *Diphylleia cymosa* (American umbrellaleaf), *Saxifraga micranthidifolia* (lettuceleaf saxifrage), and *Laportea canadensis* (Canadian woodnettle). [Umbrellaleaf may occur up to 1,585 m (5,200 feet).] ..... **Rich Montane Seep (Cove Type) (CEGL004296)**
[*Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis* Forested Herbaceous Seep]

4b. Seepage area on slight slopes or flat areas near small to large creeks with characteristic species including *Glyceria striata* (fowl mannagrass), *Glyceria melicaria* (melic mannagrass), *Osmunda cinnamomea* (cinnamon fern), *Carex gynandra* (nodding sedge), *Symphyotrichum puniceum* (purple-stem aster), *Solidago patula* var. *patula* (roundleaf goldenrod), *Chelone glabra* (white turtlehead), and *Sphagnum recurvum* (recurved sphagnum). ..... **Southern Appalachian Wet Seepage Meadow (CEGL008438)**
[*Glyceria striata - Carex gynandra - Chelone glabra - Symphyotrichum puniceum / Sphagnum* spp. Herbaceous Seep]

[16]Seeps are small scale and are not represented directly by any one map class. Seeps are included for completeness of the vegetation field key, and the surrounding matrix vegetation should be recognized.

3. Bogs and Fens

1a. Forest with a closed or open canopy and an open to dense shrub layer, interspersed with small *Sphagnum*- (sphagnum moss) and herb-dominated depressions. Canopy composed of various mixtures of evergreen and deciduous species, often dominated by *Tsuga canadensis* (eastern hemlock) and *Acer rubrum* (red maple), and less often by *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Pinus strobus* (eastern white pine), or *Pinus rigida* (pitch pine)..... **Swamp Forest - Bog (Typic Type) (CEGL007565)**
[*Tsuga canadensis - Acer rubrum - (Nyssa sylvatica) / Rhododendron maximum / Sphagnum* spp. Seep Forest]

1b. Non-forested boggy areas (tree canopy less than 20%)..... **2**

2a. Shrub-dominated saturated wetlands and seeps..... **3**
2b. Herb-dominated saturated seepage wetlands (seepage bog, or fen). **4**

3a. *Rhododendron maximum* (great laurel) dominated shrubland occurring within mountain stream floodplains. This association includes some bogs in the Southern Appalachians. ..... **Southern Appalachian Bog (Rhododendron Type) (CEGL003849)**
[*Rhododendron maximum / Sphagnum* spp. Seepage Shrubland]

3b. Low-elevation stream headwaters seep dominated by *Alnus serrulata* (hazel alder), *Lyonia ligustrina* (maleberry), *Kalmia latifolia* (mountain laurel), *Lindera benzoin* var. *benzoin* (northern spicebush), and *Vaccinium fuscatum* (black highbush blueberry); herbaceous species include *Scutellaria lateriflora* (blue skullcap), *Thelypteris noveboracensis* (New York fern), *Mimulus ringens* (Allegheny monkeyflower), *Osmunda cinnamomea* (cinnamon fern), and *Ludwigia palustris* (marsh seedbox). Physiognomy is variable and may include herbaceous-dominated patches, shrubby areas, and areas with an open canopy of trees..... **Montane Low-Elevation Seep (CEGL003909)**
[*Alnus serrulata - Lindera benzoin* / *Scutellaria lateriflora - Thelypteris noveboracensis* Seepage Shrubland]

4a. Streamside seepage area with *Glyceria striata* (fowl mannagrass), *Glyceria melicaria* (melic mannagrass), *Osmunda cinnamomea* (cinnamon fern), *Carex gynandra* (nodding sedge), *Symphyotrichum puniceum* (purple-stem aster), *Solidago patula* var. *patula* (roundleaf goldenrod), *Chelone glabra* (white turtlehead), and *Sphagnum recurvum* (recurved sphagnum). ..... **Southern Appalachian Wet Seepage Meadow (CEGL008438)**
[*Glyceria striata - Carex gynandra - Chelone glabra - Symphyotrichum puniceum / Sphagnum* spp. Herbaceous Seep]

4b. Rare fen community. *Picea rubens* (red spruce), *Abies fraseri* (Fraser fir), *Pinus strobus* (eastern white pine), and *Tsuga canadensis* (eastern hemlock) may be scattered throughout or may dominate in patches or on the edges. Dominant shrubs include *Salix sericea* (silky willow), *Viburnum nudum* var. *cassinoides* (withe-rod), *Ilex collina* (longstalk holly), *Rhododendron catawbiense* (Catawba rosebay), and *Rhododendron maximum* (great laurel). Other characteristic species include *Taxus canadensis* (Canada yew) (Long Hope Valley only), *Picea rubens* (red spruce), *Rosa palustris* (swamp rose), *Salix humilis* (prairie willow), *Carex atlantica* (prickly bog sedge), *Carex baileyi* (Bailey's sedge), *Carex echinata* (star sedge), *Carex gynandra* (nodding sedge), *Carex leptalea* (bristly-stalked sedge), *Carex lurida* (shallow sedge), *Carex trisperma* (three-seeded sedge), *Eriophorum virginicum* (tawny cottongrass), *Galium asprellum* (rough bedstraw), *Houstonia serpyllifolia* (thymeleaf bluet), *Juncus effusus* (common rush), *Osmunda cinnamomea* (cinnamon fern), *Oxypolis rigidior* (stiff cowbane), *Rhynchospora capitellata* (brownish beaksedge), *Scirpus*

cyperinus (woolgrass), *Scirpus expansus* (woodland bulrush), *Scirpus polyphyllus* (leafy bulrush), *Packera aurea* (golden ragwort), *Solidago patula* var. *patula* (roundleaf goldenrod), *Sphagnum fuscum* (brown peatmoss), *Sphagnum recurvum* (recurved sphagnum), and *Rhizomnium appalachianum* (Appalachian rhizomnium moss). Known from Grayson Highlands State Park, VA, as small patches..... **Southern Appalachian Shrub Bog (Long Hope Valley Type) (CEGL003913)**

[*Rhododendron (maximum, catawbiense) - Ilex collina - Salix sericea / Eriophorum virginicum* Seepage Shrubland]

4. Successional and Ruderal Vegetation (forested and non-forested)

1a. Successional fields/meadows/shrublands/woodlands (less than 60% cover of trees in canopy and subcanopy/understory combined). **2**
1b. Successional or planted forests (typically greater than 60% cover of canopy/overstory combined). **9**

2a. Shrub- or vine-dominated (less than 50% herbaceous). Primarily naturally disturbed areas (possibly managed), longer disturbance interval than 2b below, created and maintained by blowdowns, tree die-offs, and occasional mowing (3- to 6-year cycle). **3**
2b. Herbaceous-dominated (greater than 50% herbaceous cover). Shorter disturbance interval than 2a (above). Frequently, and anthropogenically, disturbed/managed, created and maintained by yearly mowing or grazing. The grazing/mowing regime does not distinguish these two, but primarily elevation does..... **8**

3a. Shrublands..... **4**
3b. Vine-dominated stands. **7**

4a. Shrubland found above 915 m (3,000 feet) composed of *Rhododendron maximum* (great laurel) generally found in areas where tree canopy has died or been blown down. ..... **Montane Rhododendron Thicket (CEGL003819)**
[*Rhododendron maximum* Upland Scrub]
4b. Shrubland with *Rubus* (blackberry) spp. dominant or codominant (at least 25-50% cover; on the lower end if in a more diverse mixture of successional shrub and vine species)..... **5**

5a. Low- to moderate-elevation shrubland, stand composed of a mixture of *Rubus* (blackberry) spp. (primarily with *Rubus argutus* (sawtooth blackberry), also possibly *Rubus allegheniensis* (Allegheny blackberry)); possibly with *Rosa multiflora* (multiflora rose), *Smilax* (greenbrier) spp., other successional and exotic shrub and vine species. These are anthropogenically managed/disturbed areas, not associated with "true" Appalachian balds, but with pastures, meadows, etc. They will be associated with Grazed Montane Grassland / Fire Meadow (CEGL004018) or Cultivated Grassland (CEGL004048) depending on elevation. ..... **Ruderal Blackberry - Greenbrier Shrub Thicket (CEGL004732)**
[*Rubus (argutus, trivialis) - Smilax (glauca, rotundifolia)* Ruderal Shrubland]
5b. High-elevation shrublands or woodlands (above 1,370 m [4,500 feet]) with at least 50% cover of *Rubus* (blackberry) spp. **6**

6a. High-elevation (above 1,370 m [4,500 feet]) blackberry thickets composed of *Rubus canadensis* (smooth blackberry) and/or *Rubus allegheniensis* (Allegheny blackberry), adjacent to or interspersed with high-elevation forests; arising from severe fire or extreme spruce-fir or beech die-off. Examples can include an open, woodland canopy of *Prunus pensylvanica* (pin cherry) covering up to 60% of the understory. NOTE: This *Rubus*- (blackberry) dominated type mapped in two conditions: (a) when *Rubus* (blackberry) is in or near balds (and bordering/integrating with degraded trees) at three locations: Whitetop Mtn (VA); Carvers Gap/Roan Mtn (TN/NC); and Big Bald (TN/NC); and (b) in ruderal circumstances, e.g., with CEGL004018 (which can mimic a grassy bald but without the right origin or composition). There may be confusion with CEGL003892 (higher) or CEGL004732 (below). ..... **High-Elevation Blackberry Thicket (CEGL003893)**
[*Rubus canadensis - (Rubus idaeus* ssp. *strigosus) / Athyrium filix-femina - Solidago glomerata* Shrubland]

6b. High-elevation (above 1,525 m [5,000 feet]) *Rubus canadensis* (smooth blackberry) and/or *Rubus allegheniensis* (Allegheny blackberry) thickets found adjacent to or interspersed with natural grasslands; arising from successional processes on natural grass balds following grazing or natural processes such as fire. NOTE: This *Rubus*- (blackberry) dominated type mapped only when *Rubus* (blackberry) is in or near balds (and patches surrounded by grassland) at three locations: Whitetop Mtn (VA); Carvers Gap/Roan Mtn (TN/NC); and Big Bald (TN/NC)..... **Southern Appalachian Blackberry Bald (CEGL003892)**
[*Rubus allegheniensis - Rubus canadensis / Carex pensylvanica* Shrubland]

7a. Dominated almost entirely by the exotic *Pueraria montana* (kudzu)..... **Ruderal Kudzu Vineland (CEGL003882)**
[*Pueraria montana* var. *lobata* Ruderal Vine-Shrubland]
7b. Grapevine-dominated patch in forest (so-called "grapehole") usually with greater than 25% coverage in various strata of the native *Vitis aestivalis* (summer grape) and a patchy canopy of trees. . ..... **Montane Grape Opening (CEGL003890)**
[*Vitis aestivalis* Vine-Scrub]

8a. Low to intermediate elevation (below 915 m [3,000 feet]). Herbaceous layer dominated by mixtures of introduced *Lolium (= Festuca)* spp. (meadow, tall fescue, etc.) and other grasses and/or forb species. This vegetation may be associated or interspersed with Ruderal Blackberry - Greenbrier Shrub Thicket (CEGL004732).....**Cultivated Grassland (CEGL004048)**
[*Lolium (arundinaceum, pratense)* Ruderal Grassland]
8b. High-elevation (above 915 m [3,000 feet]) pasture dominated by *Phleum pratense* (timothy) and *Bromus* (brome) spp. These are less diverse pastures of anthropogenic origin, lacking conservative native species characteristic of more natural Grassy Balds (i.e., CEGL004242); found in section 5. .....**Grazed Montane Grassland / Fire Meadow (CEGL004018)**
[*Phleum pratense - Bromus pubescens - Helenium autumnale* Ruderal Meadow]

9a. Canopy dominated by evergreen trees (at least 50% evergreen trees in canopy). **10**
9b. Canopy dominated by hardwood deciduous trees (at least 50% deciduous canopy). **12**

10a. *Pinus virginiana* (Virginia pine) a dominant component of association, either greater than 50% of canopy, or at least prevalent over other evergreens..... **Ruderal Virginia Pine Forest (CEGL002591)**
[*Pinus virginiana* Ruderal Forest]
10b. *Pinus strobus* (eastern white pine) a dominant component of association, greater than 50% of canopy. **11**

11a. Planted stand, even-aged with obvious indications of silviculture and few other species..... **Eastern White Pine Plantation (CST007178)**
[*Pinus strobus* Forest Plantation]
11b. Successional forest, even-aged or mixed-age and possibly including a mixture of other successional species. Arising from disturbance, but not evidently planted. Some examples may contain *Quercus* (oak) spp., but these are even-aged and similar in age to the dominant *Pinus strobus* (eastern white pine).....**Ruderal Eastern White Pine Forest (CEGL007944)**
[*Pinus strobus* Ruderal Forest]

12a. Communities found at higher elevation (up to 1,525 m [5,000 feet]), adjacent to grass or shrub balds, or at upper edge of Northern Hardwood stands. Canopy composed of *Crataegus* (hawthorn) spp., possibly mixed with some combination of *Quercus rubra* (northern red oak), *Betula alleghaniensis* (yellow birch), *Prunus pensylvanica* (pin cherry), and/or *Aesculus flava* (yellow buckeye). Forest or shrubland of moderate stature (5-15 m). [Note: some examples of High-Elevation Red Oak Forest (Tall Herb Type) (CEGL007298) may have a *Crataegus* (hawthorn) understory.]. ....**Southern & Central Appalachian Ruderal Hawthorn Forest (CEGL004184)**
[*Crataegus punctata - Crataegus flabellata* Ruderal Forest]
12b. Communities not restricted to higher elevations, mostly found at lower elevations (below 1,440 m [4,000 feet]). **13**

13a. Canopy dominated by *Liriodendron tulipifera* (tuliptree) (greater than 50% of canopy). These are earlier-successional, postdisturbance forests, which are typically 50-75 years old. **14**
13b. Canopy with less than 50% *Liriodendron tulipifera* (tuliptree)..... **16**

14a. *Liriodendron tulipifera* (tuliptree) forest with a large presence of understory species indicative of high calcium or base rich soils such as *Cercis canadensis* (eastern redbud), *Symphoricarpos orbiculatus* (coralberry), or *Lindera* (spicebush). This is a relatively uncommon community in the SBR project area, and is mostly restricted to VA. ....**Ruderal Tuliptree Forest (Rich Type) (CEGL007220)**
[*Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Ruderal Forest]
14b. Widely distributed and common successional *Liriodendron tulipifera* (tuliptree) forests with understory and canopy species indicative of acidic soils [less than 10% cover of *Cercis canadensis* (eastern redbud) and/or *Lindera benzoin* (northern spicebush)]. **15**

15a. Younger forest dominated by *Liriodendron tulipifera* (tuliptree) and/or sometimes codominated by *Robinia pseudoacacia* (black locust), and/or *Acer rubrum* (red maple) with less than 25% cover of oaks. This also keys below as a diverse and variable successional hardwood forest that may not be dominated by tuliptree (below). ..... **Appalachian Ruderal Hardwood Forest (CEGL007219)**
[*Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia* Ruderal Forest]
15b. Dominated by *Liriodendron tulipifera* (tuliptree) sometimes codominated by young *Quercus* (oak) spp., *Acer rubrum* (red maple), and/or *Betula alleghaniensis* (yellow birch). ....**Ruderal Tuliptree Forest (Typic Type) (CEGL007221)**
[*Liriodendron tulipifera - Quercus* spp. Ruderal Forest]

16a. Forest a more-or less monospecific successional stand of either *Juglans nigra* (black walnut) or *Robinia pseudoacacia* (black locust). **17**
16b. Diverse forest dominated by a variable mixture of successional hardwoods **18**

17a. Forest dominated by *Juglans nigra* (black walnut) with an understory of *Verbesina* (crownbeard) spp. and/or *Symphoricarpos orbiculatus* (coralberry). Frequently found on postcultivation soil or former orchard sites around old home-sites. ....**Ruderal Black Walnut Forest (CEGL007879)**
[*Juglans nigra / Verbesina alternifolia* Ruderal Forest]
17b. Forest dominated by *Robinia pseudoacacia* (black locust). Frequently found in abandoned fields and other postcultivation lands. ..... **Ruderal Black Locust Forest (CEGL007279)**
[*Robinia pseudoacacia* Ruderal Forest]

18a. Successional forest vegetation found in areas that have undergone severe disturbance, including repeated canopy removal (clearcutting), cultivation, mining, grading, etc. Typically on benches, relatively gentle slopes, and other more easily cleared terrain. Canopy dominated by some combination of *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Robinia pseudoacacia* (black locust), *Sassafras albidum* (sassafras), and *Betula lenta* (sweet birch). Stands may also contain lesser amounts of *Betula alleghaniensis* (yellow birch), *Oxydendrum arboreum* (sourwood), *Amelanchier laevis* (Allegheny serviceberry), *Nyssa sylvatica* (blackgum), and *Magnolia fraseri* (mountain magnolia). Some examples may contain *Pinus virginiana* (Virginia pine). Shrubs, when present, are typically deciduous ones, but some *Kalmia latifolia* (mountain laurel) may be present..... ..... **Appalachian Ruderal Hardwood Forest (CEGL007219)**

[*Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia* Ruderal Forest]

18b. Forests composed of successional species, but typically composed of larger and older trees than the preceding. Found on midslopes and saddles of various aspects and of varying topographic complexity. These stands are thought to have originated from episodes of logging and/or fire, but not severe soil disturbance such as cultivation or site clearing. This community may have originally been dominated by *Castanea dentata* (American chestnut) until its decline due to chestnut blight. This released the other hardwood species in the understory, resulting in this composition. In higher elevation examples, this community may be a long-term postdisturbance example of Southern Appalachian Northern Hardwood Forest (Typic Type) (CEGL007285). Canopy dominated by some combination of *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Magnolia fraseri* (mountain magnolia), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Betula alleghaniensis* (yellow birch), but **not** strongly dominated by yellow birch. Shrub species are typically primarily evergreen ones, and *Kalmia latifolia* (mountain laurel) and *Rhododendron maximum* (great laurel) can be very dense. NOTE: CEGL007219 and CEGL008558 can both have high cover of red maple, sourwood, and mountain magnolia, but CEGL008558 typically does **not** have a large component of tuliptree or yellow birch. Oak may be present in the canopy, but generally at less than 25% cover. The trees in stands of CEGL008558 are older (greater than 70 years), larger, and more mature than in CEGL007219. ....**Southern Appalachian Ruderal Acidic Mixed Hardwood Forest (CEGL008558)**

[*Acer rubrum* var. *rubrum - Betula lenta - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Ruderal Forest]

5. Sparse Woodlands, Balds, Glades, Barrens, Rocky Summits, Cliffs, and Granite Domes

1a. Vineland; stand with greater than 25% cover of *Vitis aestivalis* (summer grape) in various strata... ..... **Montane Grape Opening (CEGL003890)**
[*Vitis aestivalis* Vine-Scrub]
1b. Not a vineland. Stand dominated by trees, shrubs, forbs and graminoids or sparse vegetation..... **2**

2a. Stands lacking trees; grass/sedge- and shrub-dominated (heath etc.) balds and rocky summits and cliffs with sparse vegetation; these are distinctive, non-forested communities generally occurring at higher elevations, above 1,220 m (4,000 feet) elevation (but rarely down to 1,065 m [3,500 feet]); some types are further restricted to locations above 1,370 m (4,500 feet) or 1,525 m (5,000 feet) in elevation. **3**
2b. Stands with trees present to dominant at low to moderate cover; pine- or hardwood-dominated rocky woodlands, boulderfields (woodland phases of these associations), Hawthorn "orchards" and exfoliation domes. Found at middle- to lower-elevations generally below 1,220 m (4,000 feet) elevation (but rarely up to 1,340 m [4,400 feet], and 1,525 m [5,000 feet] in the case of the Hawthorn "orchard"). **13**

3a. Densely vegetated herb/shrub- or herb-dominated communities. [NOTE: true, natural balds are found on or near the AT corridor in only three limited areas: Whitetop Mountain area (southern VA), the Carvers Gap - Roan Mountain area (TN/NC), and Big Bald (TN/NC.]
[Southern Appalachian Shrub and Grass Balds] **4**
3b. Sparsely vegetated communities occupying vertical to horizontal rock outcrops of peaks, ridges, cliffs, upper slopes, and other topographically exposed positions. Short-statured herbs, mosses, and lichens are the most prevalent lifeforms with shrubs and graminoids sometimes encountered.
[Southern Appalachian Rocky Summits] **11**

4a. Communities dominated by shrub species Note: *Rubus*- (blackberry) dominated communities are found in Section 4 (Successional and Ruderal Vegetation). **5**
4b. Communities dominated by graminoid species (Poaceae and Cyperaceae). These following are natural grass- or sedge-dominated balds, which are only found at three locations: Whitetop Mtn (VA); Carvers Gap/Roan Mtn (TN/NC); and Big Bald (TN/NC). Some examples may contain some *Phleum pratense* (timothy), but these should not be confused with *Phleum*- (timothy) dominated pastures or hayfields of anthropogenic origin at lower elevations (CEGL004018). Some examples may have tall herbs, *Rubus* (blackberry) spp., or other shrubs at less than 25% cover, perhaps confounding the determination and/or signature. [Note: non-native herbaceous communities are found in Section 4.] **10**

5a. Shrubland primarily composed of *Alnus viridis* ssp. *crispa* (mountain alder); this vegetation of limited distribution at and near Carvers Gap on Roan Mountain. Cover of *Alnus* (alder) usually >35%, but maybe 25% when mixed with *Rhododendron catawbiense* (Catawba rosebay); sometimes with *Rubus canadensis* (smooth blackberry) codominant. Other common species include *Vaccinium corymbosum* (highbush blueberry), *Vaccinium simulatum* (upland highbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), and *Crataegus* (hawthorn) spp. This community should be generously applied in this local area; there may be confusion with shrublands dominated by *Rhododendron catawbiense* (Catawba rosebay). ..... **Southern Appalachian Alder Bald (CEGL003891)**
[*Alnus viridis* ssp. *crispa / Carex pensylvanica* Shrubland]
5b. Shrubland dominated by ericaceous species (*Rhododendron* (rhododendron), *Vaccinium* (blueberry), etc.). **6**

6a. Primarily deciduous ericaceous shrublands **7**
6b. Primarily evergreen ericaceous shrublands. In the vicinity of Carvers Gap on Roan Mountain, there may be confusion with Southern Appalachian Alder Bald (CEGL003891), and a stand containing a mixture of *Alnus* (alder) and *Rhododendron* (rhododendron) spp. should be interpreted as CEGL003891 unless it is clearly dominated by *Rhododendron* (>75% cover). **8**

7a. Deciduous shrubland codominated by *Menziesia pilosa* (minniebush), stunted *Sorbus americana* (American mountain-ash), and either *Vaccinium simulatum* (upland highbush blueberry) or *Vaccinium erythrocarpum* (southern mountain cranberry), or both. Restricted to the Rogers - Whitetop massif of the southern VA Blue Ridge. Primarily associated with, and adjacent to, rock outcrops..... **Southern Appalachian Deciduous Heath Bald (CEGL004819)**
[*Menziesia pilosa - Vaccinium (erythrocarpum, simulatum, corymbosum) - Sorbus americana* Shrubland]
7b. Primarily deciduous to mixed shrubland dominated by *Vaccinium simulatum* (upland highbush blueberry) and *Rhododendron catawbiense* (Catawba rosebay), without *Menziesia pilosa* (minniebush) or *Sorbus americana* (American mountain-ash), not adjacent to or directly associated with rock outcrops (this vegetation seen at Grayson Highlands State Park, VA; could be present in other areas of the Rogers - Whitetop massif and other parts of the higher elevation (>1,370 m [4,500 feet]), Southern Blue Ridge as well. [Deciduous/mixed variant of]. ..... **Southern Appalachian Catawba Rosebay Heath Bald (CEGL003818)**
[*Rhododendron catawbiense* Shrubland]

8a. Shrub thicket composed almost entirely of *Rhododendron catawbiense* (Catawba rosebay). Other scattered trees and shrubs can include *Photinia melanocarpa* (black chokeberry), *Abies fraseri* (Fraser fir), and *Picea rubens* (red spruce). Generally higher elevation than CEGL003814. ..... **Southern Appalachian Catawba Rosebay Heath Bald (CEGL003818)**
[*Rhododendron catawbiense* Shrubland]
8b. *Rhododendron catawbiense* (Catawba rosebay) present, but occurring with other species including *Kalmia latifolia* (mountain laurel), *Rhododendron carolinianum* (Carolina azalea), *Gaylussacia baccata* (black huckleberry), *Pieris floribunda* (mountain fetterbush), *Vaccinium* (blueberry) spp., *Sorbus americana* (American mountain-ash), and *Leiophyllum buxifolium* (sand-myrtle). **9**

9a. Dense shrub thickets 1 to 4 m (3.3-13 feet) tall; mostly evergreen, but may have local dominance by deciduous shrubs. Dominant shrubs are *Kalmia latifolia* (mountain laurel), *Rhododendron catawbiense* (Catawba rosebay), *Gaylussacia baccata* (black huckleberry), *Pieris floribunda* (mountain fetterbush), or *Vaccinium corymbosum* (highbush blueberry). Sites are southerly exposed ridges and steep slopes typically below 1,525 m (5,000 feet) elevation. ..... **Southern Appalachian Mountain Laurel Bald (CEGL003814)**
[*Kalmia latifolia - Rhododendron catawbiense - (Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum)* Shrubland]
9b. Open to dense shrub-dominated vegetation 0.5 to 4 m (0.6-3.3 feet) tall. Dominant shrubs include *Rhododendron carolinianum* (Carolina azalea), *Rhododendron catawbiense* (Catawba rosebay), and *Leiophyllum buxifolium* (sand-myrtle); also *Vaccinium corymbosum* (highbush blueberry), *Vaccinium simulatum* (upland highbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry). Sites are typically above 1,525 m (5,000 feet) elevation, in the spruce-fir zone. ..... **Southern Appalachian Heath Bald (CEGL007876)**
[*Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium* Shrubland]

10a. Natural grassy bald type, usually with a high percentage of *Danthonia compressa* (flattened oatgrass), which will be more-or-less evident depending on the season of the year. Other native species that may be present include *Sibbaldiopsis tridentata* (shrubby fivefingers), *Angelica triquinata* (filmy angelica), *Oclemena acuminata* (whorled wood aster), *Carex pensylvanica* (Pennsylvania sedge), other *Carex* (sedge) spp., *Gentiana austromontana* (Appalachian gentian), *Gentianella quinquefolia* (agueweed), *Houstonia serpyllifolia* (thymeleaf bluet), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Packera schweinitziana* (Schweinitz's ragwort), *Potentilla canadensis* (dwarf cinquefoil), *Prenanthes roanensis* (Roan Mountain rattlesnakeroot), *Solidago bicolor* (white goldenrod), *Solidago glomerata* (clustered goldenrod), and *Stachys clingmanii* (Clingman's hedgenettle). ..... **Grassy Bald (Southern Grass Type) (CEGL004242)**
[*Danthonia compressa - (Sibbaldiopsis tridentata)* Grassland]
10b. Less common grassy bald type, with similar species as CEGL004242 but with *Carex pensylvanica* (Pennsylvania sedge) dominant. Small patches (below MMU) of *Carex* (sedge) may represent inclusions. (Not all *Carex* is *Carex pensylvanica*). ..... **Grassy Bald (Sedge Type) (CEGL004094)**
[*Carex pensylvanica* Grassland]

11a. Cliff sparse vegetation characterized by *Asplenium montanum* (mountain spleenwort) and *Heuchera villosa* (hairy alumroot); mosses and lichens abundant; occurring on felsic, metamorphic and igneous vertical rock faces and cliffs. ..... **Appalachian Felsic Cliff (CEGL004980)**
[*Asplenium montanum - Heuchera villosa* Felsic Cliff Sparse Vegetation]
11b. Herbaceous rocky summit vegetation..... **12**

12a. Found above 1,810 m (5,940 feet) elevation. ..... **Southern Appalachian High-Elevation Rocky Summit (High Peak Type) (CEGL004277)**
[*Saxifraga michauxii - Carex misera - Oclemena acuminata - Solidago glomerata* Grassland]
12b. Found between 1,065 and 1,810 m (3,500-5,940 feet) elevation ..... **Southern Appalachian High-Elevation Rocky Summit (Typic Type) (CEGL004279)**
[*Saxifraga michauxii - Carex misera - Danthonia spicata - Krigia montana* Grassland]

13a. Rooting substrate contains less than 50% and usually less than 10% surface rocks and boulders; well-developed soil layer present. Canopy composed of *Crataegus* (hawthorn) spp., possibly mixed with some combination of *Quercus rubra* (northern red oak), *Betula alleghaniensis* (yellow birch), *Prunus pensylvanica* (pin cherry), and/or *Aesculus flava* (yellow buckeye). Ruderal Forest or shrubland of moderate stature (5-15 m). [Note: some examples of High-Elevation Red Oak Forest (Tall Herb Type) (CEGL007298) may have a *Crataegus* (hawthorn) understory.] ..... **Southern & Central Appalachian Ruderal Hawthorn Forest (CEGL004184)**
[*Crataegus punctata - Crataegus flabellata* Ruderal Forest]
13b. Rooting substrate contains greater than 50% surface rocks and boulders; well-developed soil layer present or absent; boulderfields, rocky woodlands, and shrubby exfoliation domes..... **14**

14a. Boulderfields (open canopy [woodland]) examples. Rooting substrate composed of large rocks and boulders with very little soil development. Canopy includes mesophytic species including *Aesculus flava* (yellow buckeye), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), *Tilia americana* (American basswood), etc. *Crataegus* (hawthorn) spp. not dominant **15**
14b. Rocky woodlands or herbaceous/shrubby exfoliation domes..... **16**

15a. Typically occurring above 1,220 m (4,000 feet) elevation. Canopy strongly dominated by *Betula alleghaniensis* (yellow birch). Other species that may form a minor canopy component include *Aesculus flava* (yellow buckeye), *Prunus pensylvanica* (pin cherry), and *Sorbus americana* (American mountain-ash). ..... **Southern Appalachian Boulderfield Forest (Currant & Rockcap Fern Type) (CEGL006124)**
[*Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum* Forest]

15b. Typically occurring below 1,220 m (4,000 feet) elevation. Canopy more diverse. Typically dominated by *Betula alleghaniensis* (yellow birch) and *Aesculus flava* (yellow buckeye) with associates including *Betula lenta* (sweet birch) and *Tilia americana* (American basswood). Common shrubs and subcanopy trees are *Acer spicatum* (mountain maple), *Hydrangea arborescens* (wild hydrangea), *Euonymus obovatus* (running strawberry-bush), and *Ribes* (currant) spp. ..... **Southern Appalachian Hardwood Rich Boulderfield Forest (CEGL004982)**
[*Betula alleghaniensis - Tilia americana* var. *heterophylla / Acer spicatum / Ribes cynosbati / Dryopteris marginalis* Forest]

16a. Rocky woodlands **or** herbaceous/shrubby exfoliation domes whose stands have presence of (but not necessarily dominance by) circumneutral indicator taxa such as *Carya* (hickory) species, *Philadelphus hirsutus* (streambank mock orange), *Ostrya virginiana* (hophornbeam), *Acer leucoderme* (chalk maple), *Cornus florida* (flowering dogwood), *Celtis tenuifolia* (dwarf hackberry), *Staphylea trifolia* (American bladdernut), *Cercis canadensis* (eastern redbud), and *Chionanthus virginicus* (white fringetree). Dominants may include *Pinus virginiana* (Virginia pine), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), *Juniperus virginiana* var. *virginiana* (eastern red-cedar), *Pinus virginiana* (Virginia pine), and *Acer rubrum* (red maple). **17**

16b. Rocky woodlands, dominated by hardwoods, pines, or a variable mixture of these. Dominants include *Pinus virginiana* (Virginia pine), *Pinus pungens* (Table Mountain pine), *Pinus rigida* (pitch pine), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), *Kalmia latifolia* (mountain laurel), *Vaccinium stamineum* (deerberry), and *Vaccinium pallidum* (Blue Ridge blueberry). Some examples have *Quercus ilicifolia* (bear oak). Stands lack circumneutral indicator taxa such as *Carya* (hickory) spp., *Philadelphus hirsutus* (streambank mock orange), *Ostrya virginiana* (hophornbeam), *Acer leucoderme* (chalk maple), *Cornus florida* (flowering dogwood), *Celtis tenuifolia* (dwarf hackberry), *Staphylea trifolia* (American bladdernut), *Cercis canadensis* (eastern redbud), and *Chionanthus virginicus* (white fringetree). **18**

17a. Granitic exfoliation domes. Trees are at low cover (generally below 35%), and may be scattered individuals or small patches. Vegetation consists primarily of lichens on bare rock, or of shallow mats generally dominated by *Selaginella rupestris* (northern selaginella). Other characteristic herbaceous species are *Baptisia tinctoria* (horseflyweed), *Cheilanthes lanosa* (hairy lipfern), *Coreopsis major* (greater tickseed), *Corydalis sempervirens* (rock harlequin), *Danthonia sericea* (downy danthonia), *Lindernia monticola* (piedmont false pimpernel), *Phlox nivalis* (trailing phlox), *Schizachyrium scoparium* (little bluestem), *Scleria triglomerata* (whip nutrush), and *Talinum teretifolium* (quill fameflower). Woody species are scattered but may include *Carya pallida* (sand hickory), *Chionanthus virginicus* (white fringetree), *Fraxinus americana* (white ash), *Juniperus virginiana* (eastern red-cedar), *Kalmia latifolia* (mountain laurel), *Pinus rigida* (pitch pine), and *Quercus prinus* (chestnut oak). ..... **Appalachian Low-Elevation Granitic Dome (CEGL007690)**
[*Selaginella rupestris - Schizachyrium scoparium - Hypericum gentianoides - Bulbostylis capillaris* Rocky Grassland]

17b. Rocky woodlands over mafic biotite gneiss or calcareous shale geology of northeast GA, primarily dominated by trees, perhaps in heterogeneous patches, typically with canopy density from 35-60%, with some instances of higher and lower densities. **19**

18a. Vegetation associated with mafic biotite gneiss geology with veins of base-rich hornblende gneiss. Canopy composed of scattered *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), *Quercus prinus* (chestnut oak), *Ostrya virginiana* (hophornbeam), and *Chionanthus virginicus* (white fringetree). *Juniperus virginiana* (eastern red-cedar) is frequent but not always present. Shrubs are scattered and may include *Ptelea trifoliata* (common hoptree), *Physocarpus opulifolius* (common ninebark), *Hypericum prolificum* (shrubby St. John's-wort), *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Lonicera flava* (yellow honeysuckle), *Amelanchier sanguinea* (roundleaf serviceberry), and *Rosa carolina* (Carolina rose). ....**Montane Basic Hardwood - Red-cedar Woodland (CEGL003752)**
[*Carya (glabra, alba) - Fraxinus americana - (Juniperus virginiana* var. *virginiana)* Woodland]
18b. Deciduous or mostly deciduous small-patch, rocky woodlands on shale, typically dominated by *Quercus prinus* (chestnut oak), *Juniperus virginiana* var. *virginiana* (eastern red-cedar), *Pinus virginiana* (Virginia pine), and *Acer rubrum* (red maple). Some stands have *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Carya carolinae-septentrionalis* (southern shagbark hickory), and *Fraxinus americana* (white ash). Typical shrubs include *Philadelphus hirsutus* (streambank mock orange) and *Ostrya virginiana* (hophornbeam). Other shrubs and small trees may include *Acer leucoderme* (chalk maple), *Cornus florida* (flowering dogwood), *Celtis tenuifolia* (dwarf hackberry), *Staphylea trifolia* (American bladdernut), *Cercis canadensis* (eastern redbud), *Chionanthus virginicus* (white fringetree), *Ulmus rubra* (slippery elm), *Ptelea trifoliata* (common hoptree), and *Symphoricarpos orbiculatus* (coralberry). ....**Blue Ridge Calcareous Shale Slope Woodland (CEGL007720)**
[*Quercus prinus - Juniperus virginiana - (Pinus virginiana) / Philadelphus hirsutus - Celtis occidentalis* Woodland]

19a. Canopy dominated by *Pinus pungens* (Table Mountain pine) and/or *Pinus rigida* (pitch pine), possibly with *Pinus virginiana* (Virginia pine), but this not dominant. Characteristic shrubs include *Kalmia latifolia* (mountain laurel), *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), *Lyonia ligustrina* var. *ligustrina* (maleberry), and *Vaccinium stamineum* (deerberry). Southern Appalachian examples are generally found above 610 m (2,000 feet) elevation. .....**Blue Ridge Table Mountain Pine - Pitch Pine Woodland (Typic Type) (CEGL007097)**
[*Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland]
19b. Canopy primarily dominated by *Pinus virginiana* (Virginia pine), with *Quercus prinus* (chestnut oak) and *Quercus rubra* (northern red oak) sometimes present. Generally found below 610 m (2,000 feet) elevation. Canopy 5-25 m tall, 25-75% cover. **20**

20a. Canopy primarily dominated by *Pinus virginiana* (Virginia pine), with *Quercus prinus* (chestnut oak) and *Quercus rubra* (northern red oak) sometimes present in substantial numbers in less extreme habitats. The shrub layer is very sparse and may include scattered individuals of *Kalmia latifolia* (mountain laurel), *Vaccinium stamineum* (deerberry), and *Vaccinium pallidum* (Blue Ridge blueberry). This should be a distinctive community on a distinctive substrate, with a stunted canopy, with a sparse herb and shrub strata, and characterized by species able to grow in loose shale fragments..... **Blue Ridge Acidic Shale Woodland (CEGL003624)**
[*Pinus virginiana / Vaccinium pallidum / Schizachyrium scoparium - Carex pensylvanica* Woodland]
20b. Very rare dry pine woodland / low density forest, primarily dominated by *Pinus virginiana* (Virginia pine), with at least 10% cover of diverse herbs with dry woodland species such as *Schizachyrium scoparium* (little bluestem), *Tephrosia virginiana* (Virginia tephrosia), *Solidago odora* (anise-scented goldenrod), etc. ....**Appalachian Low-Elevation Mixed Pine / Little Bluestem Forest (CEGL008500)**
[*Pinus virginiana - (Pinus rigida, Pinus pungens) / Schizachyrium scoparium* Forest]

6. Mesophytic Hardwoods and Rich Mesic Forests

1a. Boulderfields: rooting substrate composed of large rocks and boulders with very little soil development. Canopy includes mesophytic species including *Aesculus flava* (yellow buckeye), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), *Tilia americana* (American basswood), etc. **[Southern Appalachian Northern Hardwoods]** **2**
1b. Rooting substrate contains less than 50% and usually less than 10% surface rocks and boulders; well-developed soil layer present, canopy various. **[Three Choices]** **3**

2a. Typically occurring above 1,220 m (4,000 feet) elevation. Canopy strongly dominated by *Betula alleghaniensis* (yellow birch). Other species that may form a minor canopy component include *Aesculus flava* (yellow buckeye), *Prunus pensylvanica* (pin cherry), and *Sorbus americana* (American mountain-ash). ..... **Southern Appalachian Boulderfield Forest (Currant & Rockcap Fern Type) (CEGL006124)**
[*Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum* Forest**]**
2b. Typically occurring below 1,220 m (4,000 feet) elevation. Canopy more diverse. Typically dominated by *Betula alleghaniensis* (yellow birch) and *Aesculus flava* (yellow buckeye) with associates including *Betula lenta* (sweet birch) and *Tilia americana* (American basswood). Common shrubs and subcanopy trees are *Acer spicatum* (mountain maple), *Hydrangea arborescens* (wild hydrangea), *Euonymus obovatus* (running strawberry-bush), and *Ribes* (currant) spp. ..... **Southern Appalachian Hardwood Rich Boulderfield Forest (CEGL004982)**
[*Betula alleghaniensis - Tilia americana* var. *heterophylla / Acer spicatum / Ribes cynosbati / Dryopteris marginalis* Forest]

3a. Canopy composed of *Crataegus* (hawthorn) spp., possibly mixed with some combination of *Quercus rubra* (northern red oak), *Betula alleghaniensis* (yellow birch), *Prunus pensylvanica* (pin cherry), and/or *Aesculus flava* (yellow buckeye). Forest or shrubland of moderate stature (5-15 m). [Note: some examples of High-Elevation Red Oak Forest (Tall Herb Type) (CEGL007298) may have a *Crataegus* (hawthorn) understory.] ..... **Southern & Central Appalachian Ruderal Hawthorn Forest (CEGL004184)**
[*Crataegus punctata - Crataegus flabellata* Ruderal Forest]
3b. Canopy typically dominated (or nearly so) by *Quercus rubra* (northern red oak) or occasionally by *Quercus alba* (white oak) in the case of CEGL007692. Greater than 50% oak cover in canopy..... **4**
3c. Forest dominated by *Betula alleghaniensis* (yellow birch) and/or *Fagus grandifolia* (American beech) and/or *Aesculus flava* (yellow buckeye), or an herbaceous wetland. Canopy dominated neither by *Quercus rubra* (northern red oak) nor by *Crataegus* (hawthorn) spp.; oaks represent less than 50% of canopy cover. [Southern Appalachian Red Oak Forest (CEGL007878) keys out below here, and may be oak-dominated, despite the "less than 50% canopy cover" of oak statement above. This type keys in two places to accommodate this variation.] **[Northern Hardwood Forests]** **8**

4a. *Quercus rubra* (northern red oak) forest in sheltered coves with *Fraxinus americana* (white ash) and/or *Tilia americana* (American basswood); may also contain *Halesia* (silverbell), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech); rich and diverse herbaceous layer. Some examples may be codominated by white ash. Elevation primarily 915 to 1,220 m (3,000-4,000 feet (sometimes up to 1,430 m [4,700 feet]) and sometimes higher. Found from the Smokies south into GA. [This keys in two places to accommodate variation.] ..... **Southern Appalachian Red Oak Cove Forest (CEGL007878)**
[*Quercus rubra - Tilia americana* var. *heterophylla - (Halesia tetraptera* var. *monticola) / Collinsonia canadensis - Prosartes lanuginosa* Forest]

4b. High-elevation *Quercus rubra* (northern red oak) forests with less diverse canopies than cove forests (generally more than 75%, but sometimes down to 50%, *Quercus rubra* (northern red oak)). Elevation above 1,065 m (3,500 feet) in NC, 945 m (3,100 feet) in VA.
[Southern Appalachian Montane Oak Forests] **5**

5a. Mid- to high-elevation *Quercus alba* (white oak)-dominated (generally greater than 50%) forests, often mixed with other *Quercus* (oak) spp. Community found from about 610 to 1,370 m (2,000-4,500 feet) elevation, composed of 25-75% *Quercus alba* (white oak), often with some *Castanea dentata* (American chestnut) and *Quercus rubra* (northern red oak) usually present. Diverse, well-developed herbaceous layer and deep soils with species such as *Podophyllum peltatum* (mayapple) and *Collinsonia canadensis* (richweed). Intergrades with higher elevation oak forests. ..... **Appalachian Montane Oak - Hickory Forest (Rich Type) (CEGL007692)**
[*Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest]

5b. Dominated by *Quercus rubra* (northern red oak) and not *Quercus alba* (white oak). **6**

6a. Less than 20% shrub cover, and well-developed herb layer dominated by *Carex pensylvanica* (Pennsylvania sedge), *Ageratina altissima* var. *roanensis* (white snakeroot), *Eurybia chlorolepis* (mountain aster), *Angelica triquinata* (filmy angelica), and/or *Oclemena acuminata* (whorled wood aster). Stands can be stunted, reduced in height by harsh weather. Some examples may have a *Crataegus* (hawthorn) understory [see CEGL004184 for *Crataegus*-(hawthorn) dominated stands]..... **High-Elevation Red Oak Forest (Tall Herb Type) (CEGL007298)**
[*Quercus rubra / Carex pensylvanica - Ageratina altissima* var. *roanensis* Forest]

6b. Greater than 20% shrub cover, and herb layer less well-developed and lacking species listed above. **7**

7a. Shrub layer mainly deciduous shrubs. ..... **Southern Appalachian High-Elevation Red Oak Forest (Deciduous Shrub Type) (CEGL007300)**
[*Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis)* Forest]

7b. Shrub layer mainly evergreen, greater than 20%, usually about 100% *Rhododendron* (rhododendron) and/or *Kalmia latifolia* (mountain laurel). ..... **Southern Appalachian High-Elevation Red Oak Forest (Evergreen Shrub Type) (CEGL007299)**
[*Quercus rubra / (Kalmia latifolia, Rhododendron catawbiense, Rhododendron maximum) / Galax urceolata* Forest]

8a. Canopy entirely dominated (or nearly so) by *Fagus grandifolia* (American beech). Stands found above 1,370 m (4,500 feet) elevation. Indicator species include *Poa alsodes* (grove bluegrass), *Luzula* (woodrush) spp. Common species include *Fagus grandifolia* (American beech), *Ageratina altissima* (white snakeroot), *Carex pensylvanica* (Pennsylvania sedge), *Arisaema triphyllum* (Jack in the pulpit), *Luzula* (woodrush) spp., *Solidago curtisii* (mountain decumbent goldenrod), *Viola* (violet) spp., *Aesculus flava* (yellow buckeye). ..... **Southern Appalachian Beech Gap (CEGL006130)**
[*Fagus grandifolia / Carex pensylvanica - Ageratina altissima* var. *roanensis* Forest]
8b. Canopy not entirely dominated by *Fagus grandifolia* (American beech). Elevations various **9**

9a. Elevation usually greater than 1,100 m (3,600 feet), but as low as 975 m (3,200 feet) in some cases. Canopy codominated by *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), and *Aesculus flava* (yellow buckeye). Indicator species include *Viburnum lantanoides* (hobblebush), *Prunus serotina* (black cherry), *Allium burdickii* (narrowleaf wild leek). Common species include *Betula alleghaniensis* (yellow birch), *Ageratina altissima* (white snakeroot), *Fagus grandifolia* (American beech), *Acer pensylvanicum* (striped maple), *Acer saccharum* (sugar maple). **10**
9b. Elevation generally below 1,100 m (3,600 feet), though sometimes as high as 1,220-1,370 m (4,000-4,500 feet). Canopy variously codominated by *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Liriodendron tulipifera* (tuliptree), *Betula lenta* (sweet birch), *Tilia americana* (American basswood); particularly var. *heterophylla* (Appalachian basswood), *Fraxinus americana* (white ash), *Quercus rubra* (northern red oak), *Halesia tetraptera* var. *monticola* (mountain silverbell), *Prunus serotina* (black cherry). Common species include *Arisaema triphyllum* (Jack in the pulpit), *Caulophyllum thalictroides* (blue cohosh), *Actaea racemosa* (black baneberry), *Laportea canadensis* (Canadian woodnettle), *Prosartes lanuginosa* (yellow fairybells), and *Viola* (violet) spp. **[Central and Southern Appalachian Cove Forests]** **14**

10a. Wetland or seep within matrix of cove or northern hardwood forests. ..... **Key to SBR Keys #2**
10b. Mesic forest, but not a wetland. **11**

11a. Mixed northern hardwood forest, with or without *Tsuga canadensis* (eastern hemlock), at elevations of 1,035 to 1,525 (1,585) m (3,400-5,000 (5,200) feet); with a strong *Betula alleghaniensis* (yellow birch) component over a dense *Rhododendron* (rhododendron) cover and few herbs. *Picea rubens* (red spruce) may be a component. ..... **Blue Ridge Hemlock - Northern Hardwood Forest (CEGL007861)**
[*Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest]
11b. Primarily deciduous forest (northern hardwoods and a possibly related type of ambiguous origin); common species include *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Acer pensylvanicum* (striped maple); the 'possibly related type' will include *Betula lenta* (sweet birch), *Magnolia fraseri* (mountain magnolia), *Nyssa sylvatica* (blackgum), and *Oxydendrum arboreum* (sourwood) **12**

12a. Forest which may resemble a northern hardwoods forest, but its highly variable stands are composed of larger and older specimens of transgressive subcanopy ("successional") species. Canopy dominated by some combination of *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Magnolia fraseri* (mountain magnolia), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), and *Betula alleghaniensis* (yellow birch), but not strongly dominated by yellow birch. Shrub species are primarily evergreen, and *Kalmia latifolia* (mountain laurel) and *Rhododendron maximum* (great

laurel) can be very dense. Oak may be present in the canopy, but generally at less than 25% cover. Found on midslopes and saddles of various aspects and of varying topographic complexity. These stands are thought to have originated from episodes of logging and/or fire, but not severe soil disturbance such as cultivation or site clearing. This community may have originally been dominated by *Castanea dentata* (American chestnut) until its decline due to chestnut blight. This released the other hardwood species in the understory, resulting in this composition. In higher elevation examples, this community may be a long-term postdisturbance example of Southern Appalachian Northern Hardwood Forest (Typic Type) (CEGL007285). ..... **Southern Appalachian Ruderal Acidic Mixed Hardwood Forest (CEGL008558)**

[*Acer rubrum* var. *rubrum - Betula lenta - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Ruderal Forest]

12b. True northern hardwoods forests, lacking dominance by successional species. Dominance or codominance by *Betula alleghaniensis* (yellow birch) is typical. **13**

13a. Rich mesic herbaceous layer approaching that of a cove forest. Canopy usually divided among *Betula alleghaniensis* (yellow birch), *Aesculus flava* (yellow buckeye), and *Acer saccharum* (sugar maple); also with *Fraxinus americana* (white ash) and *Tilia americana* var. *heterophylla* (Appalachian basswood). Sometimes intergrades with rich coves around 1,065 to 1,220 m (3,500-4,000 feet) elevation. Species indicative of high base status include *Caulophyllum thalictroides* (blue cohosh), *Actaea racemosa* (black baneberry), *Collinsonia canadensis* (richweed), *Laportea canadensis* (Canadian woodnettle), and *Campanulastrum americanum* (American bellflower). ..... **Southern Appalachian Northern Hardwood Forest (Rich Type) (CEGL004973)**

[*Aesculus flava - Betula alleghaniensis - Acer saccharum / Caulophyllum thalictroides - Actaea podocarpa* Forest]

13b. Less diverse herbaceous layer, lacking high base indicators mentioned above. Stands tend to be dominated by *Betula alleghaniensis* (yellow birch) with smaller amounts of *Fagus grandifolia* (American beech), *Aesculus* (buckeye), and *Acer saccharum* (sugar maple) in canopy. This type tends to be more common than CEGL004973. Indicator species include *Viburnum lantanoides* (hobblebush), *Ageratina altissima* var. *roanensis* (white snakeroot), *Eurybia chlorolepis* (mountain aster), *Athyrium filix-femina* ssp. *asplenioides* (asplenium ladyfern), *Carex pensylvanica* (Pennsylvania sedge), *Solidago curtisii* (mountain decumbent goldenrod). [Note: some stands may appear "mixed," with some *Picea rubens* (red spruce) in the subcanopy or as a canopy component.] ..... **Southern Appalachian Northern Hardwood Forest (Typic Type) (CEGL007285)**

[*Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides / Eurybia chlorolepis - Dryopteris intermedia* Forest]

14a. Mesic forest with a canopy containing *Quercus rubra* (northern red oak) ranging from 10-25% cover (a significant component but not dominant); on sheltered slopes or coves with *Fraxinus americana* (white ash) and/or *Tilia americana* (American basswood); may also contain *Halesia* (silverbell), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech); rich and diverse herbaceous layer. Some examples may be codominated by white ash. Elevation 915-1,220 (1,430) m (3,000-4,000 [4,700] feet) and sometimes higher. Found from the Smokies south into GA. (This keys in two places to accommodate variations.) ..... **Southern Appalachian Red Oak Cove Forest (CEGL007878)**

[*Quercus rubra - Tilia americana* var. *heterophylla - (Halesia tetraptera* var. *monticola) / Collinsonia canadensis - Prosartes lanuginosa* Forest]

14b. Mesic forest with a canopy containing *Acer saccharum* (sugar maple), *Tilia americana* (American basswood), *Aesculus flava* (yellow buckeye), *Prunus serotina* (black cherry), and *Fraxinus americana* (white ash), possibly with *Liriodendron tulipifera* (tuliptree)..... **15**

15a. Cove forest, canopy generally including *Liriodendron tulipifera* (tuliptree), its coverage highly variable, often 40%, but sometimes close to 100%. Also with *Fraxinus americana* (white ash), *Tilia americana* var. *heterophylla* (Appalachian basswood), *Aesculus flava* (yellow buckeye), and *Magnolia acuminata* (cucumber-tree). Indicator species can include *Carya cordiformis* (bitternut hickory), *Trillium vaseyi* (sweet wakerobin), *Galearis spectabilis* (showy orchid), *Sanicula canadensis* (Canadian black-snakeroot), and *Phegopteris hexagonoptera* (broad beechfern). Mean elevation ca. 750 m (2,460 feet)..... **Southern Appalachian Rich Cove Forest (Typic Type) (CEGL007710)**
[*Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest]

15b. Canopy diverse, often with *Acer saccharum* (sugar maple), *Tilia americana* (American basswood); particularly var. *heterophylla* (Appalachian basswood), *Aesculus flava* (yellow buckeye), *Prunus serotina* (black cherry), and *Fraxinus americana* (white ash) all as part of canopy. Extremely diverse and rich herbaceous layer. Indicator species (including calciphiles) can include *Hydrophyllum canadense* (bluntleaf waterleaf), *Asplenium rhizophyllum* (walking fern), *Asarum canadense* (Canadian wildginger), *Cystopteris* (bladderfern) sp., and *Hepatica nobilis* var. *acuta* (sharp-lobe hepatica). Mean elevation ca. 1,000 m (3,280 feet). This association does not list *Liriodendron tulipifera* (tuliptree) as a component, but it is found within the elevational range of tuliptree. ..... **Southern Appalachian Rich Cove Forest (Montane Calcareous Type) (CEGL007695)**
[*Aesculus flava - Acer saccharum - (Tilia americana* var. *heterophylla) / Hydrophyllum canadense - Solidago flexicaulis* Forest]

7. Spruce and Fir Forests

1a. Primarily evergreen tree canopy, at least 75% cover by evergreen needle-leaved trees [e.g., *Abies fraseri* (Fraser fir) and/or *Picea rubens* (red spruce)]. **2**
1b. Mixed evergreen-deciduous tree canopy, from 25% to 50% cover by evergreen needle-leaved trees [e.g., *Abies* (fir) and/or *Picea* (spruce)] and from 25% to 50% cover by deciduous broad-leaved trees [e.g., *Betula* (birch) and/or *Aesculus flava* (yellow buckeye) or other species). **6**

2a. Mostly evergreen shrub layer..... **3**
2b. Deciduous shrub layer present or shrub layer dominated by spruce or fir, diverse herb layer present with *Oxalis montana* (mountain woodsorrel), *Athyrium filix-femina* ssp. *asplenioides* (asplenium ladyfern), *Dryopteris campyloptera* (mountain woodfern), *Clintonia borealis* (bluebead), *Oclemena acuminata* (whorled wood aster), and *Eurybia chlorolepis* (mountain aster) common. **5**

3a. *Picea rubens* (red spruce) sometimes with *Tsuga canadensis* (eastern hemlock); moist protected slope forests with as shrub layer dominated by *Rhododendron maximum* (great laurel). ..... **Red Spruce Forest (Protected Slope Type) (CEGL006152)**
[*Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest]
3b. *Abies fraseri* (Fraser fir) present..... **4**

4a. *Rhododendron catawbiense* (Catawba rosebay) and *Rhododendron maximum* (great laurel) (>75% cover of evergreens); occurring at a broad range of elevations within the spruce-fir zone (above 1,555 m [5,100 feet]) dominated by *Abies fraseri* (Fraser fir) and/or *Picea rubens* (red spruce). ..... **Red Spruce - Fraser Fir Forest (Evergreen Shrub Type) (CEGL007130)**
[*Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum)* Forest]
4b. *Abies fraseri* (Fraser fir) dominant, occurring over a shrub stratum dominated by evergreen species, typically *Rhododendron catawbiense* (Catawba rosebay), *Rhododendron maximum*, and *Rhododendron carolinianum* (Carolina azalea). ..... **Fraser Fir Forest (Evergreen Shrub Type) (CEGL006308)**
[*Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest]

5a. Occurring at lower elevations within the spruce-fir zone (1,675-1,890 m [5,500-6,200 feet]) and more strongly dominated by *Picea rubens* (red spruce), usually on slightly more sheltered sites. ..... **Red Spruce - Fraser Fir Forest (Deciduous Shrub Type) (CEGL007131)**
[*Picea rubens - (Abies fraseri) / Vaccinium erythrocarpum / Dryopteris campyloptera / Hylocomium splendens* Forest]
5b. Occurring at highest elevations (above 1,830 m [6,000 feet]) and in areas formerly strongly dominated by *Abies fraseri* (Fraser fir), now with many standing and dead trees, occurring as isolated islands on exposed summits, usually with heavy fir regeneration. Some stands are so dense they have no herb layer. ..... **Fraser Fir Forest (Deciduous Shrub Type) (CEGL006049)**
[*Abies fraseri / Viburnum lantanoides / Dryopteris campyloptera - Oxalis montana / Hylocomium splendens* Forest]

6a. Canopy composed of *Picea rubens* (red spruce) with *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), and *Aesculus flava* (yellow buckeye). Shrub stratum open to absent; herbaceous stratum well-developed, may be lush and diverse. Typical herbs include *Oclemena acuminata* (whorled wood aster), *Carex pensylvanica* (Pennsylvania sedge), *Dryopteris campyloptera* (mountain woodfern), *Dryopteris intermedia* (intermediate woodfern), *Maianthemum canadense* (Canada mayflower), *Oxalis montana* (mountain woodsorrel), and others. ....**Red Spruce - Northern Hardwood Forest (Herb Type) (CEGL006256)**
[*Picea rubens - (Betula alleghaniensis, Aesculus flava) / Viburnum lantanoides / Solidago glomerata* Forest]

6b. Canopy composed of *Picea rubens* (red spruce) with *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), and *Aesculus flava* (yellow buckeye). Shrub layer well-developed, dominated by *Rhododendron maximum* (great laurel) or *Rhododendron catawbiense* (Catawba rosebay). In the Great Smoky Mountains, *Leucothoe fontanesiana* (highland doghobble) can be dominant. .....**Red Spruce - Northern Hardwood Forest (Shrub Type) (CEGL004983)**
[*Picea rubens - (Betula alleghaniensis, Aesculus flava) / Rhododendron (maximum, catawbiense)* Forest]

8. Dry - Subxeric Forests and Woodlands

1a. Stands with trees present to dominant, from 60% to 100% cover (forests), found at a variety of elevations **2**
1b. Stands with trees present to dominant at low to moderate cover 25% to 60% cover; rocky woodlands dominated by pines, oaks or other hardwoods; or boulderfields (woodland phases of these associations). Found at middle- to lower-elevations generally below 1,220 m (4,000 feet) elevation.... ..... **12**

2a. Evergreen or mixed forests dominated by *Tsuga caroliniana* (Carolina hemlock). Indicator species include *Tsuga caroliniana* (Carolina hemlock), *Goodyera repens* (lesser rattlesnake-plantain), *Leucothoe recurva* (red-twig doghobble), *Rhododendron carolinianum* (Carolina azalea), *Rhododendron minus* (piedmont rhododendron), *Rhododendron maximum* (great laurel), *Rhododendron catawbiense* (Catawba rosebay), *Betula lenta* (sweet birch), *Hexastylis* (heartleaf) spp., *Polypodium appalachianum* (Appalachian polypody), *Trillium undulatum* (painted trillium), *Clethra acuminata* (mountain sweet-pepperbush), *Hamamelis virginiana* (American witch-hazel). Other common species include *Kalmia latifolia* (mountain laurel), *Sassafras albidum* (sassafras), *Galax urceolata* (beetleweed). **3**
2b. Evergreen or mixed forests dominated by *Pinus* (pine) spp. with or without xerophytic deciduous oak species, **or** deciduous forests dominated by (dry-mesic) dry to subxeric *Quercus* (oak) species. **[Southern Appalachian Montane Pine Forests and Woodlands]** **4**

3a. Open shrub layer; canopy dominated by *Tsuga caroliniana* (Carolina hemlock), with codominance of *Pinus* (pine) spp. and some dry-site oaks and hardwoods. The canopy varies from closed to open depending on disturbance history and environment, and the shrub layer is patchy to open, with *Rhododendron minus* (piedmont rhododendron), *Vaccinium pallidum* (Blue Ridge blueberry), and *Gaultheria procumbens* (eastern teaberry). .... **Carolina Hemlock Forest (Pine Type) (CEGL006178)**
[*Tsuga caroliniana - Pinus (rigida, pungens, virginiana)* Forest]
3b. Dense ericaceous shrub layer, canopy dominated by *Tsuga caroliniana* (Carolina hemlock), with little or no pines; (*Quercus prinus* (chestnut oak), *Quercus alba* (white oak), and/or *Quercus rubra* (northern red oak) may be present). Shrub strata tend to be dense and dominated by ericaceous species such as *Kalmia latifolia* (mountain laurel), *Rhododendron catawbiense* (Catawba rosebay), and *Rhododendron minus* (piedmont rhododendron). .... **Carolina Hemlock Forest (Typic Type) (CEGL007139)**
[*Tsuga caroliniana / Kalmia latifolia - Rhododendron catawbiense* Forest]

4a. Canopy dominated largely by dry to subxeric *Quercus* (oak) species..... **5**
4b. Canopy dominated by or including substantial cover by *Pinus* (pine) species..... **7**

5a. Primarily Southern Appalachian forest; canopy dominated largely by dry to subxeric oak species, primarily *Quercus prinus* (chestnut oak) or *Quercus coccinea* (scarlet oak), sometimes *Quercus alba* (white oak), usually (not always) occurring over a nearly completely closed shrub layer of *Kalmia latifolia* (mountain laurel), located on upper slopes and exposed ridgetops. .... **Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271)**
[*Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest]

5b. Frequent in the Central Appalachians, ranging south almost to the VA-NC line; a north- or northwest-facing oak forest occurring on convex, upper slopes, cliff tops, and spur crests at elevations from 305 to over 975 m (1,000-3,200 feet) dominated by *Quercus prinus* (chestnut oak) with dense cover of *Rhododendron catawbiense* (Catawba rosebay). This is an exceptionally species-poor, open- to closed-canopy, forest of often stunted (<10 m tall), gnarled trees over a dense evergreen tall-shrub layer..... .....**Central Appalachian Chestnut Oak / Catawba Rosebay Forest (CEGL008524)**
[*Quercus prinus / Rhododendron catawbiense* - *Kalmia latifolia* Forest]

6a. Canopy trees include a mixture of *Pinus strobus* (eastern white pine) (greater than or equal to 25% cover), with *Quercus* (oak) spp. and other hardwoods. **7**
6b. Canopy trees include pines generally associated with subxeric to dry forests (southern yellow pines), especially *Pinus echinata* (shortleaf pine), *Pinus virginiana* (Virginia pine), *Pinus rigida* (pitch pine), and *Pinus pungens* (Table Mountain pine). Pine cover in these communities should be at least 50% (possibly lower [40%] overall in a large heterogeneous mixed stand). These pines require more relative dominance rather than being indicator species by their presence at low cover. *Pinus strobus* (eastern white pine) may be present at low cover, but is not an indicator of this type. **8**

7a. Natural mixed-age forest, canopy trees include a mixture of *Pinus strobus* (eastern white pine), *Quercus coccinea* (scarlet oak), *Quercus prinus* (chestnut oak), and *Quercus velutina* (black oak). Other common species include *Kalmia latifolia* (mountain laurel), *Quercus alba* (white oak), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Vaccinium pallidum* (Blue Ridge blueberry). Pine cover may be as little as 25% in this and other white pine types, *Pinus strobus* (eastern white pine) being an indicator species. ....**Appalachian White Pine - Subxeric Oak Forest (CEGL007519)**
[*Pinus strobus - Quercus (coccinea, prinus) / (Gaylussacia ursina, Vaccinium stamineum)* Forest]
7b. Successional forest, even-aged or mixed-age and possibly including a mixture of other successional species. Arising from disturbance, but not evidently planted. Some examples may contain *Quercus* (oak) spp., but these are even-aged and similar in age to the dominant *Pinus strobus* (eastern white pine). Pine cover typically 40%, or more. ....**Ruderal Eastern White Pine Forest (CEGL007944)**
[*Pinus strobus* Ruderal Forest]

8a. Trees include *Pinus pungens* (Table Mountain pine) and/or *Pinus rigida* (pitch pine). Other trees and tall shrubs include *Kalmia latifolia* (mountain laurel) and *Quercus prinus* (chestnut oak). Found above 610 m (2,000 feet) elevation, though occasionally down to 490 m (1,600 feet). ....**Blue Ridge Table Mountain Pine - Pitch Pine Woodland (Typic Type) (CEGL007097)**
[*Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland]
8b. Canopy trees include *Pinus echinata* (shortleaf pine), *Pinus virginiana* (Virginia pine), *Quercus falcata* (southern red oak), *Quercus stellata* (post oak). Other indicator species include *Carya pallida* (sand hickory), *Cornus florida* (flowering dogwood), *Ilex opaca* var. *opaca* (American holly). Other trees include *Quercus coccinea* var. *coccinea* (scarlet oak), *Quercus alba* (white oak). Can be found below 610 m (2,000 feet) elevation. **[Southern Appalachian Low Mountain Pine Forests]** **9**

9a. Early-successional forest disturbed less than 25 years ago; dominated primarily by *Pinus virginiana* (Virginia pine) or occasionally by *Pinus echinata* (shortleaf pine) or *Pinus rigida* (pitch pine) with little to no *Quercus* (oak) except sometimes abundant *Quercus prinus* (chestnut oak) in extremely fire-suppressed examples. Few herbaceous or understory species. .... **Ruderal Virginia Pine Forest (CEGL002591)**
[*Pinus virginiana* Ruderal Forest]

9b. Later-successional forest (disturbed more than 25 years ago) with more diverse structure and species composition; dominated primarily by *Pinus virginiana* (Virginia pine) or with admixtures of *Pinus echinata* (shortleaf pine) and/or *Pinus rigida* (pitch pine); typically found below 610 m (2,000 feet) elevation..... **10**

10a. Very uncommon dry pine forest with open canopy, approaching a woodland physiognomy, with at least 10% cover of diverse herbs with dry woodland species such as *Schizachyrium scoparium* (little bluestem), *Tephrosia virginiana* (Virginia tephrosia), and *Solidago odora* (anise-scented goldenrod), among others. ....**Appalachian Low-Elevation Mixed Pine / Little Bluestem Forest (CEGL008500)**
[*Pinus virginiana - (Pinus rigida, Pinus pungens) / Schizachyrium scoparium* Forest]

10b. More common dry pine forest with closed canopy, mostly *Vaccinium pallidum* (Blue Ridge blueberry) in low-shrub layer and very little herbaceous cover..... .....**Appalachian Low-Elevation Mixed Pine / Blue Ridge Blueberry Forest (CEGL007119)**
[*Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest]

11a. Rocky woodlands, dominated by pines, oaks, other hardwoods, or a variable mixture of these. **12**

11b. Woodland versions of boulderfields; rooting substrate contains greater than 50% surface rocks and boulders. Canopy includes mesophytic species including *Aesculus flava* (yellow buckeye), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), *Tilia americana* (American basswood), etc..... **16**

12a. Rocky woodlands occurring over mafic biotite gneiss or calcareous shale geology in northeastern GA, primarily dominated by trees, perhaps in heterogeneous patches, typically with canopy density from 35-60%, with some instances of higher and lower densities whose stands have presence of (but not necessarily dominance by) circumneutral indicator taxa such as *Carya* (hickory) species, *Philadelphus hirsutus* (streambank mock orange), *Ostrya virginiana* (hophornbeam), *Acer leucoderme* (chalk maple), *Cornus florida* (flowering dogwood), *Celtis tenuifolia* (dwarf hackberry), *Staphylea trifolia* (American bladdernut), *Cercis canadensis* (eastern redbud), and *Chionanthus virginicus* (white fringetree). Dominants may include *Pinus virginiana* (Virginia pine), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), *Juniperus virginiana* var. *virginiana* (eastern red-cedar), *Pinus virginiana* (Virginia pine), and *Acer rubrum* (red maple). **13**

12b. Rocky woodlands occurring over more commonly found geologic strata (other than mafic biotite gneiss or calcareous shale), dominated by oaks, other hardwoods, pines, or a variable mixture of these. Dominants include *Pinus virginiana* (Virginia pine), *Pinus pungens* (Table Mountain pine), *Pinus rigida* (pitch pine), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), *Kalmia latifolia* (mountain laurel), *Vaccinium stamineum* (deerberry), and *Vaccinium pallidum* (Blue Ridge blueberry). Some examples have *Quercus ilicifolia* (bear oak). Stands lack circumneutral indicator taxa such as *Carya* (hickory) spp., *Philadelphus hirsutus* (streambank mock orange), *Ostrya virginiana* (hophornbeam), *Acer leucoderme* (chalk maple), *Cornus florida* (flowering dogwood), *Celtis tenuifolia* (dwarf hackberry), *Staphylea trifolia* (American bladdernut), *Cercis canadensis* (eastern redbud), and *Chionanthus virginicus* (white fringetree). **14**

13a. Vegetation associated with mafic biotite gneiss geology with veins of base-rich hornblende gneiss. Canopy composed of scattered *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), *Quercus prinus* (chestnut oak), *Ostrya virginiana* (hophornbeam), and *Chionanthus virginicus* (white fringetree). *Juniperus virginiana* (eastern red-cedar) is frequent but not always present. Scattered shrub layer may include *Ptelea trifoliata* (common hoptree), *Physocarpus opulifolius* (common ninebark), *Hypericum prolificum* (shrubby St. John's-wort), *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Lonicera flava* (yellow honeysuckle), *Amelanchier sanguinea* (roundleaf serviceberry), and *Rosa carolina* (Carolina rose)..... .....**Montane Basic Hardwood - Red-cedar Woodland (CEGL003752)**
[*Carya (glabra, alba) - Fraxinus americana - (Juniperus virginiana* var. *virginiana)* Woodland]
13b. Deciduous or mostly deciduous small-patch, rocky woodlands on calcareous shale, dominated by *Quercus prinus* (chestnut oak), *Juniperus virginiana* var. *virginiana* (eastern red-cedar), *Pinus virginiana* (Virginia pine), and *Acer rubrum* (red maple). Some stands have *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Carya carolinae-septentrionalis* (southern shagbark hickory), and *Fraxinus americana* (white ash). Shrubs include *Philadelphus hirsutus* (streambank mock orange) and *Ostrya virginiana* (hophornbeam). Other shrubs and small trees may include *Acer leucoderme* (chalk maple), *Cornus florida* (flowering dogwood), *Celtis tenuifolia* (dwarf hackberry), *Staphylea trifolia* (American bladdernut), *Cercis canadensis* (eastern redbud), *Chionanthus virginicus* (white fringetree), *Ulmus rubra* (slippery elm), *Ptelea trifoliata* (common hoptree), and *Symphoricarpos orbiculatus* (coralberry). ....**Blue Ridge Calcareous Shale Slope Woodland (CEGL007720)**
[*Quercus prinus - Juniperus virginiana - (Pinus virginiana) / Philadelphus hirsutus - Celtis occidentalis* Woodland]

14a. Canopy dominated by *Pinus pungens* (Table Mountain pine) and/or *Pinus rigida* (pitch pine), possibly with *Pinus virginiana* (Virginia pine), but this not dominant. Characteristic shrubs include *Kalmia latifolia* (mountain laurel), *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), *Lyonia ligustrina* var. *ligustrina* (maleberry), and *Vaccinium stamineum* (deerberry). Southern Appalachian examples are generally found above 610 m (2,000 feet) elevation. .....**Blue Ridge Table Mountain Pine - Pitch Pine Woodland (Typic Type) (CEGL007097)**
[*Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland]
14b. Canopy primarily dominated by *Pinus virginiana* (Virginia pine), with *Quercus prinus* (chestnut oak) and *Quercus rubra* (northern red oak) sometimes present. Generally found below 610 m (2,000 feet) elevation. Canopy 5-25 m tall, 25-75% cover. **15**

15a. Canopy primarily dominated by *Pinus virginiana* (Virginia pine), with *Quercus prinus* (chestnut oak) and *Quercus rubra* (northern red oak) sometimes present in substantial numbers in less extreme habitats. The shrub layer is very sparse and may include scattered individuals of *Kalmia latifolia* (mountain laurel), *Vaccinium stamineum* (deerberry), and *Vaccinium pallidum* (Blue Ridge blueberry). This should be a distinctive type on a distinctive substrate, with a stunted canopy and sparse herb and shrub strata characterized by species able to grow in loose shale fragments..... ..... **Blue Ridge Acidic Shale Woodland (CEGL003624)**
[*Pinus virginiana / Vaccinium pallidum / Schizachyrium scoparium - Carex pensylvanica* Woodland]
15b. Very rare dry pine woodland / low density forest, primarily dominated by *Pinus virginiana* (Virginia pine), with at least 10% cover of diverse herbs with dry woodland species such as *Schizachyrium scoparium* (little bluestem), *Tephrosia virginiana* (Virginia tephrosia), *Solidago odora* (anise-scented goldenrod), etc. ....**Appalachian Low-Elevation Mixed Pine / Little Bluestem Forest (CEGL008500)**
[*Pinus virginiana - (Pinus rigida, Pinus pungens) / Schizachyrium scoparium* Forest]

16a. Typically occurring above 1,220 m (4,000 feet) elevation. Canopy strongly dominated by *Betula alleghaniensis* (yellow birch). Other species that may form a minor canopy component include *Aesculus flava* (yellow buckeye), *Prunus pensylvanica* (pin cherry), and *Sorbus americana* (American mountain-ash). ..... **Southern Appalachian Boulderfield Forest (Currant & Rockcap Fern Type) (CEGL006124)**
[*Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum* Forest]

16b. Typically occurring below 1,220 m (4,000 feet) elevation. Canopy more diverse. Typically dominated by *Betula alleghaniensis* (yellow birch) and *Aesculus flava* (yellow buckeye) with associates including *Betula lenta* (sweet birch) and *Tilia americana* (American basswood). Common shrubs and subcanopy trees are *Acer spicatum* (mountain maple), *Hydrangea arborescens* (wild hydrangea), *Euonymus obovatus* (running strawberry-bush), and *Ribes* (currant) spp. ..... **Southern Appalachian Hardwood Rich Boulderfield Forest (CEGL004982)**
[*Betula alleghaniensis* - *Tilia americana* var. *heterophylla / Acer spicatum / Ribes cynosbati / Dryopteris marginalis* Forest]

9. Dry-Mesic Forests

1a. Dry-mesic mixed to predominantly evergreen forests containing at least 25%, and up to 75%, *Pinus strobus* (eastern white pine) in the canopy and/or subcanopy **2**
1b. Dry-mesic predominantly deciduous forests containing less than 25% evergreen trees. **3**

2a. Dry-mesic to mesic mixed forest containing at least 25% *Pinus strobus* (eastern white pine) with any or all of the following: *Quercus alba* (white oak), *Quercus prinus* (chestnut oak), and *Quercus velutina* (black oak), possibly with *Carya* (hickory) spp. and/or *Liriodendron tulipifera* (tuliptree). In contrast to CEGL007519, this type should not have *Quercus coccinea* (scarlet oak). ..... **Appalachian White Pine - Mesic Oak Forest (CEGL007517)**
[*Pinus strobus - Quercus alba - (Carya alba) / Gaylussacia ursina* Forest]
2b. Dry-mesic to subxeric forest containing at least 25% *Pinus strobus* (eastern white pine) with any or all of the following: *Quercus coccinea* (scarlet oak), *Quercus prinus* (chestnut oak), and *Quercus velutina* (black oak). Other common species include *Kalmia latifolia* (mountain laurel), *Quercus alba* (white oak), *Nyssa sylvatica* (blackgum), and *Oxydendrum arboreum* (sourwood)..... **Appalachian White Pine - Subxeric Oak Forest (CEGL007519)**
[*Pinus strobus - Quercus (coccinea, prinus) / (Gaylussacia ursina, Vaccinium stamineum)* Forest]

3a. Communities at greater than 1,065 m (3,500 feet) elevation and occurring on upper ridges and summits (usually found above 1,370 m [4,500 feet]). **4**
3b. Communities found below 1,220 m (4,000 feet) elevation and occurring on midslopes to lower slopes sometimes occurring on lower, broad ridgetops (occasionally reaching 1,370 m [4,500 feet]). **9**

4a. Canopy largely dominated by *Quercus rubra* (northern red oak) (usually greater than 75%), lacking *Carya* (hickory) species but sometimes with substantial *Quercus prinus* (chestnut oak)..... **5**
4b. Canopy a mix of *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and/or *Quercus prinus* (chestnut oak), usually with *Carya* (hickory) spp., or forests dominated by species other than *Quercus rubra* (northern red oak). **7**

5a. Less than 20% shrub cover in shrub layer; well-developed and diverse herb layer with *Carex pensylvanica* (Pennsylvania sedge), *Ageratina altissima* var. *roanensis* (white snakeroot), *Thelypteris noveboracensis* (New York fern), *Dennstaedtia punctilobula* (eastern hayscented fern), *Eurybia chlorolepis* (mountain aster), and *Oclemena acuminata* (whorled wood aster). ..... **High-Elevation Red Oak Forest (Tall Herb Type) (CEGL007298)**
[*Quercus rubra / Carex pensylvanica - Ageratina altissima* var. *roanensis* Forest]
5b. Greater than 20% shrub cover in shrub layer, generally sparse herb layer..... **6**

6a. Shrub layer mainly deciduous shrubs. ..... **Southern Appalachian High-Elevation Red Oak Forest (Deciduous Shrub Type) (CEGL007300)**
[*Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis)* Forest]
6b. Shrub layer mainly evergreen, greater than 20%, often about 100% evergreen *Rhododendron* (rhododendron) and *Kalmia latifolia* (mountain laurel). ..... **Southern Appalachian High-Elevation Red Oak Forest (Evergreen Shrub Type) (CEGL007299)**
[*Quercus rubra / (Kalmia latifolia, Rhododendron catawbiense, Rhododendron maximum) / Galax urceolata* Forest]

7a. Very heavy cover (approaching 100% in most cases) of *Rhododendron maximum* (great laurel) in shrub layer. Forest dominated by a mix of *Quercus prinus* (chestnut oak) and *Quercus rubra* (northern red oak), often on north aspect slopes. ..... **Chestnut Oak Forest (Mesic Slope Heath Type) (CEGL006286)**
[*Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest]
7b. Low to moderate levels of *Rhododendron maximum* (great laurel) in shrub layer. **8**

8a. Forest found from 610 to 1,370 m (2,000-4,500 feet) elevation; 25-75% *Quercus alba* (white oak) canopy cover with *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), and *Carya* (hickory) species also usually present. Canopy can also include *Fraxinus* (ash) and *Tilia americana* (American basswood). Also with a well-developed, diverse herbaceous layer much like a rich cove. Intergrades with higher-elevation oak forests. ..... **Appalachian Montane Oak - Hickory Forest (Rich Type) (CEGL007692)**
[*Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest]
8b. Forest occurring at similar elevations but with more acidic composition. *Gaylussacia* (huckleberry) or *Rhododendron maximum* (great laurel) sometimes present; sparse to moderate herb layer often dominated by ferns. Much less species-rich than CEGL007692. ..... **Appalachian Montane Oak - Hickory Forest (Red Oak Type) (CEGL006192)**
[*Quercus rubra - Acer rubrum / Pyrularia pubera / Thelypteris noveboracensis* Forest]

9a. Canopy dominated or codominated (greater than 50% cover) by *Quercus prinus* (chestnut oak), sometimes (but not always) with abundant *Carya* (hickory) spp. component. Other indicator species include *Galax urceolata* (beetleweed), *Rhododendron maximum* (great laurel). Common species include *Acer rubrum* (red maple), *Kalmia latifolia* (mountain laurel), *Quercus rubra* (northern red oak), *Oxydendrum arboreum* (sourwood), and *Smilax rotundifolia* (roundleaf greenbrier)..... **10**
9b. Canopy not dominated by *Quercus prinus* (chestnut oak) (less than 50% canopy cover). **14**

10a. Mesic *Quercus prinus* (chestnut oak) forest with a dominant shrub layer of *Rhododendron maximum* (great laurel); often on north-facing slopes. ..... **Chestnut Oak Forest (Mesic Slope Heath Type) (CEGL006286)**
[*Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest]
10b. Mesic to dry forest without a dominant shrub layer of *Rhododendron maximum* (great laurel). **11**

11a. Forests occurring on upper slopes and dry ridges with a nearly closed *Kalmia latifolia* (mountain laurel) layer. Stands may contain *Quercus coccinea* (scarlet oak). ..... **Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271)**
[*Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest]
11b. Somewhat protected forests occurring on lower and mid to upper slopes. Dry-mesic, usually diverse canopy of *Quercus alba* (white oak), *Quercus prinus* (chestnut oak), and *Quercus rubra* (northern red oak). Occasionally up to ridgeline, not necessarily dominated by *Quercus prinus* (chestnut oak). **12**

12a. Forests with a strong (sometimes dominant) *Quercus alba* (white oak) component and prominent shrub layer dominated by *Rhododendron calendulaceum* (flame azalea), *Vaccinium pallidum* (Blue Ridge blueberry), *Kalmia latifolia* (mountain laurel), and *Gaylussacia baccata* (black huckleberry). Some stands may have an herbaceous layer of *Carex pensylvanica* (Pennsylvania sedge). Usually at 610 to 1,370 m (2,000-4,500 feet) elevation, but sheltered and more mesic; found down to about 305 m (1,000 feet) in GA, but generally occurs about 670 m (2,200 feet) elsewhere. ..... **Appalachian Montane Oak - Hickory Forest (Typic Acidic Type) (CEGL007230)**
[*Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest]

12b. Forests without any clear dominant in the shrub layer, but with a prominent subcanopy dominated by *Cornus florida* (flowering dogwood), *Magnolia* (magnolia) spp. and/or *Acer pensylvanicum* (striped maple). **13**

13a. *Quercus prinus* (chestnut oak) typically dominant or occasionally codominant with *Quercus rubra* (northern red oak). Canopy associates include *Carya glabra* (pignut hickory), *Carya alba* (mockernut hickory), *Carya ovata* (shagbark hickory) with a subcanopy dominated by *Cornus florida* (flowering dogwood). ..... **Appalachian Montane Oak - Hickory Forest (Chestnut Oak Type) (CEGL007267)**
[*Quercus prinus - (Quercus rubra) - Carya spp. / Oxydendrum arboreum - Cornus florida* Forest]

13b. *Quercus rubra* (northern red oak) typically dominant or codominant with *Quercus prinus* (chestnut oak) with a subcanopy of *Magnolia fraseri* (mountain magnolia) or *Magnolia acuminata* (cucumber-tree). *Acer pensylvanicum* (striped maple) is dominant in the short-tree layer. ..... **Southern Appalachian Montane Northern Red Oak - Chestnut Oak Forest (CEGL004817)**
[*Quercus rubra - Quercus prinus - Magnolia (acuminata, fraseri) / Acer pensylvanicum* Forest]

14a. Forest canopy dominated by some combination of *Quercus alba* (white oak), *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), with *Carya glabra* (pignut hickory), *Carya alba* (mockernut hickory), and/or *Carya ovalis* (red hickory). Mesic herbs common or mesic heath shrub layer present with few to no herbs. **15**

14b. Forest canopy usually dominated by *Quercus alba* (white oak), a mixture of *Quercus* (oak) and *Carya* (hickory) or *Pinus strobus* (eastern white pine) and oaks, but not *Quercus rubra* (northern red oak) or *Quercus prinus* (chestnut oak) (at least not greater than 50% of canopy). Includes most of the *Quercus alba* (white oak)-dominated types below 1,220 m (4,000 feet) elevation. Other indicator species include *Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak), *Gaylussacia ursina* (bear huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Pinus strobus* (eastern white pine). Other common species include *Acer rubrum* (red maple), *Oxydendrum arboreum* (sourwood), *Nyssa sylvatica* (blackgum), *Smilax glauca* (cat greenbrier), *Kalmia latifolia* (mountain laurel), *Chimaphila maculata* (striped prince's pine). **16**

15a. Very acidic forest that can have well-developed herbaceous cover but is usually sparse to moderate and not very diverse; often greater than 50% cover of *Thelypteris noveboracensis* (New York fern) or *Dennstaedtia punctilobula* (eastern hayscented fern) or other acid-loving species in herbaceous layer..... **Appalachian Montane Oak - Hickory Forest (Red Oak Type) (CEGL006192)**
[*Quercus rubra - Acer rubrum / Pyrularia pubera / Thelypteris noveboracensis* Forest]

15b. Rich oak-hickory forest on basic soils with herbaceous layer approaching a cove in richness and diversity. Canopy dominated by *Quercus alba* (white oak), *Quercus velutina* (black oak), and/or *Quercus rubra* (northern red oak), with *Carya glabra* (pignut hickory), *Carya alba* (mockernut hickory), and/or *Carya ovalis* (red hickory), and lacking abundant *Fraxinus americana* (white ash). Found south of the Roanoke River in the Southern Appalachians. ..... **Appalachian Montane Oak - Hickory Forest (Rich Type) (CEGL007692)**
[*Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest]

16a. Canopy containing at least 25% *Pinus strobus* (eastern white pine) **17**
16b. Canopy without significant cover of *Pinus strobus* (eastern white pine). **18**

17a. Natural uneven-aged mixed forest, typically with 25-50%, and possibly up to 75%, *Pinus strobus* (eastern white pine); can include any or all of the following: *Quercus alba* (white oak), *Quercus prinus* (chestnut oak), and *Quercus velutina* (black oak), possibly with *Carya* (hickory) spp. and/or *Liriodendron tulipifera* (tuliptree). ..... **Appalachian White Pine - Mesic Oak Forest (CEGL007517)**
[*Pinus strobus - Quercus alba - (Carya alba) / Gaylussacia ursina* Forest]
17b. Successional forest, even-aged or mixed-age and possibly including a mixture of other successional species. Arising from disturbance, but not evidently planted. Some examples may contain *Quercus* (oak) spp., but these are even-aged and similar in age to the dominant *Pinus strobus* (eastern white pine). ..... **Ruderal Eastern White Pine Forest (CEGL007944)**
[*Pinus strobus* Ruderal Forest]

18a. Dry-mesic forests with a mixed canopy including *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Quercus prinus* (chestnut oak), with acidic species such as *Kalmia latifolia* (mountain laurel) and *Vaccinium pallidum* (Blue Ridge blueberry). **[Three Choices]** **19**
18b. More mesic forest with deeper soils and a rich and lush herb layer approaching that of a cove with species such as *Collinsonia canadensis* (richweed), *Podophyllum peltatum* (mayapple), and *Actaea racemosa* (black baneberry). **21**

19a. *Kalmia latifolia* (mountain laurel) characteristic in shrub layer; *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), and sometimes *Quercus prinus* (chestnut oak) present at low cover in canopy; various *Carya* (hickory) spp., as well as *Pinus echinata* (shortleaf pine) and *Pinus virginiana* (Virginia pine) may be present to common in canopy. This forest is restricted to low elevations and sandy soils and is very uncommon on the AT corridor. In some stands *Quercus falcata* (southern red oak) may be an indicator, while in others not present or detectible; in some examples *Carya* (hickory) spp. may have greater cover than *Quercus* (oak) spp. ..... **Appalachian Montane Oak - Hickory Forest (Low-Elevation Xeric Type) (CEGL007691)**
[*Quercus alba - Quercus coccinea - Quercus falcata / Kalmia latifolia - Vaccinium pallidum* Forest]
19b. Dry-mesic forests lacking *Quercus falcata* (southern red oak) as a canopy species. Stands have a mixed canopy including *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Quercus prinus* (chestnut oak), and with acidic species such as *Kalmia latifolia* (mountain laurel), *Vaccinium pallidum* (Blue Ridge blueberry), and *Rhododendron* (rhododendron) present and lacking rich herb layer; few herbs present or herb layer dominated by acid-loving herbs and ferns. Elevation ranges from 610 to 1,370 m (2,000-4,500 feet) on sheltered lower slopes and in coves over deep soils. In the Southern Blue Ridge, this essentially replaces CEGL007691 above about 670 m (2,200 feet) elevation..... **Appalachian Montane Oak - Hickory Forest (Typic Acidic Type) (CEGL007230)**
[*Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest]

19c. Forest at low elevations (below about 670 m [2,200 feet]) containing *Quercus falcata* (southern red oak) and *Quercus alba* (white oak) in the canopy. **20**

20a. Canopy dominated by *Quercus alba* (white oak), *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), or *Carya glabra* (pignut hickory), *Carya alba* (mockernut hickory), or *Carya ovalis* (red hickory). ..... **Appalachian Montane Oak - Hickory Forest (Rich Type) (CEGL007692)**
[*Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum* Forest]

20b. Canopy dominated by *Quercus alba* (white oak), *Carya ovata* (shagbark hickory), and *Carya alba* (mockernut hickory). *Quercus rubra* (northern red oak) may be a dominant component of the canopy as well. Other species that may be present in the canopy are *Acer saccharum* (sugar maple), *Liriodendron tulipifera* (tuliptree), *Quercus velutina* (black oak), *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), *Fagus grandifolia* (American beech), *Prunus serotina* (black cherry), *Ulmus rubra* (slippery elm), and *Juglans nigra* (black walnut). This is a low-elevation type (below 610 m [2,000 feet]) more characteristic of the Ridge and Valley, of uncertain occurrence on the AT corridor. .....**Rich Low-Elevation Appalachian Oak - Hickory Forest (CEGL007233)**
[*Quercus alba - Quercus rubra - Carya ovalis / Acer saccharum / Polystichum acrostichoides* Forest]

10. Acidic Mesic and Rich Forests[17]

1a. Canopy comprised of evergreen or mixed evergreen/deciduous trees; herbaceous stratum sparse to nearly absent; shrub stratum of *Rhododendron maximum* (great laurel) often with high coverage for many but not all types. **2**
1b. Canopy dominated (cover greater than 75%) by deciduous trees; *Tsuga canadensis* (eastern hemlock) occurrence may be patchy in some associations or even absent in some examples. **6**

2a. Canopy largely dominated (cover greater than 50%) by evergreen trees (*Tsuga canadensis* (eastern hemlock), *Pinus strobus* (eastern white pine)) often with a dense evergreen shrub stratum (but not for all associations). Indicator species include *Galax urceolata* (beetleweed), *Hexastylis* (heartleaf) spp., *Kalmia latifolia* (mountain laurel). Other common species include *Rhododendron maximum* (great laurel).[Note: over time, many *Tsuga* (hemlock) will be dying or dead, leading to greater dominance of *Pinus strobus* (eastern white pine) with emergent/transgressive subcanopy hardwoods.] **[Appalachian Hemlock - Hardwood Forests]** **3**
2b. Canopy comprised of evergreen and/or deciduous trees including *Tsuga canadensis* (eastern hemlock), *Liriodendron* (tuliptree), *Halesia* (silverbell), but usually less than 75% *Tsuga canadensis* (eastern hemlock) and usually lacking a dense evergreen shrub stratum. Indicator species include *Eurybia divaricata* (white wood aster), *Arisaema triphyllum* (Jack in the pulpit), *Athyrium filix-femina* ssp. *asplenioides* (asplenium ladyfern), *Laportea canadensis* (Canadian woodnettle), *Polygonatum biflorum* (smooth Solomon's-seal), *Polystichum acrostichoides* (Christmas fern), *Solidago curtisii* (mountain decumbent goldenrod), *Tiarella cordifolia* (heartleaf foamflower), *Viola rotundifolia* (roundleaf yellow violet), *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), and *Tilia americana* var. *heterophylla* (Appalachian basswood). Other common species include *Acer rubrum* (red maple), *Rhododendron maximum* (great laurel), and *Betula lenta* (sweet birch). **5**

3a. Forest mostly *Tsuga canadensis* (eastern hemlock), but occasionally with hardwood trees up to 25% of canopy often with a strong presence of *Betula alleghaniensis* (yellow birch). This type also appears in the key as a more deciduous forest, stands may lack *Tsuga* (hemlock). .... **Blue Ridge Hemlock - Northern Hardwood Forest (CEGL007861)**
[*Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest]
3b. Forest with a substantial amount of *Pinus strobus* (eastern white pine) in canopy (usually >20%). **4**

4a. Canopy includes a mixture of *Pinus strobus* (eastern white pine) and *Quercus* (oak) species, usually *Quercus alba* (white oak), *Quercus prinus* (chestnut oak), and/or *Quercus velutina* (black oak), possibly with *Carya* (hickory) spp. and/or *Liriodendron tulipifera* (tuliptree). .... **Appalachian White Pine - Mesic Oak Forest (CEGL007517)**
[*Pinus strobus - Quercus alba - (Carya alba) / Gaylussacia ursina* Forest]
4b. Canopy dominated almost exclusively by evergreen conifers. Ericaceous understory usually close to 100% *Rhododendron maximum* (great laurel). Canopy mixed *Tsuga canadensis* (eastern hemlock) and *Pinus strobus* (eastern white pine). Largely restricted to lower slopes, gorges and stream and river margins. .... **Southern Appalachian Eastern Hemlock Forest (White Pine Type) (CEGL007102)**
[*Pinus strobus - Tsuga canadensis / Rhododendron maximum - (Leucothoe fontanesiana)* Forest]

[17]Standing dead hemlock should be treated as though it was alive for mapping and keying purposes.

5a. Lower elevation (400-1,160 m [1,300-3,800 feet]) with a variable canopy that usually does not include much *Halesia* (silverbell). Canopy is usually dominated by *Liriodendron tulipifera* (tuliptree) or *Betula lenta* (sweet birch) mixed with *Tsuga canadensis* (eastern hemlock); relative proportion of *Tsuga canadensis* (eastern hemlock) may vary greatly, with some sites having little or no *Tsuga* (hemlock) in the canopy. Other deciduous species more typical of "rich" coves may occur as scattered individuals, including *Tilia americana* var. *heterophylla* (Appalachian basswood), *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), and *Fagus grandifolia* (American beech). ..... **Southern Appalachian Acidic Cove Forest (Typic Type) (CEGL007543)**
[*Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest]

5b. Higher elevation (850-1,400 m [2,800-4,600 feet]) usually with greater than 25% *Halesia* (silverbell) in the canopy. The most important canopy trees are *Tsuga canadensis* (eastern hemlock) and *Halesia tetraptera* var. *monticola* (mountain silverbell), although *Magnolia fraseri* (mountain magnolia) or *Fagus grandifolia* (American beech) can have high canopy coverage in some examples. Some occurrences have the tall-shrub stratum dominated by *Rhododendron maximum* (great laurel), while others are more open and often dominated by *Dryopteris intermedia* (intermediate woodfern). [A type of limited distribution, found in the Smokies near (but maybe not on) the AT corridor.]..... ..... **Southern Appalachian Acidic Cove Forest (Silverbell Type) (CEGL007693)**
[*Tsuga canadensis - Halesia tetraptera - Magnolia fraseri / Rhododendron maximum / Dryopteris intermedia* Forest]

6a. Forests usually on slopes, often monotypic or dominated by a mixture of *Acer rubrum* (red maple), *Betula lenta* (sweet birch), and/or *Betula alleghaniensis* (yellow birch) usually over a dense ericaceous layer, primarily *Rhododendron maximum* (great laurel). Herb layer very poorly developed or dominated by acid-loving species, especially ferns..... **7**

6b. Forests occurring in sheltered coves, usually with a very diverse canopy, often (not always) with a well-developed and diverse herb layer; shrub stratum typically sparse to absent (except for in acidic coves). **[Southern Appalachian Cove Forests]**..... **8**

7a. Forests occurring primarily on midslopes of various aspects at lower elevations (760-1,400 m [2,500-4,600 feet]) and dominated largely by a mix of species such as *Acer rubrum* (red maple), *Betula lenta* (sweet birch), and occasionally with some *Betula alleghaniensis* (yellow birch), but not strongly dominated by yellow birch. .... **Southern Appalachian Ruderal Acidic Mixed Hardwood Forest (CEGL008558)**
[*Acer rubrum* var. *rubrum - Betula lenta - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Ruderal Forest]

7b. Forests usually on sheltered north aspect slopes, occurring generally at higher elevations (1,035-1,460 m [3,400-4,800 feet]) and strongly dominated by *Betula alleghaniensis* (yellow birch); *Tsuga canadensis* (eastern hemlock) can be a codominant or a minor component. If stands lack *Tsuga* (hemlock) and have heavy dominance by *Betula* (birch), they may be hard to distinguish from CEGL008558 (above). ..... **Blue Ridge Hemlock - Northern Hardwood Forest (CEGL007861)**
[*Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest]

8a. Seeps found within cove matrix..... **9**

8b. Mesic coves, but not true seeps. **10**

9a. Seeps above 1,100 m (3,600 feet) elevation; primarily open seep, small patch in matrix of rich coves and rich northern hardwood forests from 1,100 to 1,525 m (3,600-5,000 feet) elevation. Herbaceous layer dominated by forbs including *Impatiens pallida* (pale touch-me-not), *Monarda didyma* (scarlet beebalm), and *Rudbeckia laciniata* (cutleaf coneflower). ..... **Rich Montane Seep (High-Elevation Type) (CEGL004293)**
[*Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata* var. *humilis* Herbaceous Seep]

9b. Seeps found below 1,100 m (3,600 feet) elevation. Seepage on mid and lower slopes in matrix of cove forests. Usually canopy either partially or fully covered by cove forest trees from adjacent communities. Characteristic species include *Diphylleia cymosa* (American umbrellaleaf), *Saxifraga micranthidifolia* (lettuceleaf saxifrage), and *Laportea canadensis* (Canadian woodnettle). [Note: *Diphylleia cymosa* (American umbrellaleaf) may occur up to 1,585 m (5,200 feet), so elevation may not be an effective discriminator between these two seep types.] ..... **Rich Montane Seep (Cove Type) (CEGL004296)**
[*Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis* Forested Herbaceous Seep]

10a. Canopy dominated by species associated with acidic geology, such as *Liriodendron tulipifera* (tuliptree), *Betula lenta* (sweet birch), and *Tsuga canadensis* (eastern hemlock), and lacking those of nutrient-rich sites such as *Tilia americana* (American basswood), *Fraxinus americana* (white ash), or *Aesculus flava* (yellow buckeye); herbaceous layer usually dominated by ferns, with low to moderately high diversity and lacking species indicative of nutrient-rich soils. ..... **Southern Appalachian Acidic Cove Forest (Typic Type) (CEGL007543)**
[*Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest]

10b. Canopy including species indicative of nutrient-rich soils such as *Tilia americana* (American basswood), *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), or *Fraxinus* (ash); herbaceous layer well-developed and diverse, including species indicative of nutrient-rich soils such as *Actaea* (baneberry), *Laportea* (woodnettle), *Hydrophyllum* (waterleaf), *Hepatica* (hepatica), etc. **11**

11a. Cove forest, canopy generally including *Liriodendron tulipifera* (tuliptree), its coverage highly variable, often 40%, but sometimes close to 100%. Also with *Fraxinus americana* (white ash), *Tilia americana* var. *heterophylla* (American basswood), *Aesculus flava* (yellow buckeye), and *Magnolia acuminata* (cucumber-tree). Indicator species can include *Carya cordiformis* (bitternut hickory), *Trillium vaseyi* (sweet wakerobin), *Galearis spectabilis* (showy orchid), *Sanicula canadensis* (Canadian black-snakeroot), and *Phegopteris hexagonoptera* (broad beechfern). Mean elevation ca. 750 m. ..... **Southern Appalachian Rich Cove Forest (Typic Type) (CEGL007710)**
[*Liriodendron tulipifera - Fraxinus americana - (Aesculus flava) / Actaea racemosa - Laportea canadensis* Forest]

11b. Canopy diverse, often with *Acer saccharum* (sugar maple), *Tilia americana* (American basswood), particularly var. *heterophylla* (Appalachian basswood), *Aesculus flava* (yellow buckeye), *Prunus serotina* (black cherry), and *Fraxinus americana* (white ash) all as part of canopy. Extremely diverse and rich herbaceous layer. Indicator species (including calciphiles) can include *Hydrophyllum canadense* (bluntleaf waterleaf), *Asplenium rhizophyllum* (walking fern), *Asarum canadense* (Canadian wildginger), *Cystopteris* (bladderfern) sp., and *Hepatica nobilis* var. *acuta* (sharp-lobe hepatica). Mean elevation ca. 1,000 m. This type does not list tuliptree as a component, but it is found within the elevational range of tuliptree. ..... **Southern Appalachian Rich Cove Forest (Montane Calcareous Type) (CEGL007695)**
[*Aesculus flava - Acer saccharum - (Tilia americana* var. *heterophylla) / Hydrophyllum canadense - Solidago flexicaulis* Forest]

Field Key to Vegetation Associations of the Central Appalachian Project Area

This field key provides classification to USNVC associations that were identified during the APPA vegetation mapping project for the CAP project area (see Figure D–2 in the "Key to Field Keys by Project Area"). The CAP project area includes APPA lands between Dickey Gap in Virginia (Corners Creek Road near State Highway 16) and the Delaware River (Pennsylvania-New Jersey State line along Interstate 80).

Notes about Scale for the Central Appalachian Project Area

All forest associations were mapped to a 0.5-ha MMU (a circle with a 40-m radius) and all nonforest associations were mapped to a 0.25-ha MMU (a circle with a 28-m radius). Some of the smaller-scale associations mapped to a MMU of 0.25 ha include: CEGL003683, CEGL003882, CEGL003896, CEGL003939, CEGL004044, CEGL004103, CEGL004142, CEGL004143, CEGL004286, CEGL004996, CEGL006037, CEGL006044, CEGL006107, CEGL006153, CEGL006431, CEGL006451, CEGL006480, CEGL006481, CEGL006483, CEGL006565, CEGL006571, CEGL006576, CEGL006622, CEGL006670, CEGL007119, CEGL008508, CEGL008525, CEGL008526, CEGL008529, CEGL008536, and CEGL008540.

Key to Keys for the Central Appalachian Project Area

1a. Vegetation strongly altered by recent human disturbance such as clearing, pasturing, logging, and/or fires; dominated by trees, shrubs, forbs, grasses, and/or vines, including disturbance-oriented (ruderal) native species (e.g., *Pinus virginiana* (Virginia pine), *Pinus strobus* (eastern white pine), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Robinia pseudoacacia* (black locust), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Crataegus punctata* (dotted hawthorn) and/or non-native species [e.g., *Ailanthus altissima* (tree of heaven) or *Pueraria montana* var. *lobata* (kudzu)] often in monotypic, even-aged stands; also includes evergreen plantations, pine successional forests, even-aged *Liriodendron tulipifera* (tuliptree) dominated forests, successional shrublands (including power line shrublands and non-native dominated shrublands), and old fields as well as disturbed wetland vegetation including successional wet meadows, shrub swamps and marshes invaded by *Phragmites* (reed) and *Phalaris* (canarygrass). ..... **Successional and Ruderal Vegetation (Key #11, p. D-92)**
1b. Vegetation structure and/or composition determined by a spontaneously growing set of native plant species shaped by ecological processes (i.e., NOT ruderal or early successional vegetation). **2**

2a. Wetland vegetation, regularly influenced, and compositionally driven, by stream flooding, seasonal flooding, or groundwater seepage. **3**
2b. Upland vegetation, never or very rarely influenced, and compositionally not driven, by stream flooding, seasonal flooding, or groundwater seepage. **5**

3a. Alluvial forests, woodlands, shrublands and herbaceous communities occurring along banks or channels of rivers and streams and adjacent levees and bottomlands, at least occasionally inundated by temporary overland flooding; also beaver pond areas that are part of larger alluvial systems. .... **Alluvial Forest, Woodland, Shrubland, and Herbaceous Vegetation (Key #1; p. D-51)**

3b. Non-alluvial wetland vegetation - substrate is saturated to the surface by groundwater for extended periods during the growing season or seepage-fed; rarely, if ever, flooded by alluvial waters, includes seepage-fed beaver pond impoundments, seepage-fed boulderfields and coves, poorly drained depressions and basin swamps, vernal pools, shrub swamps, aquatic pond vegetation, herbaceous wetlands and wet meadows. **4**

4a. Forested sites and sites generally with overhanging canopy of trees. Canopy cover varies widely depending upon elevation, fertility, and rockiness, but all examples with the exception of the vernal pools have diverse herbaceous layers. ..... **Forested Swamps, Seeps, Vernal Pools, and Aquatic Vegetation (Key #2; p. D-56)**
4b. Non-forested sites, shrub swamps and bogs or herb- and forb-dominated wetlands, with deep saturated soils and aquatic vegetation of ponds. ..... **Shrub Swamps, Bogs, Non-Alluvial Herbaceous Wetlands, and Aquatic Vegetation (Key #3; p. D-58)**

5a. Non-forested vegetation (canopy trees over 6 m sparse or absent, covering less than 25% of the area); shrublands, grasslands, nonvascular vegetation, or bare rock; associated with very shallow soils or rock outcrops; includes savanna-like areas and glades with widely spaced, open-grown trees (or small clumps of trees) over otherwise herbaceous vegetation. ..... **Non Forested Barrens, Glades, Rocky Outcrops, Boulderfields, and Talus Slopes (Key #4; p. D-60)**
5b. Forest and Woodland vegetation with canopy trees over 6m tall covering at least 25% of the area; understory varies. **6**

6a. Woodlands (25-60% tree cover). **7**
6b. Forests (>60% tree cover)[18]. **8**

7a. Deciduous dominated woodland canopies. ..... **Upland Deciduous Woodlands (Key #5, p. D-64)**
7b. Evergreen or mixed evergreen-deciduous woodland canopies (deciduous trees less than 75% cover); Pine- (*Pinus* sp.) or mixed pine-dominated canopies. Includes *Pinus strobus* (eastern white pine), *Pinus rigida* (pitch pine), *Pinus virginiana* (Virginia pine), *Pinus echinata* (shortleaf pine), *Pinus pungens* (Table Mountain pine); canopies codominated by pine and *Tsuga canadensis* (eastern hemlock); and canopies codominated by pines, oaks, and mesophytic hardwoods..... **Pine and Mixed Pine-Deciduous Forests and Woodlands (Key #6; p. D-68)**

8a. Evergreen and mixed evergreen-deciduous forests; pines and hemlock generally common to abundant in canopy. **9**
8b. Deciduous dominated canopies; pines and hemlock generally absent to minor in canopy cover. **10**

9a. Evergreen or mixed evergreen-deciduous forest canopies (deciduous trees less than 75% cover); Pine- (*Pinus* sp.) or mixed pine-dominated canopies. Includes *Pinus strobus* (eastern white pine), *Pinus rigida* (pitch pine), *Pinus virginiana* (Virginia pine), *Pinus echinata* (shortleaf pine), *Pinus pungens* (Table Mountain pine); canopies codominated by pine and *Tsuga canadensis* (eastern hemlock); and canopies codominated by pines, oaks, and mesophytic hardwoods..... **Pine and Mixed Pine-Deciduous Forests and Woodlands (Key #6; p. D-68)**

[18]Typically >60% tree cover, except in obvious cases of severe disturbance from gypsy moth, hemlock woolly adelgid, windstorms, etc. Such disturbed stands are quite common. Key users should try to key to the pre-disturbance association if possible or identify the new, postdisturbance association if the pre-disturbance association diagnostic species are absent.

9b. Forest canopy codominated by some combination mesophytic hardwoods, typically *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree) and variable amounts of *Tsuga canadensis* (eastern hemlock) and/or *Pinus strobus* (eastern white pine); lacking nutrient-rich indicators. *Quercus rubra* (northern red oak) and occasionally *Quercus prinus* (chestnut oak) may be common in some mixed canopies; includes acidic coves. ..... **Hemlock - White Pine, Hemlock - Hardwood, Hemlock - Oak, Mesophytic Hardwood, and Acidic Cove Forests (Key #7; p. D-72)**

10a. Oak and oak-hickory-dominated canopies. **11**
10b. Deciduous hardwoods such as *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), and/or mesophytic tree species such as *Aesculus flava* (yellow buckeye), *Tilia americana* (American basswood), *Fraxinus americana* (white ash), and/or *Liriodendron tulipifera* (tuliptree) codominant in canopy. *Quercus* (oak) species and *Carya* (hickory) species occasionally present to common, but never diagnostic. **12**

11a. Oak-dominated forests with ericaceous (heath) shrubs strongly dominant in lower woody layers; if sparse, then clearly more numerous than non-ericaceous species; hickories absent or unimportant; true herbaceous plants usually sparse to absent. ..... **Oak / Heath Forests (Key #8; p. D-79)**[19]
11b. Oak, oak-hickory, and mixed oak-hardwood forests lacking a strongly dominant ericaceous component; ericaceous shrubs absent, or of low to moderate cover and admixed with non-ericaceous species; herb layer patchy to well developed, with a moderate to high diversity of true herbaceous plants; in rare cases where ericads are dominant, then hickories abundant and/or herb layer well developed. ..... **Mixed Oak and Oak - Hickory Forests (Key #9; p. D-82)**

12a. Forest canopy codominated by some combination of mesophytic or northern hardwoods, typically *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree) and variable amounts of *Tsuga canadensis* (eastern hemlock) and/or *Pinus strobus* (eastern white pine); lacking nutrient-rich indicators. *Quercus rubra* (northern red oak) and occasionally *Quercus prinus* (chestnut oak) may be common in some mixed hemlock - oak forest canopies; includes acidic coves. ..... **Hemlock - White Pine, Hemlock - Hardwood, Hemlock - Oak, Mesophytic Hardwood, and Acidic Cove Forests (Key #7; p. D-72)**
12b. Forest canopy codominated by a combination of tree species indicative of nutrient-rich substrates such as *Tilia americana* (American basswood), *Fraxinus americana* (white ash), *Aesculus flava* (yellow buckeye), *Acer saccharum* (sugar maple), and/or mesophytic generalists such as *Liriodendron tulipifera* (tuliptree) typically occurring in ravines, lower slopes, coves, deep-soiled upper slopes and flats; includes rich boulderfield and cove forests. ..... **Rich Cove and Rich Boulderfield Forests (Key #10; p. D-86)**

[19]Severe disturbance from gypsy moth, hemlock woolly adelgid, windstorms, etc. are quite common. Key users should try to key to the pre-disturbance association if possible or identify the new, postdisturbance association if the pre-disturbance association diagnostic species are absent.

1. Alluvial Forest, Woodland, Shrubland, and Herbaceous Vegetation

1a. Forested communities, with greater than 40% tree canopy coverage. **2**
1b. Woodlands, shrublands, and herbaceous communities along river margins. **10**

2a. Widespread, variable, anthropogenically-disturbed forest of the Northeast with variable mixtures of young, even-aged trees can include *Acer negundo* (box-elder), *Robinia pseudoacacia* (black locust), *Juglans nigra* (black walnut), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Celtis occidentalis* (common hackberry), *Pinus strobus* (eastern white pine), and/or *Ailanthus altissima* (tree of heaven), any one of which can dominate over small areas; understory heavily invaded by exotics such as *Rosa multiflora* (multiflora rose), *Celastrus orbiculata* (Oriental bittersweet), and *Lonicera japonica* (Japanese honeysuckle); typically an upland forest, but may also occur in floodplains and wet settings. ..... **Northeastern Ruderal Hardwood Forest (CEGL006599)**
[*Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana - (Robinia pseudoacacia)* Ruderal Forest]
2b. Naturally occurring and less anthropogenically-disturbed floodplain forests. **3**

3a. *Acer saccharinum* (silver maple) dominant, codominant or common in canopy. **4**
3b. *Acer saccharinum* (silver maple) minor to absent. **7**

4a. Early-successional community with scattered stunted and often battered and flood-trained *Platanus occidentalis* (American sycamore) and *Betula nigra* (river birch); trees (varying from less than 5 m tall to >10 m tall); dense shrub layer with *Salix* (willow) spp. and *Cephalanthus occidentalis* (common buttonbush). *Acer saccharinum* (silver maple) and *Fraxinus pennsylvanica* (green ash) may occur as minor associates. *Hibiscus laevis* (halberdleaf rosemallow) and/or *Justicia americana* (American water-willow) characteristic in the herb layer along with *Chamaesyce humistrata* (spreading sandmat), *Eupatorium serotinum* (lateflowering thoroughwort), and *Acalypha rhomboidea* (common threeseed mercury); occurs on coarse-textured (cobbly / bouldery) to fine-textured (silty or muddy) depositional bars and islands along rivers and large streams in the High Allegheny Plateau, Central Appalachians, and Lower New England.....
..... **Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896)**
[*Platanus occidentalis - Betula nigra - Salix (caroliniana, nigra)* Floodplain Forest]
4b. Mature floodplain forest; *Betula nigra* (river birch) sparse to absent. **5**

5a. Widespread rich floodplain forest occupying the higher elevations of well-drained floodplain terraces of major Mid-Atlantic rivers in PA, MD, VA, WV; less actively flooded and scoured than the silver maple floodplain forests immediately adjacent to the river; canopy dominated by a mixture of *Platanus occidentalis* (American sycamore), *Juglans nigra* (black walnut), *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), and *Ulmus americana* (American elm); *Acer saccharinum* (silver maple) is codominant in a minority of stands but absent or unimportant in many others: it is never monodominant in the canopy; *Acer negundo* (box-elder) is strongly dominant in the subcanopy; *Asimina triloba* (pawpaw) and/or *Lindera benzoin* (northern spicebush) dominate a moderately dense shrub layer; rich in spring ephemerals and nutrient-demanding species such as *Mertensia virginica* (Virginia bluebells), *Asarum canadense* (Canadian wildginger), *Chaerophyllum procumbens* (spreading chervil), *Hydrophyllum canadense* (bluntleaf waterleaf), *Viola striata* (striped cream violet), *Phlox divaricata* (wild blue phlox), *Podophyllum peltatum* (mayapple), and others; invasive exotics typically abundant. .....
..... **Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073)**
[*Platanus occidentalis - Acer negundo - Juglans nigra / Asimina triloba / Mertensia virginica* Floodplain Forest]

5b. Actively flooded *Acer saccharinum* (silver maple) dominated floodplain forests adjacent to a river. **6**

6a. *Acer saccharinum* (silver maple) floodplain forest ranging from New England south to PA and possibly MD occurring on the deep, alluvial, silty to somewhat coarse soils of point bars, levees, and adjacent terraces of medium to large, high-energy and moderate-gradient rivers; *Acer saccharinum*- (silver maple) dominated canopy with or without *Populus deltoides* (eastern cottonwood), *Acer negundo* (box-elder), *Ulmus rubra* (slippery elm), and *Fraxinus pennsylvanica* (green ash); shrub layer sparse; *Toxicodendron radicans* (eastern poison-ivy) dominant vine; lush herb layer with *Impatiens* (touch-me-not) spp., *Laportea canadensis* (Canadian woodnettle), *Matteuccia struthiopteris* (ostrich fern), and *Leersia oryzoides* (rice cutgrass) along with invasives such as *Alliaria petiolata* (garlic mustard), *Lysimachia nummularia* (creeping jenny), and *Microstegium vimineum* (Nepalese browntop). ..... **Silver Maple Floodplain Levee Forest (CEGL006147)**
[*Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Floodplain Forest]

6b. *Acer saccharinum* (silver maple) floodplain forest on river banks and low floodplain terraces bordering the main river channel; restricted to large river floodplains of major Mid-Atlantic rivers in PA, MD, WV, and VA; canopy dominated by *Acer saccharinum* (silver maple); *Platanus occidentalis* (American sycamore) may codominate the canopy layer, with *Acer negundo* (box-elder) dominating a subcanopy layer; other minor associates include *Populus deltoides* (eastern cottonwood), *Celtis occidentalis* (common hackberry), *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), and *Juglans nigra* (black walnut); shrub layer usually open or sparse; characteristic herbs include *Ageratina altissima* (white snakeroot), *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Viola sororia* (common blue violet), *Leersia virginica* (whitegrass), and *Verbesina alternifolia* (wingstem). .... **Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217)**
[*Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Floodplain Forest]

7a. Early-successional community with scattered stunted and often battered and flood-trained *Platanus occidentalis* (American sycamore) and *Betula nigra* (river birch); trees (varying from less than 5 m tall to >10 m tall); dense shrub layer with *Salix* (willow) spp. and *Cephalanthus occidentalis* (common buttonbush); *Hibiscus laevis* (halberdleaf rosemallow) and/or *Justicia americana* (American water-willow) characteristic in the herb layer along with *Chamaesyce humistrata* (spreading sandmat), *Eupatorium serotinum* (lateflowering thoroughwort), and *Acalypha rhomboidea* (common threeseed mercury); occurs on coarse-textured (cobbly / bouldery) to fine-textured (silty or muddy) depositional bars and islands along rivers and large streams in the High Allegheny Plateau, Central Appalachians, and Lower New England..... ..... **Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896)**
[*Platanus occidentalis - Betula nigra - Salix (caroliniana, nigra)* Floodplain Forest]

7b. Stand not dominated by *Platanus occidentalis* (American sycamore), *Betula nigra* (river birch), and/or *Salix caroliniana* (coastal plain willow) or *Salix nigra* (black willow)..... **8**

8a. Rich floodplain forest occupying the higher elevations of floodplains, floodplain berms, and low terraces of major Mid-Atlantic rivers in PA, MD, VA, and WV; less actively flooded and scoured than the silver maple floodplain forests immediately adjacent to the river; canopy dominated by a mixture of *Platanus occidentalis* (American sycamore), *Juglans nigra* (black walnut), *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), and *Ulmus americana* (American elm); *Acer saccharinum* (silver maple) is codominant in a minority of stands but absent or unimportant in many others: it is never monodominant in the canopy; *Acer negundo* (box-elder) is strongly dominant in the subcanopy; *Asimina triloba* (pawpaw) and/or *Lindera benzoin* (northern spicebush) dominate a moderately dense to dense shrub layer; rich in spring ephemerals and nutrient-demanding species such as *Mertensia virginica* (Virginia bluebells), *Asarum canadense* (Canadian wildginger), *Chaerophyllum procumbens* (spreading chervil), *Hydrophyllum canadense* (bluntleaf waterleaf), *Viola striata* (striped cream violet), *Phlox divaricata* (wild blue phlox), *Podophyllum peltatum* (mayapple), and others; invasive exotics typically abundant..... **Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073)**
[*Platanus occidentalis - Acer negundo - Juglans nigra / Asimina triloba / Mertensia virginica* Floodplain Forest]

8b. Small-stream floodplain forests of Virginia's Ridge and Valley and parts of the Northern Blue Ridge. **9**

9a. Floodplain forest characteristic of streams on less base-rich substrates such as shale, acidic granites, and quartzite in shale lowlands of the VA Ridge and Valley and parts of the Northern Blue Ridge includes various mixtures of *Tsuga canadensis* (eastern hemlock), *Pinus strobus* (eastern white pine), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), and *Acer rubrum* (red maple); *Cornus florida* (flowering dogwood) and *Carpinus caroliniana* (American hornbeam) common; diverse herbaceous layer with a mixture of wetland and upland species such as *Amphicarpaea bracteata* (American hogpeanut), *Eurybia divaricata* (white wood aster), and *Mitchella repens* (partridgeberry). ..... **Central Appalachian Montane Small-Stream Floodplain Forest (CEGL008405)**
[*Liriodendron tulipifera - Pinus strobus - (Tsuga canadensis) / Carpinus caroliniana / Amphicarpaea bracteata* Forest]

9b. Richer and more diverse small stream floodplain forest in the Northern Blue Ridge near Roanoke, VA (and extending north to Catoctin Mountain, MD), confined to floodplains with relatively fertile base-rich alluvial deposits derived from metabasalt (greenstone), pyroxene-rich granites, or metasiltstone/phyllite; canopy dominated or codominated by *Liriodendron tulipifera* (tuliptree) but with a mixture of other trees, including *Platanus occidentalis* (American sycamore), *Betula lenta* (sweet birch), *Acer saccharum* var. *saccharum* (sugar maple), *Acer rubrum* (red maple), *Carya cordiformis* (bitternut hickory), *Aesculus flava* (yellow buckeye), *Quercus* (oak) spp., *Fagus grandifolia* (American beech), and others; *Lindera benzoin* (northern spicebush) dominates the shrub layer, but it can also include *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Viburnum prunifolium*(blackhaw), and others; vines may be common; the herb layer is very diverse and dominated by numerous upland mesophytic species; *Circaea lutetiana* ssp. *canadensis* (broadleaf enchanter's nightshade) is characteristic; *Polygonatum biflorum* var. *commutatum* (smooth Solomon's seal), *Mertensia virginica* (Virginia bluebells), and *Eurybia divaricata* (white wood aster) may be common. .....**Northern Blue Ridge Montane Alluvial Forest (CEGL006255)**
[*Liriodendron tulipifera - Platanus occidentalis - Betula lenta / Lindera benzoin / Circaea lutetiana* ssp. *canadensis* Floodplain Forest]

10a. Early-successional woodland community with scattered stunted, battered and flood-trained *Platanus occidentalis* (American sycamore) and *Betula nigra* (river birch) occurring on coarse-textured (cobbly / bouldery) to fine-textured (silty or muddy) depositional bars and islands along rivers and large streams in the High Allegheny Plateau and Central Appalachians; trees (varying from less than 5 m tall to >10 m tall); dense shrub layer with *Salix* (willow) spp. and *Cephalanthus occidentalis* (common buttonbush); *Hibiscus laevis* (halberdleaf rosemallow) and/or *Justicia americana* (American water-willow) characteristic in the herb layer along with *Chamaesyce humistrata* (spreading sandmat), *Eupatorium serotinum* (lateflowering thoroughwort) and *Acalypha rhomboidea* (common threeseed mercury). ..... **Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896)**
[*Platanus occidentalis - Betula nigra - Salix (caroliniana, nigra)* Floodplain Forest]
10b. Herbaceous communities. **11**

11a. Vegetation primarily dominated by one species. **12**
11b. Vegetation dominated by a combination of multiple species. **15**

12a. *Carex torta* (twisted sedge), *Justicia americana* (American water-willow) or *Saururus cernuus* (lizard's-tail) dominant or codominant. **13**
12b. *Phragmites australis* (common reed) or *Phalaris arundinacea* (reed canarygrass) dominant.... **14**

13a. *Carex torta* (twisted sedge) dominated rock, gravel and sand bars, and active channel shelves of high-gradient streams and small rivers, often forming small, discontinuous, linear patches along waterways in the Southern and Central Appalachians; *Boehmeria cylindrica* (small-spike false nettle) and *Lycopus virginicus* (Virginia water horehound) characteristic; *Carex torta* (twisted sedge) obviously dominant but many other species can co-occur and stands can be relatively diverse floristically; tolerant of frequent inundation and flood-scouring. ..... **Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103)**
[*Carex torta* Riverbed Vegetation]
13b. *Justicia americana* (American water-willow) typically monospecific occurring on shoals or bars of rocky streams and riverbeds; entirely submerged by most flood events; ranges from the Piedmont and Central Appalachians to the Southern Appalachians; *Saururus cernuus* (lizard's-tail) is often present and may be codominant. ..... **Water-willow Rocky Bar and Shore (CEGL004286)**
[*Justicia americana* Riverbed Vegetation]

14a. *Phragmites australis* (common reed) dominant. ..... **Eastern Ruderal Common Reed Marsh (CEGL004141)**
[*Phragmites australis* ssp. *australis* Eastern Ruderal Marsh]
14b. Monocultural stands of the invasive grass *Phalaris arundinacea* (reed canarygrass) found in both basin wetlands and along rivershores. ..... **Eastern Ruderal Reed Canarygrass Marsh (CEGL006044)**
[*Phalaris arundinacea* Eastern Ruderal Marsh]

15a. Tall riverbank herbaceous community typically occurring along stable riverbanks and depositional bars with low sediment turnover during floods and prevalence of perennial herbs; in the Piedmont and mountain regions of MD, VA, and WV; diverse herbs can include *Eupatorium fistulosum* (trumpetweed), *Tripsacum dactyloides* (eastern gamagrass), *Solidago* (goldenrod) spp.; *Verbesina alternifolia* (wingstem), *Elymus riparius* (riverbank wildrye), *Apios americana* (groundnut), and *Asclepias syriaca* (common milkweed); shrubs and vines can include *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore), *Salix nigra* (black willow), and *Vitis riparia* (riverbank grape). ..... **Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480)**
[*Verbesina alternifolia - Elymus riparius - Solidago gigantea - (Teucrium canadense)* Riverbar Wet Meadow]

15b. Herbaceous communities experiencing high rates of sediment erosion and turnover during floods; sediment deposition is frequent; occurs on depositional bars and/or lowest parts of riverbanks. **16**

16a. Scour bar herbaceous vegetation occurring on depositional bars and in sand deposits on bedrock floodplains and boulder bars; patch dominants typically include *Eupatorium serotinum* (lateflowering thoroughwort) and one or more *Polygonum* (knotweed) spp.; other herbs possible such as *Chamaesyce humistrata* (spreading sandmat), *Artemisia annua* (sweet sagewort), *Cyperus squarrosus* (bearded flatsedge), *Datura stramonium* (jimsonweed), and *Eragrostis* (lovegrass) spp.; *Salix nigra* (black willow) may be present; occurs in the Piedmont and mountain provinces of MD, VA, and WV. ..... **Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481)**
[*Eupatorium serotinum - Polygonum (lapathifolium, punctatum, pensylvanicum)* Riverbar Wet Meadow]

16b. Narrow (<2 m wide) river bar drawdown shore, seasonally exposed shoreline flats and toes of riverbanks, wet beaches, and/or very low rivershore depositional bars dominated by *Eragrostis hypnoides* (teal lovegrass), *Ludwigia palustris* (marsh seedbox), *Rotala ramosior* (lowland rotala), *Cyperus strigosus* (strawcolored flatsedge), and *Cyperus squarrosus* (bearded flatsedge); may also occur in back channels and sloughs; occurs along major rivers in the Piedmont and mountains of MD, VA, WV, and DC. ..... **Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483)**
[*Eragrostis hypnoides - Ludwigia palustris - Lindernia dubia - Cyperus squarrosus* Riverbar Wet Meadow]

2. Forested Swamps, Seeps, Vernal Pools, and Aquatic Vegetation

1a. Forested swamp communities. **2**
1b. Herbaceous seeps, sparsely vegetated vernal pools, and aquatic vegetation. **6**

2a. *Acer rubrum* (red maple) present but not dominant in the canopy; hemlock/laurel swamp of the Central Appalachians; dominated by *Tsuga canadensis* (eastern hemlock) with *Pinus strobus* (eastern white pine), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and/or *Betula alleghaniensis* (yellow birch) common; *Rhododendron maximum* (great laurel) common in the shrub layer; *Sphagnum* (sphagnum moss) spp. common; occurs on saturated acidic muck to imperfectly drained mineral soils in upland valleys, bedrock depressions, low slopes, and adjacent to streams and lakes. ..... **Eastern Hemlock / Great Laurel Swamp Forest (CEGL006279)**
[*Tsuga canadensis / Rhododendron maximum / Sphagnum* spp. Swamp Forest]
2b. *Acer rubrum* (red maple) dominant or codominant in the canopy. **3**

3a. *Nyssa sylvatica* (blackgum) and/or *Betula alleghaniensis* (yellow birch) common in the canopy; *Fraxinus* (ash) spp. Absent. **4**
3b. One or more *Fraxinus* (ash) spp., including *Fraxinus americana* (white ash), *Fraxinus nigra* (black ash), and/or *Fraxinus pennsylvanica* (green ash), usually codominant or common in the canopy with *Acer rubrum* (red maple). **5**

4a. Basin swamp occupying saturated or seasonally wet basins in upland forest settings; not a streamside wetland; *Nyssa sylvatica* (blackgum) and/or *Betula alleghaniensis* (yellow birch) common in canopy; *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), *Rhododendron viscosum* (swamp azalea), and/or *Lindera benzoin* (northern spicebush) common; *Sphagnum* (sphagnum moss) spp., *Osmunda cinnamomea* (cinnamon fern), and occasionally *Symplocarpus foetidus* (skunk-cabbage) carpet the ground; *Maianthemum canadense* (Canada mayflower) and *Medeola virginiana* (Indian cucumber) are also common; found from the Central Appalachians north to central New England. ..... **Red Maple - Blackgum Basin Swamp Forest (CEGL006014)**
[*Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum* spp. Swamp Forest]
4b. Narrow, elongated seepage swamp occurring on groundwater-saturated flats and low slopes along streams (may be ephemeral) at elevations of 200-900 m (700-2,900 feet); *Acer rubrum* (red maple) and/or *Nyssa sylvatica* (blackgum) codominant in canopy; *Liriodendron tulipifera* (tuliptree) may be present; *Hamamelis virginiana* (American witch-hazel), *Ilex verticillata* (common winterberry), and *Lindera benzoin* (northern spicebush) are common shrubs; *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern) dominates the ground story; ranges from the Central Appalachians of MD and VA into the Cumberland Mountains in WV. ..... **Central Appalachian Acidic Seepage Swamp Forest (CEGL007853)**
[*Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Seep Forest]

5a. *Fraxinus nigra* (black ash) >5% in canopy; *Fraxinus americana* (white ash), *Betula alleghaniensis* (yellow birch) and/or *Liriodendron tulipifera* (tuliptree) also common with *Acer rubrum* (red maple); basic seepage swamp occurring at groundwater-saturated stream headwaters, as large spring seeps and runs, and as lateral areas in ravine and stream bottoms where groundwater emerges at the base of slopes; *Lindera benzoin* (northern spicebush) constant in shrub layer; *Asimina triloba* (pawpaw) may be common north of MD; *Chrysosplenium americanum* (American golden

saxifrage), *Veratrum viride* (green false hellebore), and *Symplocarpus foetidus* (skunk-cabbage) common in diverse herb layer. ..... **Central Appalachian Basic Seepage Swamp Forest (CEGL008416)**
[*Acer rubrum - Fraxinus nigra - Betula alleghaniensis / Veratrum viride - Carex bromoides* Seep Forest]

5b. *Fraxinus nigra* (black ash) minor to absent (≤5%); *Acer rubrum* (red maple) seepage swamp ranging from southern New England south to the Piedmont of VA; *Fraxinus americana* (white ash) and/or *Fraxinus pennsylvanica* (green ash) usually present; *Betula alleghaniensis* (yellow birch) may be common along with *Quercus palustris* (pin oak), *Quercus bicolor* (swamp white oak), and scattered *Ulmus americana* (American elm), *Pinus strobus* (eastern white pine), and/or *Tsuga canadensis* (eastern hemlock); *Carpinus caroliniana* (American hornbeam) typical; *Lindera benzoin* (northern spicebush), *Vaccinium corymbosum* (highbush blueberry), and *Ilex verticillata* (common winterberry) common; *Symplocarpus foetidus* (skunk-cabbage) and *Osmunda cinnamomea* (cinnamon fern) are nearly always present; *Sphagnum* (sphagnum moss) spp. may be common; occurs in saturated settings on slightly sloping hillsides, along small streams or in basins that receive overland flooding and groundwater influence. ..... **Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest (CEGL006406)**
[*Acer rubrum - Fraxinus (pennsylvanica, americana) / Lindera benzoin / Symplocarpus foetidus* Swamp Forest]

6a. *Dulichium arundinaceum* (threeway sedge), *Sparganium americanum* (American bur-reed), and *Scirpus cyperinus* (woolgrass) are dominant in variable combinations; occurs in shallow basins, swales, moats of bog mats, and pondshores in peat, muck or sandy soils; known from NY, PA, and WV. ..... **Threeway Sedge Basin Marsh (CEGL006552)**
[*Dulichium arundinaceum - Carex folliculata - Juncus* spp. Seepage Meadow]
6b. Vernal pools and aquatic vegetation of ponds. **7**

7a. Vernal pool characterized by seasonally fluctuating water levels; species composition is variable among sites; many smaller, shaded vernal ponds are unvegetated, their bottoms consisting of dead leaves and algae; primarily in glaciated or periglacial areas, from Quebec and New Brunswick south through NY to northern PA and northern NJ. ..... **Eastern Woodland Vernal Pool (CEGL006453)**
[Eastern Woodland Vernal Pool]
7b. Aquatic vegetation of ponds. **8**

8a. *Lemna* (duckweed) spp. dominant. .... **Eastern North America Duckweed Pond (CEGL005451)**
[*Lemna* spp. Eastern North American Aquatic Vegetation]
8b. Aquatic vegetation of ponds; dominants are usually submerged macrophytes or floating-leaved pondweeds including *Elodea canadensis* (Canadian waterweed), *Potamogeton robbinsii* (Robbins' pondweed), *Potamogeton vaseyi* (Vasey's pondweed), *Stuckenia filiformis* (fineleaf pondweed), *Potamogeton crispus* (curly pondweed), *Potamogeton friesii* (Fries' pondweed), and *Potamogeton strictifolius* (narrowleaf pondweed). *Vallisneria americana* (American eel-grass), *Nymphaea odorata* (American white waterlily), and *Nuphar* (pond-lily) spp. are often present but not abundant. ..... **Eastern Waterweed - Pondweed Aquatic Vegetation (CEGL006431)**
[*Elodea canadensis - Potamogeton* spp. Eastern Aquatic Vegetation]

3. Shrub Swamps, Bogs, Non-Alluvial Herbaceous Wetlands, and Aquatic Vegetation

1a. Herbaceous wetlands, wet meadows, and aquatic vegetation of ponds. **2**
1b. Shrub swamps, shrubby wet meadows and shrub bogs. **8**

2a. Aquatic vegetation of ponds. **3**
2b. Herbaceous marshes, seeps, and wet meadows. **4**

3a. *Lemna* (duckweed) spp. dominant. .... **Eastern North America Duckweed Pond (CEGL005451)**
[*Lemna* spp. Eastern North American Aquatic Vegetation]
3b. Dominants are usually submerged macrophytes or floating-leaved pondweeds including *Elodea canadensis* (Canadian waterweed), *Potamogeton robbinsii* (Robbins' pondweed), *Potamogeton vaseyi* (Vasey's pondweed), *Stuckenia filiformis* (fineleaf pondweed), *Potamogeton crispus* (curly pondweed), *Potamogeton friesii* (Fries' pondweed), and *Potamogeton strictifolius* (narrowleaf pondweed). *Vallisneria americana* (American eel-grass), *Nymphaea odorata* (American white waterlily), and *Nuphar* (pond-lily) spp. are often present but not abundant. ..... **Eastern Waterweed - Pondweed Aquatic Vegetation (CEGL006431)**
[*Elodea canadensis* - *Potamogeton* spp. Eastern Aquatic Vegetation]

4a. Marshes dominated by native species, including *Typha* (cattail) spp., *Dulichium arundinaceum* (threeway sedge), *Sparganium americanum* (American bur-reed), and *Scirpus cyperinus* (woolgrass). **5**
4b. Disturbed marshes, invaded by exotics or native increasers, managed marshes, and wet meadows. **6**

5a. Cattail marsh dominated by *Typha* (cattail) spp. ..... **Eastern Cattail Marsh (CEGL006153)**
[*Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Eastern Marsh]
5b. *Dulichium arundinaceum* (threeway sedge), *Sparganium americanum* (American bur-reed), and *Scirpus cyperinus* (woolgrass); occurs in shallow basins, swales, moats of bog mats, and pondshores in peat, muck or sandy soils; known from PA and WV. ..... **Threeway Sedge Basin Marsh (CEGL006552)**
[*Dulichium arundinaceum* - *Carex folliculata* - *Juncus* spp. Seepage Meadow]

6a. Successional wet meadow dominated by an admixture of primarily herbaceous upland and wetland old-field species; may be mowed annually, "wet old fields"; may have successional shrubs (<50%). ..... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]
6b. Monocultural stands of exotic forbs and grasses. **7**

7a. *Phragmites australis* (common reed) marsh. ..... **Eastern Ruderal Common Reed Marsh (CEGL004141)**
[*Phragmites australis* ssp. *australis* Eastern Ruderal Marsh]
7b. Monocultural stands of *Phalaris arundinacea* (reed canarygrass) found in both basin wetlands and along rivershores. ..... **Eastern Ruderal Reed Canarygrass Marsh (CEGL006044)**
[*Phalaris arundinacea* Eastern Ruderal Marsh]

8a. Successional shrub swamps and wet meadows with successional shrubs. **9**
8b. *Vaccinium corymbosum* (highbush blueberry) bog thicket; common shrubs include *Rhododendron viscosum* (swamp azalea), *Clethra alnifolia* (coastal sweet-pepperbush), *Gaylussacia baccata* (black huckleberry), *Kalmia angustifolia* (sheep laurel), and *Ilex verticillata* (common winterberry); sparse herb layer; thick *Sphagnum* (sphagnum moss) spp. layer; near the Delaware Water Gap (DEWA) and north. ..... **Highbush Blueberry Bog Thicket (CEGL006190)**
[*Vaccinium corymbosum / Sphagnum* spp. Acidic Peatland]

9a. Successional wet meadow dominated by an admixture of upland and wetland old-field species; may be annually mowed "wet old fields"; may have successional shrubs usually only about 1 m tall, *Rubus* (blackberry) spp. and *Spiraea* (spirea) spp. common; *Cornus* (dogwood) spp. may be present but are not dominant. ... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa - Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]
9b. Tall successional shrub swamp (2-4 m) occurring in low-lying areas of old fields or pastures, or the edges of beaver-impacted wetlands or impoundments; vegetation is highly variable with *Cornus amomum* (silky dogwood), *Cornus sericea* (red-osier dogwood), *Viburnum dentatum* (southern arrow-wood), *Spiraea alba* var. *latifolia* (white meadowsweet), *Rosa multiflora* (multiflora rose), *Rubus allegheniensis* (Allegheny blackberry), and *Rubus hispidus* (bristly dewberry) typically present and abundant any one of which can exhibit patch dominance; *Salix* (willow) spp. may also be present but less common. ..... **Ruderal Dogwood - Arrow-wood Shrub Swamp (CEGL006576)**
[*Cornus (amomum, sericea) - Viburnum dentatum - Rosa multiflora* Ruderal Shrub Swamp]

4. Non Forested Barrens, Glades, Rocky Outcrops, Boulderfields, and Talus Slopes

1a. Shrublands and wooded herbaceous vegetation (tree coverage typically less than 25%). **2**
1b. Communities dominated by herbaceous or nonvascular species on rock outcrops. **11**

2a. Successional shrublands of old fields, rights-of-way and modified lands and high-elevation "hawthorn orchards." **3**
2b. Shrubland barrens, glades, boulderfields, and wooded herbaceous vegetation (<25% tree cover over herbaceous layer) originating from natural processes and generally lacking successional and exotic species. **5**

3a. *Crataegus punctata*- (dotted hawthorn) dominated successional woodland/forest/"orchard" of high elevations in the Southern and Central Appalachians; large patch along the AT corridor in the saddle between Beech Mountain and Whitetop in VA. ..... **Southern & Central Appalachian Ruderal Hawthorn Forest (CEGL004184)**
[*Crataegus punctata - Crataegus flabellata* Ruderal Forest]
3b. Dominated by an admixture of species. **4**

4a. Tall, typically closed-canopy shrubland thicket occurring on old fields, pastures, or modified lands dominated by an admixture of non-native and native shrubs such as *Elaeagnus umbellata* (Autumn olive), *Rubus allegheniensis* (Allegheny blackberry), *Rosa multiflora* (multiflora rose), *Lonicera morrowii* (Morrow's honeysuckle), *Celastrus orbiculata* (Oriental bittersweet), *Lonicera japonica* (Japanese honeysuckle), *Ligustrum vulgare* (European privet), *Juniperus virginiana* (eastern red-cedar), and other small trees such as *Liriodendron tulipifera* (tuliptree) (<25% in cover); old-field grasses and forbs are common in more open-canopied variants where tall and short shrubs cover at least 25% of the field. ..... **Northeastern Ruderal Shrubland (CEGL006451)**
[*Elaeagnus umbellata - Cornus racemosa - Rosa multiflora - Juniperus virginiana* Ruderal Shrubland]
4b. Native successional shrubland dominated by heath shrubs including *Gaylussacia* (huckleberry) spp., *Vaccinium* (blueberry) spp., and *Kalmia latifolia* (mountain laurel); *Dennstaedtia punctilobula* (eastern hayscented fern); frequent along rights-of-way. ..... **Successional Heath Shrubland (CEGL006622)**
[*Gaylussacia baccata - Vaccinium pallidum - Vaccinium corymbosum* Shrubland]

5a. Shrub-dominated barrens and wooded-herbaceous vegetation occurring on exposed rocky outcrops and rocky summits. Shrub cover may be quite patchy and limited due to extensive exposed rock surfaces. **6**
5b. Vegetation of boulderfields and/or talus slopes. **9**

6a. Heath barrens; vegetation characterized by ericaceous shrubs. **7**
6b. Wooded herbaceous vegetation characterized by patchy herbaceous and scrub vegetation **8**

7a. Central Appalachian heath barrens dominated by *Kalmia latifolia* (mountain laurel) occurring on upper-slope and ridgetop outcrops, pavements, and clifftops of acidic bedrock (quartzite and granitic) at elevations from about 950 to 1,460 m (3,100-4,800 feet); limited to Shenandoah National Park in VA on the AT corridor; *Sorbus americana* (American mountain-ash) and *Vaccinium* (blueberry) spp. common; *Menziesia pilosa* (minniebush) and *Prunus pensylvanica* (pin cherry) may be present; herbaceous patches absent or sparse. ..... **Central Appalachian Heath Barrens (CEGL003939)**
[*Kalmia latifolia - Gaylussacia baccata - Vaccinium (angustifolium, pallidum) - Menziesia pilosa* Shrubland]

7b. *Kalmia latifolia* (mountain laurel) may be present but not dominant; medium- to high-elevation igneous outcrop barrens and rocky summits dominated by *Photinia melanocarpa* (black chokeberry) and *Gaylussacia baccata* (black huckleberry) occurring from about 880 to 1,400 m (2,900-4,600 feet) from Shenandoah National Park, VA, south to central VA; *Vaccinium pallidum* (Blue Ridge blueberry) and *Sorbus americana* (American mountain-ash) may be common; herbaceous patches usually sparse or limited; *Carex pensylvanica* (Pennsylvania sedge), *Hylotelephium telephioides* (Allegheny stonecrop), *Deschampsia flexuosa* (wavy hairgrass) and *Maianthemum canadense* (Canada mayflower) are most characteristic; scattered *Quercus rubra* (northern red oak) and/or *Betula alleghaniensis* (yellow birch) possible. ..... **High-Elevation Outcrop Barrens (Black Chokeberry Igneous / Metamorphic Type) (CEGL008508)**

[*Photinia melanocarpa - Gaylussacia baccata / Carex pensylvanica* Shrubland]

8a. Low elevation 170 to 580 m (550-1,900 feet) wooded herbaceous vegetation occurring on a variety of substrates (including calcareous shales), and has a large component of elevation-limited lithophytes; *Fraxinus americana* (white ash) sometimes codominant with *Juniperus virginiana* (eastern red-cedar); *Rhus aromatica* (fragrant sumac) and/or *Cheilanthes lanosa* (hairy lipfern) characteristic; *Carex pensylvanica* (Pennsylvania sedge) is constant and dominant; *Danthonia spicata* (poverty oatgrass) is frequent but sparse; other herbs can include *Symphyotrichum oblongifolium* (aromatic aster), *Dichanthelium linearifolium* (slimleaf panicgrass), and/or *Euphorbia corollata* (flowering spurge); known along the AT corridor in Shenandoah National Park in VA on steep, southeast - to southwest-facing slopes. ..... **Central Appalachian Circumneutral Barrens (CEGL006037)**

[*Juniperus virginiana - Fraxinus americana / Carex pensylvanica - Cheilanthes lanosa* Open Woodland]

8b. Middle-elevation (550-1,050 m [1,800-3,450 feet]) mafic barren vegetation occurring on metabasalt and calcium-bearing granitic outcrops; *Juniperus virginiana* (eastern red-cedar) less constant and lacks many other low-elevation species; stunted *Fraxinus americana* (white ash) common with *Physocarpus opulifolius* (common ninebark), *Chionanthus virginicus* (white fringetree), *Rosa carolina* var. *carolina* (Carolina rose), and/or *Rhus typhina* (staghorn sumac) often abundant; *Symphyotrichum laeve* var. *concinnum* (smooth blue aster) and *Hylotelephium telephioides* (Allegheny stonecrop) usually present and characteristic; *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa* (wavy hairgrass), and/or *Schizachyrium scoparium* (little bluestem) common; *Phacelia dubia* (smallflower phacelia) common in the spring. ..... **Central Appalachian Mafic Barrens (Ninebark / Pennsylvania Sedge Type) (CEGL008529)**

[*Fraxinus americana / Physocarpus opulifolius / Carex pensylvanica - Allium cernuum - (Phacelia dubia)* Wooded Grassland]

9a. Boulderfield or talus slope vegetation characterized by gnarled and usually stunted *Betula lenta* (sweet birch), *Quercus prinus* (chestnut oak), and/or *Quercus rubra* (northern red oak); physiognomy varies from nearly closed forest to very sparse woodland; other common trees may include *Prunus serotina* (black cherry), *Pinus strobus* (eastern white pine), *Acer rubrum* (red maple),and/or *Nyssa sylvatica* (blackgum); *Hamamelis virginiana* (American witch-hazel) and *Vaccinium pallidum* (Blue Ridge blueberry) common; *Parthenocissus quinquefolia* (Virginia creeper) characteristic vine; *Aralia nudicaulis* (wild sarsaparilla) characteristic herb; high lichen cover; occurring on fractured rock from 100 to 1,025 m (300-3,360 feet) elevation throughout the Blue Ridge and Ridge and Valley sections of PA, VA, WV, and MD. ..... **Sweet Birch - Chestnut Oak Talus Woodland (CEGL006565)**

[*Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland]

9b. Boulderfields dominated by non vascular vegetation. **10**

10a. Quartzite and sandstone boulderfields covered with *Lasallia papulosa* (blistered naval lichen) and/or *Lasallia pensylvanica* (Pennsylvania blistered naval lichen) either singly or together along with *Dimelaena oreina* (mountain lichen); *Melanelia culbersonii* (Culberson's black-parmelia) is diagnostic; stunted *Betula lenta* (sweet birch) sometimes present in very low numbers; occurs at elevations from about 300 to 1,000 m (1,000-3,300 feet) and within the AT corridor in MD and Shenandoah National Park (SHEN) in VA; expected along the AT corridor in boulderfields that are characteristic of Central Appalachian siliciclastic ridges. ..... **Central Appalachian Acidic Boulderfield (CEGL004142)**
[*Lasallia (papulosa, pensylvanica) - Dimelaena oreina - (Melanelia culbersonii)* Nonvascular Vegetation]

10b. Metabasalt boulderfields in the northern VA Blue Ridge, covered with *Lasallia papulosa* (blistered naval lichen) and *Stereocaulon glaucescens* (snow lichen) in variable combinations; *Chrysothrix chlorina* (dust lichen) is scattered on sheltered boulder faces and is diagnostic; occurs from about 670 to 1,160 m (2,200-3,800 feet); this rare mafic nonvascular type occurs in SHEN in VA. ..... **Central Appalachian Mafic Boulderfield (CEGL004143)**
[*Lasallia papulosa - Stereocaulon glaucescens - Chrysothrix chlorina* Nonvascular Vegetation

11a. Herbaceous vegetation, sometimes with sparse shrub patches. **12**
11b. Nonvascular vegetation of boulderfields. Vascular plants absent or very sparse. **13**

12a. High-elevation barrens occurring on exposed rocky summits and upper-slope outcrops of Catoctin Formation metabasalt (greenstone) at elevations from 870 to 1,230 m (2,860-4,040 feet); all known sites on the AT corridor are located in Shenandoah National Park; *Deschampsia flexuosa* var. *flexuosa* (wavy hairgrass), *Sibbaldiopsis tridentata* (shrubby fivefingers), *Solidago simplex* var. *randii* (Rand's goldenrod), *Hylotelephium telephioides* (Allegheny stonecrop), and *Polypodium appalachianum* (Appalachian polypody) abundant; shrubs can include *Physocarpus opulifolius* var. *opulifolius* (common ninebark), *Diervilla lonicera* (northern bush honeysuckle), *Kalmia latifolia* (mountain laurel), and *Photinia melanocarpa* (black chokeberry); stunted trees may include *Betula alleghaniensis* (yellow birch), *Sorbus americana* (American mountain-ash), and *Prunus* (plum) spp.; patchwork of shrub thickets (typically <25% cover), herbaceous mats (typically <40% cover), and crustose lichen colonies. ..... **High-Elevation Greenstone Barrens (CEGL008536)**
[*Diervilla lonicera - Solidago simplex* var. *randii - Deschampsia flexuosa - Hylotelephium telephioides - Saxifraga michauxii* Grassland]

12b. Grassy openings found on rock outcrops and summits at 365-1,220 m (1,200-4,000 feet) elevation in the Central Appalachians; *Schizachyrium scoparium* (little bluestem), *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa* (wavy hairgrass), and *Carex pensylvanica* (Pennsylvania sedge) characteristic with high *Cladonia* (cup lichen) spp. cover on exposed rocks; reported in PA, NJ, NY, CT. ..... **Low- to Mid-Elevation Little Bluestem - Poverty Oatgrass Outcrop Opening (CEGL006544)**
[*Schizachyrium scoparium - Danthonia spicata - Carex pensylvanica / Cladonia* spp. Grassland]

13a. Quartzite and sandstone boulderfields covered with *Lasallia papulosa* (blistered naval lichen) and/or *Lasallia pensylvanica* (Pennsylvania blistered naval lichen) either singly or together along with *Dimelaena oreina* (mountain lichen); *Melanelia culbersonii* (Culberson's black-parmelia) is diagnostic; stunted *Betula lenta* (sweet birch) sometimes present in very low numbers; occurs at elevations from about 300 to 1,000 m (1,000-3,300 feet) and within the AT corridor in MD and Shenandoah National Park (SHEN) in VA; expected along the AT corridor in boulderfields that are characteristic of Central Appalachian siliciclastic ridges. ..... **Central Appalachian Acidic Boulderfield (CEGL004142)**

[*Lasallia (papulosa, pensylvanica) - Dimelaena oreina - (Melanelia culbersonii)* Nonvascular Vegetation]

13b. Metabasalt boulderfields in the northern VA Blue Ridge, covered with *Lasallia papulosa* (blistered naval lichen) and *Stereocaulon glaucescens* (snow lichen) in variable combinations; *Chrysothrix chlorina* (dust lichen) is scattered on sheltered boulder faces and is diagnostic; occurs from about 670 to 1,160 m (2,200-3,800 feet); this rare mafic nonvascular type occurs in SHEN in VA. ..... **Central Appalachian Mafic Boulderfield (CEGL004143)**

[*Lasallia papulosa - Stereocaulon glaucescens - Chrysothrix chlorina* Nonvascular Vegetation]

5. Upland Deciduous Woodlands

1a. *Quercus* (oak) spp. and/or *Betula* (birch) spp. dominant. **2**
1b. *Quercus* (oak) spp. and/or *Betula* (birch) spp. **not** dominant. **10**

2a. *Betula* (birch) spp. more abundant than *Quercus* (oak) spp. **3**
2b. *Quercus* (oak) spp. more abundant than *Betula* (birch) spp. **7**

3a. *Betula lenta* (sweet birch) dominant. **4**
3b. *Betula alleghaniensis* (yellow birch) dominant. **5**

4a. Boulderfield or talus slope vegetation occurring on fractured rock from 100 to 1,025 m (300-3,360 feet) elevation throughout the Blue Ridge and Ridge and Valley sections of PA, VA, WV, and MD; gnarled *Betula lenta* (sweet birch), *Quercus prinus* (chestnut oak), and/or *Quercus rubra* (northern red oak) characteristic; other common trees may include *Prunus serotina* (black cherry), *Pinus strobus* (eastern white pine), *Acer rubrum* (red maple), and/or *Nyssa sylvatica* (blackgum); *Hamamelis virginiana* (American witch-hazel), *Vaccinium pallidum* (Blue Ridge blueberry) common shrubs; *Parthenocissus quinquefolia* (Virginia creeper) characteristic vine; *Aralia nudicaulis* (wild sarsaparilla) characteristic herb; high lichen cover. ..... **Sweet Birch - Chestnut Oak Talus Woodland (CEGL006565)**
[*Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland]

4b. *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) codominant in canopy with dense *Lycopodium* (clubmoss) spp. or *Dennstaedtia punctilobula* (eastern hayscented fern) ground cover; *Nyssa sylvatica* (blackgum) may be common; distribution is centered in the High Allegheny Mountains and Allegheny Plateau but extends north to NY, NJ and PA; common in WV, less common in VA. Often originating after severe disturbance such as fire, clear-cutting, or gypsy moth outbreaks. ..... **Central Appalachian Ruderal Sweet Birch - Red Maple Forest (CEGL008503)**
[*Betula lenta - Acer rubrum* / *Lycopodium annotinum - Dennstaedtia punctilobula* Ruderal Forest]

5a. Northern hardwood - oak talus slope woodland occurring on thin soils at low to mid elevations, from near sea level to about 520 m (0-1,700 feet) in the High Allegheny Plateau and Lower New England south to the northern Piedmont (1 occurrence along AT in northern PA); *Betula alleghaniensis* (yellow birch) and *Quercus rubra* (northern red oak) codominant in canopy; scattered *Kalmia latifolia* (mountain laurel) may be present over an herb layer dominated by *Polypodium virginianum* (rock polypody) and *Dryopteris marginalis* (marginal woodfern); ground cover is exposed talus, moss- and lichen-covered boulders, and deciduous litter. ..... **Oak - Birch Talus Slope Woodland (CEGL006585)**
[*Quercus rubra - Betula lenta* / *Polypodium virginianum* Woodland]

5b. High-elevation boulderfield woodland or open forest of the Northern Blue Ridge, Ridge and Valley, and Allegheny Mountains in VA and WV. **6**

6a. *Quercus rubra* (northern red oak) absent or rare; very open canopy dominated by stunted and gnarled *Betula alleghaniensis* (yellow birch); *Sorbus americana* (American mountain-ash), *Prunus pensylvanica* (pin cherry), and *Acer spicatum* (mountain maple) often have high cover; *Menziesia pilosa* (minniebush), *Sambucus racemosa* (red elderberry), and/or *Ribes cynosbati* (eastern prickly gooseberry) are frequent shrubs; *Polypodium appalachianum* (Appalachian polypody) may abundantly cover mossy rock surfaces; high lichen cover. ..... **Central Appalachian High-Elevation Boulderfield Forest (CEGL008504)**
[*Betula alleghaniensis* / *Sorbus americana - Acer spicatum* / *Polypodium appalachianum* Forest]

6b. *Quercus rubra* (northern red oak) present; open to somewhat closed canopy dominated by gnarled *Betula alleghaniensis* (yellow birch); *Acer pensylvanicum* (striped maple) and *Acer spicatum* (mountain maple) characteristic understory trees, although *Ilex montana* (mountain holly) may be locally abundant; *Hamamelis virginiana* (American witch-hazel), *Sambucus racemosa* var. *racemosa* (red elderberry), and *Kalmia latifolia* (mountain laurel) are common shrubs; herbs can include *Oclemena acuminata* (whorled wood aster) and ferns such as *Athyrium filix-femina* ssp. *asplenioides* (asplenium ladyfern), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Dryopteris intermedia* (intermediate woodfern); generally on weathered talus. ..... **Central Appalachian Northern Hardwood Forest (Yellow Birch - Northern Red Oak Type) (CEGL008502)**
[*Betula alleghaniensis - Quercus rubra* / *Acer spicatum* / *Dryopteris intermedia - Oclemena acuminata* Forest]

7a. *Quercus rubra* (northern red oak) dominant or codominant in canopy. **8**
7b. *Quercus prinus* (chestnut oak) dominant or codominant in canopy. **9**

8a. Northern hardwood - oak talus slope woodland occurring on thin soils at low to mid elevations, from near sea level to about 520 m (0-1,700 feet) in the High Allegheny Plateau and Lower New England south to the northern Piedmont (1 occurrence along AT in northern PA); *Betula alleghaniensis* (yellow birch) and *Quercus rubra* (northern red oak) codominant in canopy; scattered *Kalmia latifolia* (mountain laurel) may be present over an herb layer dominated by *Polypodium virginianum* (rock polypody) and *Dryopteris marginalis* (marginal woodfern); ground cover is exposed talus, moss- and lichen-covered boulders, and deciduous litter. ..... **Oak - Birch Talus Slope Woodland (CEGL006585)**
[*Quercus rubra - Betula lenta* / *Polypodium virginianum* Woodland]

8b. Central Appalachian northern hardwood forest characterized by *Betula alleghaniensis* (yellow birch) and *Quercus rubra* (northern red oak) occurring on rocky, northwest- to northeast-facing slopes at elevations from about 975 m to more than 1,300 m (3,000-4,300 feet); occurs in high-elevation areas of the Central Appalachians in VA, WV, MD, and PA; *Acer pensylvanicum* (striped maple) and *Acer spicatum* (mountain maple) characteristic understory trees, although *Ilex montana* (mountain holly) may be locally abundant; *Hamamelis virginiana* (American witch-hazel), *Sambucus racemosa* var. *racemosa* (red elderberry), and *Kalmia latifolia* (mountain laurel) are common shrubs; herbs can include *Oclemena acuminata* (whorled wood aster) and ferns such as *Athyrium filix-femina* ssp. *asplenioides* (asplenium ladyfern), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Dryopteris intermedia* (intermediate woodfern). ..... **Central Appalachian Northern Hardwood Forest (Yellow Birch - Northern Red Oak Type) (CEGL008502)**
[*Betula alleghaniensis - Quercus rubra* / *Acer spicatum* / *Dryopteris intermedia - Oclemena acuminata* Forest]

9a. Boulderfield or talus slope vegetation occurring on fractured rock from 100 to 1,025 m (300-3,360 feet) elevation throughout the Blue Ridge and Ridge and Valley sections of PA, VA, WV, and MD; physiognomy varies from nearly closed forest to very sparse woodland; gnarled and usually stunted *Betula lenta* (sweet birch), *Quercus prinus* (chestnut oak), and/or *Quercus rubra* (northern red oak) characteristic; other common trees may include *Prunus serotina* (black cherry), *Pinus strobus* (eastern white pine), *Acer rubrum* (red maple), *Betula* (birch) spp., and/or *Nyssa sylvatica* (blackgum); *Hamamelis virginiana* (American witch-hazel) and *Vaccinium pallidum* (Blue Ridge blueberry) common shrubs; *Parthenocissus quinquefolia* (Virginia creeper) characteristic vine; *Aralia nudicaulis* (wild sarsaparilla) characteristic herb; high lichen cover..... **Sweet Birch - Chestnut Oak Talus Woodland (CEGL006565)**
[*Betula lenta* - *Quercus prinus* / *Parthenocissus quinquefolia* Woodland]

9b. Central Appalachian xeric shale woodland occurring in the Ridge and Valley and also on metashale of the northern Blue Ridge, and is found in Bedford and Rockbridge counties north of Roanoke VA; codominated by *Quercus prinus* (chestnut oak) and *Pinus virginiana* (Virginia pine) at low elevations, up to about 840 m (2,760 feet) in the shale barrens of the Central Appalachians a patchy to moderately dense herb layer is present with *Danthonia spicata* (poverty oatgrass), *Carex pensylvanica* (Pennsylvania sedge), *Coreopsis verticillata* (whorled tickseed), *Solidago bicolor* (white goldenrod), and *Schizachyrium scoparium* (little bluestem); *Quercus ilicifolia* (bear oak) characteristic in the shrub layer; occurring on steep south- to west-facing, mid to upper slopes with abundant outcrops. ..... **Central Appalachian Xeric Shale Woodland (Chestnut Oak / Mixed Herbs Type) (CEGL008526)**
[*Quercus prinus* / *Quercus ilicifolia* / *Danthonia spicata* Woodland]

10a. *Crataegus punctata*- (dotted hawthorn) dominated successional woodland, forest, or "orchard" of high elevations in the Southern and Central Appalachians; large patch along the AT corridor in the saddle between Beech Mountain and Whitetop in VA. ..... **Southern & Central Appalachian Ruderal Hawthorn Forest (CEGL004184)**
[*Crataegus punctata* - *Crataegus flabellata* Ruderal Forest]

10b. *Carya* (hickory) spp., *Fraxinus americana* (white ash), *Tilia americana* (American basswood), and/or *Acer saccharum* (sugar maple) codominant in canopy. **11**

11a. Central Appalachian basic woodland of steep rocky metabasalt outcrops and slopes in the Blue Ridge and upper Piedmont of VA, MD, and WV from 60 to 1,000 m (240-3,300 feet) elevation; *Carya glabra* (pignut hickory) and *Fraxinus americana* (white ash) are the typical dominants; *Quercus prinus* (chestnut oak), and *Quercus rubra* (northern red oak) may also be common in canopy; *Celtis occidentalis* (common hackberry) common in subcanopy; herbs include *Asplenium platyneuron* (ebony spleenwort), *Bidens bipinnata* (Spanish needles), *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Carex muehlenbergii* (Muhlenberg's sedge), *Muhlenbergia sobolifera* (rock muhly), *Paronychia canadensis* (smooth forked nailwort), *Phytolacca americana* (American pokeweed), *Pycnanthemum incanum* (hoary mountainmint), *Verbascum thapsus* (common mullein), and *Solidago ulmifolia* (elmleaf goldenrod). ..... **Central Appalachian Basic Woodland (CEGL003683)**
[*Fraxinus americana* - *Carya glabra* / *Muhlenbergia sobolifera* - *Helianthus divaricatus* - *Solidago ulmifolia* Woodland]

11b. Boulderfield forests with substrates varying from stable, large-block boulderfields to fine talus and unstable, loose scree; occurring on steep, boulder and stone deposits below cliffs; stream- or river-fronting boulder- and talus-strewn slopes. **12**

12a. Central Appalachian basic boulderfield forest dominated by *Tilia americana* (American basswood) and *Fraxinus americana* (white ash) occurring on steep, boulder and stone slides below cliffs, boulder-filled slope concavities, and other very rocky, submesic to mesic habitats between 760 and 1,030 m (2,500-3,400 feet) elevation in the Northern Blue Ridge in VA, MD, and WV, and more locally in the western VA Ridge and Valley region; *Quercus rubra* (northern red oak), *Carya ovata* (shagbark hickory), and *Betula lenta* (sweet birch) also common; *Ostrya virginiana* (hophornbeam) and *Acer pensylvanicum* (striped maple) common in the subcanopy; shrubs can include *Sambucus racemosa* var. *racemosa* (red elderberry), *Prunus virginiana* (chokecherry), and/or *Hamamelis virginiana* (American witch-hazel); herb layer is diverse with *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Hydrophyllum virginianum* (eastern waterleaf), *Dryopteris marginalis* (marginal woodfern), *Arisaema triphyllum* (Jack in the pulpit), and others. .... **Central Appalachian Basic Boulderfield Forest (Montane Basswood - White Ash Type) (CEGL008528)**

[*Tilia americana* - *Fraxinus americana* / *Acer pensylvanicum* / *Parthenocissus quinquefolia* - *Impatiens pallida* Woodland]

12b. *Acer saccharum* (sugar maple) codominant in canopy; rich boulderfield forest occurring on stream- or river-fronting boulder- and talus-strewn slopes in the Central Appalachians of PA, MD, northern VA, and probably northeastern WV; characterized by a mixed canopy with *Tilia americana* (American basswood), *Fraxinus americana* (white ash), and *Acer saccharum* (sugar maple); *Staphylea trifolia* (American bladdernut) abundant in the shrub layer; *Acer nigrum* (black maple) may also be codominant; *Cardamine concatenata* (cutleaf toothwort), *Dicentra canadensis* (squirrel corn), *Impatiens pallida* (pale touch-me-not), *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), and *Polystichum acrostichoides* (Christmas fern) common herbs. .... **Central Appalachian-Piedmont Rich Boulderfield Forest (CEGL006471)**

[*Acer saccharum* - *Tilia americana* / *Staphylea trifolia* / *Dryopteris marginalis* - (*Impatiens pallida*) Forest]

6. Pine and Mixed Pine-Deciduous Forests and Woodlands

1a. Uneven-aged pine or mixed pine forests lacking indicators of recent (0-60 years) stand-initiating anthropogenic disturbance. **2**
1b. Successional, semi-natural pine and mixed pine forests and plantations occurring on altered, plowed, farmed, or planted lands. **14**

2a. *Pinus strobus* (eastern white pine) codominant in canopy (>25%). **3**
2b. Other pine species dominant or codominant in canopy. **9**

3a. *Tsuga canadensis* (eastern hemlock) codominant in the canopy. **4**
3b. Deciduous trees are codominant. **6**

4a. Matrix *Pinus strobus* (eastern white pine) - *Tsuga canadensis* (eastern hemlock) forest of the northern part of the Central Appalachians in PA; canopy associates include *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), *Nyssa sylvatica* (blackgum), and *Quercus prinus* (chestnut oak); sparse shrub and herb layers; occurs on dry-mesic sites with infertile, sandy soils. ..... **Central Appalachian White Pine - Eastern Hemlock Forest (CEGL006019)**
[*Pinus strobus* - *Tsuga canadensis* / *Acer pensylvanicum* / *Polystichum acrostichoides* Forest]
4b. Acidic cove forests occurring on the lower slopes and bottoms of ravines and coves at lower elevations, generally below 1,160 m (3,800 feet). **5**

5a. Ranging from the southern part of the Central Appalachians in Roanoke, VA, north to MD; *Liriodendron tulipifera* (tuliptree) characteristic; canopy associates can include *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), and/or *Quercus alba* (white oak); *Acer rubrum* (red maple), *Acer pensylvanicum* (striped maple), *Amelanchier arborea* (common serviceberry), *Cercis canadensis* (eastern redbud), and/or *Cornus florida* (flowering dogwood) common; *Rhododendron maximum* (great laurel) absent. ..... **Central Appalachian Acidic Cove Forest (White Pine - Hemlock - Mixed Hardwoods Type) (CEGL006304)**
[*Liriodendron tulipifera* - *Pinus strobus* - *Tsuga canadensis* - *Quercus rubra* / *Polystichum acrostichoides* Forest]
5b. Lower-elevation (400-1,160 m [1,300-3,800 feet]) acidic cove forest ranging from Roanoke, VA, south to GA; *Rhododendron maximum* (great laurel) dominant shrub; with a variable canopy with *Liriodendron tulipifera* (tuliptree) and *Betula lenta* (sweet birch) mixed with *Tsuga canadensis* (eastern hemlock), *Acer rubrum* (red maple), *Quercus rubra* (northern red oak), and/or *Quercus alba* (white oak) that usually does not include much *Halesia* (silverbell) spp.; relative proportion of *Tsuga canadensis* (eastern hemlock) may vary greatly, with some sites having little or none in the canopy; *Aesculus flava* (yellow buckeye), *Acer pensylvanicum* (striped maple), and *Hamamelis virginiana* (American witch-hazel) are common shrubs; characteristic herbs include *Anemone quinquefolia* var. *quinquefolia* (nightcaps), *Carex laxiculmis* var. *laxiculmis* (spreading sedge), and *Viola blanda* var. *blanda* (sweet white violet). ..... **Southern Appalachian Acidic Cove Forest (Typic Type) (CEGL007543)**
[*Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest]

6a. Wide-ranging pine-oak forests occurring on a variety of slopes, exposures, and settings; *Quercus coccinea* (scarlet oak), *Quercus prinus* (chestnut oak), *Quercus alba* (white oak), *Quercus velutina* (black oak), and/or *Quercus rubra* (northern red oak) in the canopy; *Liriodendron tulipifera* (tuliptree) minor to absent. **7**

6b. Acidic cove forests occurring on the lower slopes and bottoms of ravines and coves at lower elevations, generally below 915 m (3,000 feet). **8**

7a. *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and *Quercus prinus* (chestnut oak) share canopy with *Pinus strobus* (eastern white pine); *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Betula lenta* (sweet birch) common in subcanopy; heaths are dominant shrubs; New England south and west to PA and WV. .... **Northeastern White Pine - Oak Forest (CEGL006293)**
[*Pinus strobus* - *Quercus* (*rubra, velutina*) - *Fagus grandifolia* Forest]

7b. *Pinus strobus* (eastern white pine) - subxeric oak forest widespread on low shale mountains and hills in west-central VA and adjacent WV; sites are mid and upper slopes, ridge crests, dry ravines, and bluffs underlain primarily by shale and similar sedimentary rocks (siltstone) mostly below 760 m (2,500 feet) elevation in the Central Appalachians of VA, MD, and WV, and the northern and central Piedmont of VA; *Quercus prinus* (chestnut oak), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and/or *Quercus coccinea* (scarlet oak) codominant with *Pinus strobus* (eastern white pine) in the canopy; *Acer rubrum* (red maple), *Amelanchier arborea* (common serviceberry) and *Cornus florida* (flowering dogwood) are common in subcanopy; *Kalmia latifolia* (mountain laurel), *Viburnum acerifolium* (mapleleaf viburnum), *Vaccinium pallidum* (Blue Ridge blueberry) and *Vaccinium stamineum* (deerberry) typical shrubs; scattered herbs including *Chimaphila maculata* (striped prince's pine), *Galax urceolata* (beetleweed), and *Polygonatum biflorum* (smooth Solomon's seal). ..... **Central Appalachian-Piedmont White Pine - Subxeric Oak Forest (CEGL008539)**
[*Pinus strobus* - *Quercus alba* - *Quercus prinus* / *Vaccinium stamineum* Forest]

8a. Cove forest of lower slopes and ravines below 915 m (3,000 feet) in the Central Appalachians from Roanoke, VA, north to MD; canopy associates can include *Liriodendron tulipifera* (tuliptree), *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), and/or *Quercus alba* (white oak); *Acer rubrum* (red maple), *Acer pensylvanicum* (striped maple), *Amelanchier arborea* (common serviceberry), *Cercis canadensis* (eastern redbud), and/or *Cornus florida* (flowering dogwood) common; *Rhododendron maximum* (great laurel) absent. .... **Central Appalachian Acidic Cove Forest (White Pine - Hemlock - Mixed Hardwoods Type) (CEGL006304)**
[*Liriodendron tulipifera* - *Pinus strobus* - *Tsuga canadensis* - *Quercus rubra* / *Polystichum acrostichoides* Forest]

8b. Lower-elevation (400-1,160 m [1,300-3,800 feet]) acidic cove forest ranging from Roanoke, VA, south to GA; *Rhododendron maximum* (great laurel) dominant shrub; with a variable canopy with *Liriodendron tulipifera* (tuliptree) and *Betula lenta* (sweet birch) mixed with *Tsuga canadensis* (eastern hemlock), *Acer rubrum* (red maple), *Quercus rubra* (northern red oak), and/or *Quercus alba* (white oak) that usually does not include much *Halesia* (silverbell) spp.; relative proportion of *Tsuga canadensis* (eastern hemlock) may vary greatly, with some sites having little or none in the canopy; *Aesculus flava* (yellow buckeye), *Acer pensylvanicum* (striped maple), and *Hamamelis virginiana* (American witch-hazel) are common shrubs; characteristic herbs include *Anemone quinquefolia* var. *quinquefolia* (nightcaps), *Carex laxiculmis* var. *laxiculmis* (spreading sedge), and *Viola blanda* var. *blanda* (sweet white violet). .... **Southern Appalachian Acidic Cove Forest (Typic Type) (CEGL007543)**
[*Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest]

9a. *Pinus virginiana* (Virginia pine) and/or *Pinus rigida* (pitch pine) dominant or codominant in canopy. **10**
9b. Other pine species and/or conifers dominant. **15**

10a. *Pinus virginiana* (Virginia pine) dominant or codominant in canopy (≥20%) **11**
10b. *Pinus rigida* (pitch pine) and/or *Pinus pungens* (Table Mountain pine) share canopy dominance with *Quercus prinus* (chestnut oak) and/or *Quercus coccinea* (scarlet oak); *Pinus virginiana* (Virginia pine) absent to minor unless in in disturbed (and unburned) stands; *Quercus ilicifolia* (bear oak) is diagnostic but not always present; herbaceous species sparse to absent *Kalmia latifolia* (mountain laurel), *Amelanchier arborea* (common serviceberry), *Gaylussacia baccata* (black huckleberry), and *Vaccinium pallidum* (Blue Ridge blueberry) dominant; occurs on xeric, convex, often rocky south- and west-facing slopes, ridge spurs, crests, and clifftops at elevations from 275 to 1,200 m (900-4,000 feet); canopies of many stands have become quite closed due to fire exclusion, occurs throughout the Central Appalachians and peripherally in the Piedmont and Southern Blue Ridge. ..... **Central Appalachian Pine - Oak / Heath Woodland (CEGL004996)**
[*Pinus* (*pungens, rigida)* - *Quercus prinus* / (*Quercus ilicifolia*) / *Gaylussacia baccata* Woodland]

11a. Mixed pine-oak woodlands of the shale barrens in the Central Appalachians. **12**
11b. *Pinus virginiana* (Virginia pine) forests and woodlands not occurring on shale **13**

12a. Central Appalachian xeric shale woodland endemic to the Central Appalachian province of the Ridge and Valley, south (west) of Roanoke, VA dominated by *Pinus virginiana* (Virginia pine); *Pinus pungens* (Table Mountain pine) and *Quercus prinus* (chestnut oak) mixed in the canopy over a sparse *Quercus ilicifolia* (bear oak) and *Vaccinium pallidum* (Blue Ridge blueberry); occurs on moderate to steep slopes from 300-730 m (1,000-2,400 feet) elevation. ..... **Central Appalachian Xeric Shale Woodland (Virginia Pine / Sparse Herbs Type) (CEGL008525)**
[*Pinus virginiana* - *Quercus prinus* / *Quercus ilicifolia* / (*Hieracium greenii, Viola pedata*) Woodland]

12b. Central Appalachian xeric shale woodland occurring in the VA Ridge and Valley and also on metashale of the northern Blue Ridge, found in Bedford and Rockbridge counties north of Roanoke; codominated by *Quercus prinus* (chestnut oak) and *Pinus virginiana* (Virginia pine) at low elevations, up to about 840 m (2,760 feet) in the shale barrens of the Central Appalachians a patchy to moderately dense herb layer is present with *Danthonia spicata* (poverty oatgrass), *Carex pensylvanica* (Pennsylvania sedge), *Coreopsis verticillata* (whorled tickseed), *Solidago bicolor* (white goldenrod), and *Schizachyrium scoparium* (little bluestem); *Quercus ilicifolia* (bear oak) characteristic in the shrub layer; occurring on steep south- to west-facing, mid to upper slopes with abundant outcrops. ..... **Central Appalachian Xeric Shale Woodland (Chestnut Oak / Mixed Herbs Type) (CEGL008526)**
[*Quercus prinus* / *Quercus ilicifolia* / *Danthonia spicata* Woodland]

13a. Closed canopy *Pinus virginiana* (Virginia pine) forests..... **14**
13b. Xeric woodland with open canopy confined to lower elevations (<770 m [2,500 feet]) with southeast to southwest aspects on steep convex slopes, ridge spurs, and clifftops; abundant outcrops; limited to the Northern Blue Ridge, Ridge and Valley, and western Piedmont in VA, WV, and MD; *Pinus virginiana* (Virginia pine) and *Quercus prinus* (chestnut oak) codominant in canopy; *Schizachyrium scoparium* (little bluestem), *Carex pensylvanica* (Pennsylvania sedge), and/or *Danthonia spicata* (poverty oatgrass) common; *Amelanchier arborea* (common serviceberry) and *Vaccinium stamineum* (deerberry) are common shrubs; *Quercus ilicifolia* (bear oak) absent. ....**Central Appalachian Chestnut Oak - Virginia Pine Woodland (CEGL008540)**
[*Quercus prinus* - *Pinus virginiana* - (*Pinus pungens*) / *Schizachyrium scoparium* - *Dichanthelium depauperatum* Woodland]

14a. Dry *Pinus virginiana* (Virginia pine) forest with closed canopy, mostly *Vaccinium pallidum* (Blue Ridge blueberry) in low-shrub layer and very little herbaceous cover. ....**Appalachian Low-Elevation Mixed Pine / Blue Ridge Blueberry Forest (CEGL007119)**
[*Pinus virginiana* - *Pinus (rigida, echinata)* - *(Quercus prinus) / Vaccinium pallidum* Forest]
14b. Successional *Pinus virginiana* (Virginia pine) forest (over 50% of canopy); occupies flat to moderately sloping land that was heavily plowed or grazed and eroded in the recent past (10-60 years ago). ..... **Ruderal Virginia Pine Forest (CEGL002591)**
[*Pinus virginiana* Ruderal Forest]

15a. Mixed conifer plantation; pines (*Pinus* spp.) or conifers other than *Pinus strobus* (eastern white pine) codominant. ..... **Mixed Pine Conifer Plantation (CST006313)**
[*Pinus* spp. Forest Plantation]
15b. *Pinus strobus* (eastern white pine) a dominant component (greater than 50% of canopy). **17**

16a. Planted even-aged stand of *Pinus strobus* (eastern white pine) with obvious indications of silviculture and few other species. .....**Eastern White Pine Plantation (CST007178)**
[*Pinus strobus* Forest Plantation]
16b. Successional forest, usually mixed-age and including a mixture of other successional species. ....**Ruderal Eastern White Pine Forest (CEGL007944)**
[*Pinus strobus* Ruderal Forest]

7. Hemlock - White Pine, Hemlock - Hardwood, Hemlock - Oak, Mesophytic Hardwood, and Acidic Cove Forests[20]

1a. Evergreen trees dominant or codominant in canopy (>25% canopy coverage)..... **2**
1b. Deciduous trees dominant in canopy; *Tsuga canadensis* (eastern hemlock) and *Pinus strobus* (eastern white pine) minor to absent (<25% coverage). **11**

2a. *Pinus strobus* (eastern white pine) and *Tsuga canadensis* (eastern hemlock) both present, one or both of them dominant in the canopy..... **3**
2b. *Tsuga canadensis* (eastern hemlock) dominant or codominant in canopy; *Pinus strobus* (eastern white pine) minor associate to absent. **5**

3a. *Pinus strobus* (eastern white pine) - *Tsuga canadensis* (eastern hemlock) forest which occurs on dry-mesic sites restricted to the northern part of the Central Appalachians in PA, and possibly the High Allegheny Plateau in PA; canopy associates include *Liriodendron tulipifera* (tuliptree) *Prunus serotina* (black cherry), *Nyssa sylvatica* (blackgum), and *Quercus prinus* (chestnut oak); sparse shrub and herb layers; occurs on mid slopes with infertile, sandy soils. .... **Central Appalachian White Pine - Eastern Hemlock Forest (CEGL006019)**
[*Pinus strobus* - *Tsuga canadensis* / *Acer pensylvanicum* / *Polystichum acrostichoides* Forest]
3b. Cove forests of lower slopes and ravines below 1,160 m (3,800 feet) elevation, from MD south, containing *Pinus strobus* (eastern white pine) and *Tsuga canadensis* (eastern hemlock). **4**

4a. Acidic cove forests found in VA (from Roanoke north), MD, and WV; *Rhododendron maximum* (great laurel) typically absent; canopy associates can include *Liriodendron tulipifera* (tuliptree), *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), and/or *Quercus alba* (white oak); *Acer rubrum* (red maple), *Acer pensylvanicum* (striped maple), *Amelanchier arborea* (common serviceberry), *Cercis canadensis* (eastern redbud), and/or *Cornus florida* (flowering dogwood) common; occurs on the lower slopes and bottoms of ravines and coves at lower elevations, generally below 915 m (3,000 feet). .... **Central Appalachian Acidic Cove Forest (White Pine - Hemlock - Mixed Hardwoods Type) (CEGL006304)**
[*Liriodendron tulipifera* - *Pinus strobus* - *Tsuga canadensis* - *Quercus rubra* / *Polystichum acrostichoides* Forest]
4b. Lower-elevation (400-1,160 m [1,300-3,800 feet]) acidic cove forest ranging from Roanoke, VA, south to GA; *Rhododendron maximum* (great laurel) dominant shrub; canopy variable with *Liriodendron tulipifera* (tuliptree) and *Betula lenta* (sweet birch) mixed with *Tsuga canadensis* (eastern hemlock), *Acer rubrum* (red maple), *Quercus rubra* (northern red oak), and/or *Quercus alba* (white oak) that usually does not include much *Halesia* (silverbell) spp.; relative proportion of *Tsuga canadensis* (eastern hemlock) may vary greatly, with some sites having little or none in the canopy; *Aesculus flava* (yellow buckeye), *Acer pensylvanicum* (striped maple), and *Hamamelis virginiana* (American witch-hazel) are common shrubs; characteristic herbs include *Anemone quinquefolia* var.

[20]For all *Tsuga canadensis* associations that have been impacted by the hemlock woolly adelgid, treat standing and fallen dead trees as part of *Tsuga canadensis* canopy cover. Due to the loss of hemlock from adelgids, *Pinus strobus* is now the sole evergreen codominant or dominant in many stands. Even in stands unaffected by adelgid, the proportions of hemlock and white pine were highly variable.

quinquefolia (nightcaps), *Carex laxiculmis* var. *laxiculmis* (spreading sedge), and *Viola blanda* var. *blanda* (sweet white violet). ..... **Southern Appalachian Acidic Cove Forest (Typic Type) (CEGL007543)**
[*Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest]

5a. *Betula alleghaniensis* (yellow birch) codominant or common in stand..... **6**
5b. *Betula alleghaniensis* (yellow birch) minor to absent; *Betula lenta* (sweet birch) may be common..... **8**

6a. *Rhododendron maximum* (great laurel) absent in the shrub layer; *Tsuga canadensis* (eastern hemlock) - northern hardwood forest occurring on rocky acidic soils on north-facing slopes; distributed in large patches from NH south through PA; restricted to local patches at higher elevations of the Central Appalachians in MD, WV, and VA; at the southern end of the range (in VA and MD), *Liriodendron tulipifera* (tuliptree) may be an important overstory associate while to the north *Fagus grandifolia* (American beech) and *Acer saccharum* (sugar maple) are more common; *Quercus* (oak) spp., such as *Quercus prinus* (chestnut oak), *Quercus alba* (white oak), and *Quercus rubra* (northern red oak) and *Pinus strobus* (eastern white pine) tend to be absent or, if present, only occur with low abundance; subcanopy includes *Tsuga canadensis* (eastern hemlock), *Acer rubrum* (red maple), and *Betula lenta* (sweet birch); *Hamamelis virginiana* (American witch-hazel) is a characteristic shrub; sparse herb layer but *Mitchella repens* (partridgeberry), *Thelypteris noveboracensis* (New York fern), *Medeola virginiana* (Indian cucumber) and *Eurybia divaricata* (white wood aster) are characteristic. ..... **Hemlock - Transitional Northern Hardwood Forest (CEGL006639)**
[*Tsuga canadensis* - *Acer saccharum* - *Fagus grandifolia* / *Dryopteris intermedia* Forest]
6b. *Rhododendron maximum* (great laurel) characteristic in the shrub layer. **7**

7a. *Tsuga canadensis* (eastern hemlock) - northern hardwood forest occurring on sandy loams and sands of glacial till or sandstone, in rocky ravines, or moderately steep slopes of any aspect, on stream terraces, or occasionally on flats; ranges from PA and southern NY south to WV; *Betula lenta* (sweet birch), *Prunus serotina* (black cherry), *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Quercus alba* (white oak), and/or *Liriodendron tulipifera* (tuliptree) also common in canopy; *Hamamelis virginiana* (American witch-hazel) is a common shrub..... **Central Appalachian Hemlock - Northern Hardwood Forest (CEGL006206)**
[*Tsuga canadensis* - *Betula alleghaniensis* - *Prunus serotina* / *Rhododendron maximum* Forest]
7b. Mixed northern hardwood forest of the Blue Ridge Mountains at elevations of 320 to 1,040 m (1,000-5,000 feet); strong *Betula alleghaniensis* (yellow birch) component with variable amounts of *Tsuga canadensis* (eastern hemlock) and *Acer rubrum* (red maple); *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), and/or *Acer pensylvanicum* (striped maple) may be present in some stands; dense *Rhododendron maximum* (great laurel) cover and few herbs, including *Dennstaedtia punctilobula* (eastern hayscented fern) and *Dryopteris intermedia* (intermediate woodfern); steep, mostly north-facing mesic slopes, and on toeslopes and flats along streams; locally distributed throughout higher elevations of the Southern and Central Appalachians (NC, TN, VA, WV)..... **Blue Ridge Hemlock - Northern Hardwood Forest (CEGL007861)**
[*Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest]

8a. Acidic cove forest found at lower-elevations (400-1,160 m [1,300-3,800 feet]), ranging from Roanoke, VA, south to GA; *Rhododendron maximum* (great laurel) dominant shrub; with a variable canopy with *Liriodendron tulipifera* (tuliptree) and *Betula lenta* (sweet birch) mixed with *Tsuga canadensis* (eastern hemlock), *Acer rubrum* (red maple), *Quercus rubra* (northern red oak) and/or *Quercus alba* (white oak) that usually does not include much *Halesia* (silverbell) spp.; relative proportion of *Tsuga canadensis* (eastern hemlock) may vary greatly, with some sites having little or none in the canopy; *Aesculus flava* (yellow buckeye), *Acer pensylvanicum* (striped maple), and *Hamamelis virginiana* (American witch-hazel) are common shrubs; characteristic herbs include *Anemone quinquefolia* var. *quinquefolia* (nightcaps), *Carex laxiculmis* var. *laxiculmis* (spreading sedge), and *Viola blanda* var. *blanda* (sweet white violet). ..... **Southern Appalachian Acidic Cove Forest (Typic Type) (CEGL007543)**
[*Liriodendron tulipifera - Betula lenta - Tsuga canadensis* / *Rhododendron maximum* Forest]

8b. Various forests occurring from New England south to central VA (near Roanoke). **9**

9a. Central Appalachian *Tsuga canadensis* (eastern hemlock) - mixed oak forest occurring on moderately steep sheltered slopes and low flats with northeastern to northwestern exposures at lower elevations from 150 m to about 750 m (500-2,500 feet); ranges from the NJ Highlands south to the Blue Ridge, Ridge and Valley, and Piedmont provinces of PA and MD, and the Cumberlands in WV; *Quercus prinus* (chestnut oak) codominant with *Tsuga canadensis* (eastern hemlock); *Quercus rubra* (northern red oak) and *Quercus alba* (white oak) are overstory associates; *Pinus strobus* (eastern white pine) minor associate; *Betula lenta* (sweet birch), *Acer rubrum* (red maple), and *Tsuga canadensis* (eastern hemlock) common in subcanopy; *Hamamelis virginiana* (American witch-hazel) most consistently providing moderate cover; less frequently, *Kalmia latifolia* (mountain laurel), *Rhododendron maximum* (great laurel), *Vaccinium pallidum* (Blue Ridge blueberry), *Amelanchier arborea* (common serviceberry), and *Viburnum acerifolium* (mapleleaf viburnum) are shrub components. ..... **Central Appalachian Hemlock - Chestnut Oak Forest (CEGL006923)**
[*Tsuga canadensis - Quercus prinus - Betula lenta* Forest]

9b. Mixed hemlock-hardwood or white pine - hemlock - hardwood acidic cove forests occurring on the lower slopes and bottoms of ravines. **10**

10a. Mixed hardwood - white pine - hemlock acidic cove forest distributed in the Central Appalachians from Roanoke, VA, north to MD generally below 915 m (3,000 feet); variable canopy can include *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), and/or *Quercus alba* (white oak), along with *Tsuga canadensis* (eastern hemlock), *Liriodendron tulipifera* (tuliptree), and/or *Pinus strobus* (eastern white pine); *Acer rubrum* (red maple), *Acer pensylvanicum* (striped maple), *Amelanchier arborea* (common serviceberry), *Cercis canadensis* (eastern redbud), and/or *Cornus florida* (flowering dogwood) common; *Rhododendron maximum* (great laurel) absent. ..... **Central Appalachian Acidic Cove Forest (White Pine - Hemlock - Mixed Hardwoods Type) (CEGL006304)**
[*Liriodendron tulipifera - Pinus strobus - Tsuga canadensis - Quercus rubra* / *Polystichum acrostichoides* Forest]

10b. Mixed hemlock-hardwood acidic cove forest found along the AT corridor only at Shenandoah National Park; sites are located between 275 and 760 m (900-2,500 feet) elevation; stands often occupy elongated, linear patches in mesic ravines with incising first-, second-, and third-order stream; *Tsuga canadensis* (eastern hemlock), *Quercus prinus* (chestnut oak), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Quercus rubra* (northern red oak), and *Nyssa sylvatica* (blackgum) are the most characteristic and abundant trees; *Fagus grandifolia* (American beech), *Magnolia acuminata* (cucumber-tree), *Pinus strobus* (eastern white pine), and *Quercus alba* (white oak) are minor and localized overstory associates; understory tree layers are

mostly composed of younger trees of the canopy species; *Kalmia latifolia* (mountain laurel), *Hamamelis virginiana* (American witch-hazel), and *Acer pensylvanicum* (striped maple) are abundant species shrubs; less frequently *Menziesia pilosa* (minniebush), *Rhododendron catawbiense* (Catawba rosebay), and rarely *Rhododendron maximum* (great laurel) may form large colonies; typically sparse herb layer, but some stands have substantial cover by the clonal ferns *Dennstaedtia punctilobula* (eastern hayscented fern) and/or *Thelypteris noveboracensis* (New York fern). .... **Central Appalachian Acidic Cove Forest (CEGL008512)**[21]

[*Tsuga canadensis - Quercus prinus - Liriodendron tulipifera / Kalmia latifolia - (Rhododendron catawbiense)* Forest]

11a. *Betula alleghaniensis* (yellow birch) present to codominant in canopy. **12**
11b. *Betula alleghaniensis* (yellow birch) absent from canopy. **15**

12a. Forests of the Central Appalachians (north of Roanoke, VA). **13**
12b. Forests more typical of the Southern Appalachians (Roanoke, VA and south). **14**

13a. Central Appalachian northern hardwood forest characterized by *Betula alleghaniensis* (yellow birch) and *Quercus rubra* (northern red oak) occurring on rocky, northwest- to northeast-facing slopes at elevations from about 975 m to more than 1,300 m (3,000-4,300 feet); occurs in high-elevation areas of the Central Appalachians in VA, WV, MD, and PA; *Acer pensylvanicum* (striped maple) and *Acer spicatum* (mountain maple) characteristic understory trees, although *Ilex montana* (mountain holly) may be locally abundant; *Hamamelis virginiana* (American witch-hazel), *Sambucus racemosa* var. *racemosa* (red elderberry), and *Kalmia latifolia* (mountain laurel) are common shrubs; herbs can include *Oclemena acuminata* (whorled wood aster) and ferns such as *Athyrium filix-femina* ssp. *asplenioides* (asplenium ladyfern), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Dryopteris intermedia* (intermediate woodfern). .... **Central Appalachian Northern Hardwood Forest (Yellow Birch - Northern Red Oak Type) (CEGL008502)**

[*Betula alleghaniensis - Quercus rubra* / *Acer spicatum* / *Dryopteris intermedia - Oclemena acuminata* Forest]

13b. High-elevation boulderfield woodland or open forest of the Northern Blue Ridge, Ridge and Valley, and Allegheny Mountains in VA and WV; *Quercus rubra* (northern red oak) usually absent; very open canopy dominated by stunted and gnarled *Betula alleghaniensis* (yellow birch); *Sorbus americana* (American mountain-ash), *Prunus pensylvanica* (pin cherry), and *Acer spicatum* (mountain maple) often have high cover; *Menziesia pilosa* (minniebush), *Sambucus racemosa* (red elderberry), and/or *Ribes cynosbati* (eastern prickly gooseberry) are frequent shrubs; *Polypodium appalachianum* (Appalachian polypody) may abundantly cover mossy rock surfaces; high lichen cover. ..... **Central Appalachian High-Elevation Boulderfield Forest (CEGL008504)**

[*Betula alleghaniensis* / *Sorbus americana - Acer spicatum* / *Polypodium appalachianum* Forest]

[21]In Virginia, hemlock has been almost entirely extirpated from the canopy of this type by adelgids, although significant hemlock cover remains in the understory of many stands.

14a. Typic Southern Appalachian northern hardwood forest occurring on exposed landforms such as open, north-facing slopes at high elevations typically over 1,220 m (4,000 feet); common in high elevations of the Southern Blue Ridge in eastern TN, western NC, and southwestern VA; variable canopy includes *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), *Aesculus flava* (yellow buckeye), and *Acer saccharum* (sugar maple); indicator species include *Viburnum lantanoides* (hobblebush), *Ageratina altissima* var. *roanensis* (white snakeroot), *Eurybia chlorolepis* (mountain aster), *Athyrium filix-femina* ssp. *asplenioides* (asplenium ladyfern), *Carex lucorum* var. *austrolucorum* (Blue Ridge sedge) and *Viola blanda* var. *blanda* (sweet white violet)..... ..... **Southern Appalachian Northern Hardwood Forest (Typic Type) (CEGL007285)**
[*Betula alleghaniensis - Fagus grandifolia* / *Viburnum lantanoides* / *Eurybia chlorolepis - Dryopteris intermedia* Forest]

14b. Mixed hemlock - northern hardwood forest of the Blue Ridge Mountains at elevations of 320 to 1,040 m (1,000-5,000 feet); strong *Betula alleghaniensis* (yellow birch) component with variable amounts of *Tsuga canadensis* (eastern hemlock); *Liriodendron tulipifera* (tuliptree) may be present in some stands; *Oxydendrum arboreum* (sourwood) common; dense *Rhododendron maximum* (great laurel) cover and few herbs, including *Mitchella repens* (partridgeberry) and *Carex laevivaginata* (smoothsheath sedge); steep, mostly north-facing mesic slopes, and on toeslopes and flats along streams; locally distributed throughout higher elevations of the Southern and Central Appalachians (NC, TN, VA, WV).....**Blue Ridge Hemlock - Northern Hardwood Forest (CEGL007861)**
[*Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest]

15a. *Quercus* (oak) spp. absent from canopy..... **16**
15b. *Quercus* (oak) spp. present in canopy..... **19**

16a. Mesophytic hardwood and cove forests ranging from Roanoke, VA, south through the Southern Blue Ridge. **17**
16b. Successional hardwood and cove forests ranging from Roanoke, VA, north through PA..... **18**

17a. Typic Southern Appalachian high-elevation [over 1,220 m (4,000 feet)] northern hardwood forest occurring on exposed open, north-facing slopes; endemic to high elevations of the Southern Blue Ridge in eastern TN, western NC, and southwestern VA; variable canopy includes *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), *Aesculus flava* (yellow buckeye), and *Acer saccharum* (sugar maple) dominant in canopy; indicator species include *Viburnum lantanoides* (hobblebush), *Ageratina altissima* var. *roanensis* (white snakeroot), *Eurybia chlorolepis* (mountain aster), *Athyrium filix-femina* ssp. *asplenioides* (asplenium ladyfern), *Carex lucorum* var. *austrolucorum* (Blue Ridge sedge), and *Viola blanda* var. *blanda* (sweet white violet)..... ..... **Southern Appalachian Northern Hardwood Forest (Typic Type) (CEGL007285)**
[*Betula alleghaniensis - Fagus grandifolia* / *Viburnum lantanoides* / *Eurybia chlorolepis - Dryopteris intermedia* Forest]

17b. Lower-elevation (400-1,160 m [1,300-3,800 feet]) acidic cove forest ranging from Roanoke, VA, south to GA; *Rhododendron maximum* (great laurel) dominant shrub; with a variable canopy with *Liriodendron tulipifera* (tuliptree) and *Betula lenta* (sweet birch) mixed with *Tsuga canadensis* (eastern hemlock), *Acer rubrum* (red maple), *Quercus rubra* (northern red oak), and/or *Quercus alba* (white oak) that usually does not include much *Halesia* (silverbell) spp.; relative proportion of *Tsuga canadensis* (eastern hemlock) may vary greatly, with some sites having little or none in the canopy; *Aesculus flava* (yellow buckeye), *Acer pensylvanicum* (striped maple), and *Hamamelis virginiana* (American witch-hazel) are common shrubs; characteristic herbs include *Anemone quinquefolia* var.

quinquefolia (nightcaps), *Carex laxiculmis* var. *laxiculmis* (spreading sedge), and *Viola blanda* var. *blanda* (sweet white violet). ..... **Southern Appalachian Acidic Cove Forest (Typic Type) (CEGL007543)**
[*Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest]

18a. *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) in canopy with dense *Lycopodium* (clubmoss) spp. or *Dennstaedtia punctilobula* (eastern hayscented fern) ground cover; *Nyssa sylvatica* (blackgum) may be common; distribution is centered in the High Allegheny Mountains and Allegheny Plateau but extends north to NY, NJ and PA; common in WV, less common in VA; often originating after severe disturbance such as fire, clear-cutting, or gypsy moth outbreaks. ..... **Central Appalachian Ruderal Sweet Birch - Red Maple Forest (CEGL008503)**
[*Betula lenta* - *Acer rubrum* / *Lycopodium annotinum* - *Dennstaedtia punctilobula* Ruderal Forest]
18b. Tuliptree dominated forests and acidic cove forests..... **19**

19a. *Liriodendron tulipifera* (tuliptree) dominated forests (>30% cover). **20**
19b. *Liriodendron tulipifera* (tuliptree) not dominant in canopy (<30% cover); Acidic cove forests of the Central Appalachians, more diverse, containing some combination of *Tsuga canadensis* (eastern hemlock), *Liriodendron tulipifera* (tuliptree), *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), and/or *Quercus alba* (white oak); *Quercus rubra* (northern red oak), as well as possibly *Betula lenta* (sweet birch), *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum). **21**

20a. Widespread *Liriodendron tulipifera* (tuliptree) forest of relatively fertile substrates in all provinces of the Mid-Atlantic states and in parts of the Southeast; *Quercus* (oak) spp. generally absent, with a large presence of understory species indicative of high-calcium or base-rich soils such as *Cercis canadensis* (eastern redbud), *Symphoricarpos orbiculatus* (coralberry), or *Lindera benzoin* (northern spicebush); exotic shrubs, including *Rosa multiflora* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), and/or *Lonicera japonica* (Japanese honeysuckle), may be common; ground layer lush and diverse. ..... **Ruderal Tuliptree Forest (Rich Type) (CEGL007220)**
[*Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Ruderal Forest]
20b. Widespread typic acidic *Liriodendron tulipifera* (tuliptree) and *Quercus* (oak) spp. forest in areas that had stand-initiating disturbance such as logging in the past; oaks present in canopy and/or subcanopy (>10% cover); understory lacking calcium-rich indicators; additional associates may include *Acer rubrum* (red maple), *Carya* (hickory) spp., *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), *Betula lenta* (sweet birch), and/or *Robinia pseudoacacia* (black locust); shrub layers may include *Acer pensylvanicum* (striped maple), *Amelanchier arborea* (common serviceberry), *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush) (in small amounts), and *Vaccinium pallidum* (Blue Ridge blueberry); ground layer less diverse, not lush. ..... **Ruderal Tuliptree Forest (Typic Type) (CEGL007221)**
[*Liriodendron tulipifera* - *Quercus* spp. Ruderal Forest]

21a. Mixed hemlock-hardwood acidic cove forest found only at Shenandoah National Park along the AT corridor; sites are located between 275 and 760 m (900-2,500 feet); stands often occupy elongated, linear patches in mesic ravines with incising first-, second-, and third-order streams; *Tsuga canadensis* (eastern hemlock), *Quercus prinus* (chestnut oak), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Quercus rubra* (northern red oak), and *Nyssa sylvatica* (blackgum) are the most characteristic and abundant trees; *Fagus grandifolia* (American beech), *Magnolia acuminata* (cucumber-tree), *Pinus strobus* (eastern white pine), and *Quercus alba* (white oak) are minor and localized overstory associates; *Kalmia latifolia* (mountain laurel), *Hamamelis virginiana* (American witch-hazel), and *Acer pensylvanicum* (striped maple) are abundant shrubs; less frequently *Menziesia pilosa* (minniebush), *Rhododendron catawbiense* (Catawba rosebay), and rarely *Rhododendron maximum* (great laurel) may form large colonies; sparse herb layer, but some stands have substantial cover by the clonal ferns *Dennstaedtia punctilobula* (eastern hayscented fern) and/or *Thelypteris noveboracensis* (New York fern). ....**Central Appalachian Acidic Cove Forest (CEGL008512)**

[*Tsuga canadensis - Quercus prinus - Liriodendron tulipifera / Kalmia latifolia - (Rhododendron catawbiense)* Forest]

21b. White pine-hemlock-mixed hardwoods acidic cove forest of the Central Appalachians from Roanoke, VA, north to MD; *Liriodendron tulipifera* (tuliptree) characteristic; acidic cove forest occurring on the lower slopes and bottoms of ravines and coves at lower elevations, generally below 915 m (3,000 feet); canopy associates can include, *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), and/or *Quercus alba* (white oak); *Acer rubrum* (red maple), *Acer pensylvanicum* (striped maple), *Amelanchier arborea* (common serviceberry), *Cercis canadensis* (eastern redbud), and/or *Cornus florida* (flowering dogwood) common; *Rhododendron maximum* (great laurel) absent. .....**Central Appalachian Acidic Cove Forest (White Pine - Hemlock - Mixed Hardwoods Type) (CEGL006304)**

[*Liriodendron tulipifera - Pinus strobus - Tsuga canadensis - Quercus rubra* / *Polystichum acrostichoides* Forest]

8. Oak / Heath Forests

1a. Evergreen trees codominant with dry-site oaks. **2**
1b. Evergreen trees sparse or absent. **3**

2a. *Tsuga canadensis* (eastern hemlock) codominant with *Quercus prinus* (chestnut oak), or dominant in the understory; occurring on moderately steep sheltered slopes with northeastern to northwestern exposures at lower elevations from 150 m to about 750 m (500-2,500 feet); ranges from the NJ Highlands south to the Blue Ridge, Ridge and Valley, and Piedmont provinces of PA and MD, and the Cumberlands in WV. ..... **Central Appalachian Hemlock - Chestnut Oak Forest (CEGL006923)**
[*Tsuga canadensis* - *Quercus prinus* - *Betula lenta* Forest]
2b. *Pinus strobus* (eastern white pine) codominant in canopy with mixed oaks, or dominant in the understory; widespread on low shale mountains and hills in west-central VA and adjacent WV; sites are mid and upper slopes, ridge crests, dry ravines, and bluffs underlain primarily by shale and similar sedimentary rocks (siltstone) mostly below 760 m (2,500 feet) elevation; *Amelanchier arborea* (common serviceberry), and *Cornus florida* (flowering dogwood) are common in subcanopy; *Kalmia latifolia* (mountain laurel) and *Viburnum acerifolium* (mapleleaf viburnum) common in the tall-shrub layer; *Vaccinium pallidum* (Blue Ridge blueberry) and *Vaccinium stamineum* (deerberry) characteristic; scattered herbs including *Chimaphila maculata* (striped prince's pine), *Galax urceolata* (beetleweed), and *Polygonatum biflorum* (smooth Solomon's seal). ..... **Central Appalachian-Piedmont White Pine - Subxeric Oak Forest (CEGL008539)**
[*Pinus strobus* - *Quercus alba* - *Quercus prinus* / *Vaccinium stamineum* Forest]

3a. Stand strongly dominated by *Quercus prinus* (chestnut oak), or some combination of *Quercus prinus* (chestnut oak) with other dry-site oaks [e.g., *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Quercus alba* (white oak), *Quercus rubra* (northern red oak)]..... **4**
3b. Stand codominated by *Quercus prinus* (chestnut oak) and *Quercus rubra* (northern red oak), or strongly dominated by *Quercus rubra* (northern red oak). **8**

4a. *Rhododendron catawbiense* (Catawba rosebay) dominant in shrub layer; occurs on north- or northwest-facing convex, upper slopes, clifftops, and spur crests from 305 to 1,097 m (1,000 to 3,600 feet) elevation from the northern part of the Southern Blue Ridge north through central VA (documented in Augusta Nelson, Amherst, and Rockbridge counties); scattered *Pinus pungens* (Table Mountain pine) possible; *Kalmia latifolia* (mountain laurel), *Amelanchier arborea* (common serviceberry), and *Hamamelis virginiana* (American witch-hazel) mixed in shrub layer; *Vaccinium pallidum* (Blue Ridge blueberry) and *Gaylussacia baccata* (black huckleberry) prominent; herbs are sparse but include *Galax urceolata* (beetleweed). ..... **Central Appalachian Chestnut Oak / Catawba Rosebay Forest (CEGL008524)**
[*Quercus prinus* / *Rhododendron catawbiense* - *Kalmia latifolia* Forest]
4b. *Rhododendron catawbiense* (Catawba rosebay) sparse or absent. **5**

5a. *Quercus alba* (white oak) important (often codominant) in stand; deciduous heaths dominant in shrub layer; restricted to low elevations, usually <457 m (1,500 feet), rarely to 762 m (2,500 feet), and relatively gentle slopes matrix forest of dry, nutrient-poor uplands of the Mid-Atlantic Piedmont Plateau; various *Pinus* (pine) spp., including *Pinus virginiana* (Virginia pine), *Pinus echinata* (shortleaf pine), *Pinus strobus* (eastern white pine), and/or *Pinus rigida* (pitch pine), can be overstory associates (but <30% in canopy - this is an oak forest, not a mixed oak-pine forest); subcanopy can include *Acer rubrum* (red maple); shrub layer can include *Rhododendron periclymenoides* (pink azalea), *Photinia melanocarpa* (black chokeberry), *Gaylussacia baccata* (black huckleberry), and *Vaccinium corymbosum* (highbush blueberry). ..... **Low-Elevation Mixed Oak / Heath Forest (CEGL008521)**
[*Quercus alba* - *Quercus* (*coccinea, velutina, prinus*) / *Gaylussacia baccata* Forest]

5b. *Quercus alba* (white oak) sparse or absent; occurring over a greater range of elevations and topographic settings; *Kalmia latifolia* (mountain laurel) usually dominant or codominant in shrub layer in VA and MD stands, PA stands have more variable ericaceous shrub species composition sometimes with *Kalmia* and sometimes without..... **6**

6a. Oak-heath forest occurring in a variety of topographic positions south of Roanoke, VA; characteristic Southern Appalachian species such as *Oxydendrum arboreum* (sourwood), *Leucothoe recurva* (redtwig doghobble), and *Galax urceolata* (beetleweed) prominent in stand; *Quercus coccinea* (scarlet oak), *Nyssa sylvatica* (blackgum), and *Acer rubrum* (red maple) common canopy associates; *Kalmia latifolia* (mountain laurel) and *Castanea dentata* (American chestnut) in shrub layer; *Gaultheria procumbens* (eastern teaberry), *Epigaea repens* (trailing arbutus), and *Uvularia puberula* (mountain bellwort) are common herbs..... **Chestnut Oak Forest (Subxeric Ridge Type) (CEGL006271)**
[*Quercus* (*prinus, coccinea*) / *Kalmia latifolia* / (*Galax urceolata, Gaultheria procumbens*) Forest]

6b. Oak-heath forest occurring north of Roanoke, VA; characteristic Southern Appalachian species absent. **7**

7a. Oak-heath forest occurring from Roanoke, VA, to Cumberland Co., PA; *Quercus prinus* (chestnut oak) over *Kalmia latifolia* (mountain laurel) with well-developed ericaceous shrub layer which includes *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and *Gaylussacia baccata* (black huckleberry), any one of which can exhibit patch-dominance; (heath) shrubs strongly dominant in lower woody layers; if sparse, then clearly more numerous than non-ericaceous species. ..... **Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299)**
[*Quercus prinus* - (*Quercus coccinea, Quercus rubra*) / *Kalmia latifolia* / *Vaccinium pallidum* Forest]

7b. Oak-heath forest occurring from Cumberland Co., PA, to southern New England; *Betula lenta* (sweet birch) common in subcanopy; understory with dense *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), and/or *Gaylussacia baccata* (black huckleberry); *Kalmia latifolia* (mountain laurel) and/or *Hamamelis virginiana* (American witch-hazel) may be present with other tall shrubs; herbaceous layer poorly developed and depauperate..... **Lower New England High Slope Chestnut Oak Forest (CEGL006282)**
[*Quercus prinus* - *Quercus* (*rubra, velutina*) / *Vaccinium* (*angustifolium, pallidum*) Forest]

8a. Stand codominated by *Quercus prinus* (chestnut oak) and *Quercus rubra* (northern red oak); forests of low to middle elevations. **9**

8b. Stand strongly dominated by *Quercus rubra* (northern red oak); forests of high elevations **11**

9a. *Rhododendron maximum* (great laurel) dominant in shrub layer; usually on north aspect slopes; occurs rarely in the Central Appalachians; ranges from south of the New River in VA to the Southern Blue Ridge. ..... **Chestnut Oak Forest (Mesic Slope Heath Type) (CEGL006286)**
[*Quercus prinus* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest]
9b. *Rhododendron maximum* (great laurel) sparse or absent. **10**

10a. Deciduous heaths *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry) and *Viburnum acerifolium* (mapleleaf viburnum), patchy *Rhododendron periclymenoides* (pink azalea) and/or *Kalmia latifolia* (mountain laurel); occurring on exposed, convex higher-elevation (610-914 m [2,000-3,000 feet]), moderately steep, middle to upper slopes, ridge crests, and boulderfields from the Northern Blue Ridge to just north of Roanoke to Harpers Ferry to the Catoctin Mountains of northern MD, and extending into northeastern WV; *Acer rubrum* (red maple) cover may equal or exceed that of the diagnostic oak species in stands with recent harvesting; patchy to dense shrub layer dominated by heaths herbs are usually sparse but can be moderately diverse on rocky soils include *Aralia nudicaulis* (wild sarsaparilla), *Houstonia longifolia* (longleaf summer bluet), and *Campanula divaricata* (small bonny bellflower); *Dennstaedtia punctilobula* (eastern hayscented fern) more common on deeper soils. ..... **Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest (CEGL008523)**
[*Quercus prinus* - *Quercus rubra* / *Vaccinium pallidum* - (*Rhododendron periclymenoides*) Forest]
10b. *Kalmia latifolia* (mountain laurel) dominant in shrub layer; oak-heath forest occurring from Roanoke, VA to Cumberland Co., PA; *Quercus prinus* (chestnut oak) over *Kalmia latifolia* (mountain laurel) with well-developed ericaceous shrub layer which includes *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and *Gaylussacia baccata* (black huckleberry), any one of which can exhibit patch-dominance; occasionally stands in PA have an entirely deciduous ericaceous shrub layer with sparse *Kalmia*..... **Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299)**
[*Quercus prinus* - (*Quercus coccinea, Quercus rubra*) / *Kalmia latifolia* / *Vaccinium pallidum* Forest]

11a. Combinations of evergreen *Rhododendron catawbiense* (Catawba rosebay), *Rhododendron maximum* (great laurel), and *Kalmia latifolia* (mountain laurel) forming >50% of shrub layer; occurring primarily south of the New River, with scattered outliers north to Bedford and Botetourt counties, VA. ..... **Southern Appalachian High-Elevation Red Oak Forest (Evergreen Shrub Type) (CEGL007299)**
[*Quercus rubra* / (*Kalmia latifolia, Rhododendron catawbiense, Rhododendron maximum*) / *Galax urceolata* Forest]
11b. *Kalmia latifolia* (mountain laurel), sometimes with *Menziesia pilosa* (minniebush) and/or *Rhododendron prinophyllum* (early azalea), dominating the shrub layer; *Rhododendron catawbiense* (Catawba rosebay) and *Rhododendron maximum* (great laurel) absent; occurring from Roanoke, VA, north through Shenandoah National Park. ..... **Central Appalachian Northern Red Oak Forest (CEGL008506)**
[*Quercus rubra* - (*Quercus alba*) / *Ilex montana* / *Dennstaedtia punctilobula* - *Lysimachia quadrifolia* Forest]

9. Mixed Oak and Oak - Hickory Forests

1a. High-elevation forests [above 915 m (3,000 feet)] strongly dominated by *Quercus rubra* (northern red oak) (*Quercus alba* (white oak) or *Quercus velutina* (black oak) occasionally codominant); *Quercus prinus* (chestnut oak) and *Carya* (hickory) spp. generally rare to absent (even in understory)[22]. **2**
1b. Lower- to middle-elevation forests [below 1,130 m (3,600 feet)] containing mixtures of various oaks [usually including *Quercus prinus* (chestnut oak)], often with hickories and/or other hardwoods. **4**

2a. Northern red oak forests of the Southern Appalachians, ranging north to Craig Co., VA; Southern Appalachian species such as *Rhododendron calendulaceum* (flame azalea), *Vaccinium erythrocarpum* (southern mountain cranberry), and *Galax urceolata* (beetleweed) prominent in stand. .....**Southern Appalachian High-Elevation Red Oak Forest (Deciduous Shrub Type) (CEGL007300)**
[*Quercus rubra* / (*Vaccinium simulatum, Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula, Thelypteris noveboracensis*) Forest]
2b. Northern red oak forests of the Central Appalachians, ranging from Roanoke, VA north through PA; lacking species characteristic of the Southern Appalachians. **3**

3a. Central Appalachian northern red oak forest with *Acer pensylvanicum* (striped maple), *Ilex montana* (mountain holly), *Hamamelis virginiana* (American witch-hazel); variable understory and herbaceous but *Dennstaedtia punctilobula* (eastern hayscented fern), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Carex pensylvanica* (Pennsylvania sedge), and *Solidago curtisii* (mountain decumbent goldenrod) are characteristic species. .... **Central Appalachian Northern Red Oak Forest (CEGL008506)**
[*Quercus rubra* - (*Quercus alba*) / *Ilex montana* / *Dennstaedtia punctilobula* - *Lysimachia quadrifolia* Forest]
3b. Central Appalachian northern hardwood - red oak forest characterized by *Betula alleghaniensis* (yellow birch) and *Quercus rubra* (northern red oak) occurring on rocky, northwest- to northeast-facing slopes at elevations from about 975 m to more than 1,300 m (3,000-4,300 feet); occurs in high-elevation areas of the Central Appalachians in VA, WV, MD, and PA; *Acer pensylvanicum* (striped maple) and *Acer spicatum* (mountain maple) characteristic understory trees, although *Ilex montana* (mountain holly) may be locally abundant; *Hamamelis virginiana* (American witch-hazel), *Sambucus racemosa* var. *racemosa* (red elderberry), and *Kalmia latifolia* (mountain laurel) are common shrubs; herbs can include *Oclemena acuminata* (whorled wood aster) and ferns such as *Athyrium filix-femina* ssp. *asplenioides* (asplenium ladyfern), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Dryopteris intermedia* (intermediate woodfern). .... **Central Appalachian Northern Hardwood Forest (Yellow Birch - Northern Red Oak Type) (CEGL008502)**
[*Betula alleghaniensis* - *Quercus rubra* / *Acer spicatum* / *Dryopteris intermedia* - *Oclemena acuminata* Forest]

[22]In the Virginia Northern Blue Ridge section (Roanoke through SHEN), northern red oak forests and montane oak-hickory forests co-occur extensively, and there are transition zones in which hickories are common in otherwise typical northern red oak stands.

4a. *Acer saccharum* (sugar maple) [and/or *Acer nigrum* (black maple)] among the canopy dominants. **5**
4b. Various oaks and often hickories codominant in the canopy; *Acer saccharum* (sugar maple) sometimes important in the understory but not in the canopy. **7**

5a. *Quercus muehlenbergii* (chinquapin oak) characteristic, often codominant; on dry, usually rocky limestone or dolomite slopes and ridges; *Cercis canadensis* (eastern redbud) is characteristic in the subcanopy; the herb layer is low and fairly dense, featuring patch-dominance by *Packera obovata* (roundleaf ragwort), *Erigeron pulchellus* (robin's plantain), *Hepatica nobilis* var. *acuta* (sharplobe hepatica), and *Thalictrum dioicum* (early meadowrue); uncommon along AT because of its being restricted to limestone; limited to valleys of the Ridge and Valley divergence area between I-81 and Roanoke in VA. ..... **Appalachian Sugar Maple - Chinquapin Oak Limestone Forest (CEGL006017)**
[*Acer saccharum* - *Quercus muehlenbergii* / *Cercis canadensis* Forest]
5b. *Quercus muehlenbergii* (chinquapin oak) sparse to absent; *Quercus rubra* (northern red oak) usually codominant; on dry-mesic to mesic slopes and in coves with various geological substrates ... **6**

6a. Red oak - sugar maple forest, often with abundant hickory, occurring only in the Ridge and Valley portion of the Central Appalachians in VA and MD; uncommon above 1,000 m (3,000 feet); *Fraxinus americana* (white ash) may be important, and *Liriodendron tulipifera* (tuliptree) may be common in disturbed stands; understory layers contain substantial reproduction of *Acer saccharum* (sugar maple); *Ostrya virginiana* (hophornbeam) is the most constant and abundant small tree/shrub, with *Cornus florida* (flowering dogwood), *Cercis canadensis* (eastern redbud); herbs are patchy with *Cardamine concatenata* (cutleaf toothwort) and *Ageratina altissima* (white snakeroot) characteristic.. ..... **Central Appalachian Rich Red Oak - Sugar Maple Forest (CEGL008517)**
[*Quercus rubra* - *Acer saccharum* / *Ostrya virginiana* / *Cardamine concatenata* Forest]
6b. Red oak - sugar maple - tuliptree forest occurring from Catoctin Mountain, MD north to NY and NJ; *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) common in the subcanopy; sparse shrub layer..... **High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125)**
[*Quercus rubra* - *Acer saccharum* - *Liriodendron tulipifera* Forest]

7a. Montane basic oak-hickory forest occurring from 760 m to 1,220 m (2,500 feet to >4,000 feet) in VA, WV and MD with variable mixtures of *Quercus rubra* (northern red oak) and other hardwoods, most typically *Quercus alba* (white oak), *Tilia americana* (American basswood), *Fraxinus americana* (white ash), *Carya ovalis* (red hickory), and *Carya ovata* (shagbark hickory), in the canopy, the latter three also common in the subcanopy; *Acer saccharum* common in the subcanopy of some stands; *Quercus prinus* (chestnut oak) rare to absent; lush herb layer with many nutrient-demanding forbs, i.e., *Actaea racemosa* (black baneberry), *Hydrophyllum virginianum* (eastern waterleaf), *Collinsonia canadensis* (richweed), *Thalictrum coriaceum* (maid-of-the-mist); occupies deep-soiled gentle crests, saddles, and upper slopes over base-rich igneous, metamorphic, and sedimentary rocks. ..... **Central Appalachian Montane Oak - Hickory Forest (Basic Type) (CEGL008518)**
[*Quercus rubra* - *Carya ovata* - *Fraxinus americana* / *Actaea racemosa* - *Hydrophyllum virginianum* Forest]
7b. *Quercus prinus* (chestnut oak) characteristic in mixtures with other trees; composition and environmental setting not as above. **8**

8a. Middle-elevation [760 m to 1,220 m (2,000 to 4,000 feet)] forests occurring from the vicinity of the New River south; Southern Appalachian species such as *Oxydendrum arboreum* (sourwood), *Magnolia fraseri* (mountain magnolia), *Rhododendron maximum* (great laurel), *Rhododendron calendulaceum* (flame azalea), *Galax urceolata* (beetleweed), and *Convallaria majuscula* (American lily-of-the-valley) prominent in stand. **9**
8b. Forests of various topographic settings, occurring from the vicinity of the New River north; Southern Appalachian species rare or absent in stand. **10**

9a. *Quercus rubra* (northern red oak) and *Quercus prinus* (chestnut oak) usually strongly codominant in stand; *Quercus alba* (white oak) absent to occasionally important; *Magnolia acuminata* (cucumber-tree) and/or *Magnolia fraseri* (mountain magnolia) usually important in canopy or understory; *Acer pensylvanicum* (striped maple) common to dominant in shrub layer; habitat variable, but most typically on somewhat sheltered, submesic, lower to middle slopes. ....**Southern Appalachian Montane Northern Red Oak - Chestnut Oak Forest (CEGL004817)**
[*Quercus rubra - Quercus prinus - Magnolia* (*acuminata, fraseri*) / *Acer pensylvanicum* Forest]
9b. *Quercus alba* (white oak) important (often codominant) in mixtures with *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), and *Carya* (hickory) spp.; high diversity of understory/shrub species (partly ericaceous) with no clear dominants; a diverse herb layer includes *Desmodium nudiflorum* (nakedflower ticktrefoil), *Prenanthes altissima* (tall rattlesnakeroot), *Polygonatum biflorum* (smooth Solomon's seal), *Potentilla canadensis* (dwarf cinquefoil), *Uvularia perfoliata* (perfoliate bellwort), *Uvularia puberula* (mountain bellwort), and *Zizia trifoliata* (meadow alexanders); usually on drier, more exposed convex upper slopes, crests, and saddles. ....**Appalachian Montane Oak - Hickory Forest (Typic Acidic Type) (CEGL007230)**
[*Quercus alba - Quercus* (*rubra, prinus*) / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest]

10a. *Quercus rubra* (northern red oak) and *Quercus prinus* (chestnut oak) usually strongly codominant; *Quercus alba* (white oak) rare to absent; *Carya* (hickory) spp. absent to sometimes important; *Hamamelis virginiana* (American witch-hazel) and/or *Acer pensylvanicum* (striped maple) characteristic; on sheltered, rocky slopes from 304 to 1,097 m (1,000 to 3,600 feet) elevation throughout the Central Appalachians; often on weathered boulderfields or talus; *Liriodendron tulipifera* (tuliptree) and *Acer rubrum* (red maple) and/or *Betula lenta* (sweet birch) possible in canopy or subcanopy; lower shrub layer is patchy and contains a mixture of scrambling vines, ericads, and non-ericaceous species; sparse but diverse dry-mesophytic herbs including *Carex* (sedge) spp., *Asplenium platyneuron* (ebony spleenwort), *Dioscorea quaternata* (fourleaf yam), *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Maianthemum racemosum* ssp. *racemosum* (feathery false lily of the valley), and *Solidago caesia* (wreath goldenrod). ....**Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057)**
[*Quercus prinus - Quercus rubra* / *Hamamelis virginiana* Forest]
10b. True oak - hickory forests with *Carya* (hickory) spp. common (usually codominant or dominant) in canopy and/or understory; *Quercus alba* (white oak) often important in the mixtures of oaks; understory variable; typically on more exposed slope positions, rarely on weathered boulderfields or talus..... **11**

11a. Dry oak-hickory forest occurring in the northern part of the Central Appalachians, along the AT corridor from PA northward; *Nyssa sylvatica* (blackgum) may be common; *Cornus florida* (flowering dogwood) is a characteristic understory tree; shrub layer is characterized by *Viburnum*

acerifolium (mapleleaf viburnum); patchy low-shrub layer of *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), and/or *Gaylussacia baccata* (black huckleberry); patchy herb layer with *Aralia nudicaulis* (wild sarsaparilla) and *Dryopteris marginalis* (marginal woodfern). ..... **Northeastern Dry Oak - Hickory Forest (CEGL006336)**
[*Quercus* (*alba, rubra, velutina*) - *Carya* spp. / *Viburnum acerifolium* Forest]

11b. Oak-hickory forests occurring in the southern part of the Central Appalachians, along the AT corridor from MD south. **12**

12a. Dry-mesic oak-hickory forest restricted to base-rich soils weathered from metabasalt and granitic rocks of the Northern Blue Ridge in VA, MD, and WV; elevation ranges from 140 to 950 m (450-3,100 feet); *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree) and *Acer saccharum* (sugar maple) canopy associates; *Cercis canadensis* (eastern redbud) (at lower elevations), *Cornus florida* (flowering dogwood), *Asimina triloba* (pawpaw), *Ostrya virginiana* (hophornbeam), and/or *Acer rubrum* (red maple) dominate the lowest tree and shrub layers; pines (*Pinus* spp.) and ericaceous shrubs absent; diverse herb layer includes *Galium circaezans* (licorice bedstraw), *Festuca subverticillata* (nodding fescue), *Maianthemum racemosum* ssp. *racemosum* (feathery false lily of the valley), *Dioscorea quaternata* (fourleaf yam), *Solidago caesia* (wreath goldenrod), *Actaea racemosa* (black baneberry), *Circaea lutetiana* ssp. *canadensis* (broadleaf enchanter's nightshade), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Podophyllum peltatum* (mayapple), and/or *Sanguinaria canadensis* (bloodroot). .....
Central Appalachian Basic Oak - Hickory Forest (Western Piedmont / Lower Blue Ridge Type) (CEGL008514)
[*Quercus rubra* - *Quercus prinus* - *Carya ovalis* / (*Cercis canadensis*) / *Solidago caesia* Forest]

12b. Dry oak-hickory forests restricted to more acidic soils of sedimentary and metasedimentary substrates of both the Northern Blue Ridge and Ridge and Valley regions..... **13**

13a. Low elevation (generally <610 m, rarely to 760 m (2,000 feet, rarely to 2,500 feet) acidic oak-hickory forest occurring primarily on shale and sandstone; *Carya glabra* (pignut hickory) is the most characteristic hickory; pines (*Pinus strobus* (eastern white pine) and *Pinus virginiana* (Virginia pine) are frequent to common associates, particularly in disturbed or fire-suppressed stands; *Cornus florida* (flowering dogwood) common in understory; common shrubs include *Amelanchier arborea* (common serviceberry), *Rosa carolina* var. *carolina* (Carolina rose), *Vaccinium stamineum* (deerberry), and *Vaccinium pallidum* (Blue Ridge blueberry); common herbs include *Carex pensylvanica* (Pennsylvania sedge), *Chimaphila maculata* (striped prince's pine), *Dichanthelium boscii* (Bosc's panicgrass), *Danthonia spicata* (poverty oatgrass), *Houstonia longifolia* (longleaf summer bluet), *Polygonatum biflorum* (smooth Solomon's seal), *Potentilla canadensis* (dwarf cinquefoil), and *Symphyotrichum undulatum* (wavyleaf aster). .....
..... **Central Appalachian Acidic Oak - Hickory Forest (CEGL008515)**
[*Quercus alba* - *Quercus prinus* - *Carya glabra* / *Cornus florida* / *Vaccinium pallidum* Forest]

13b. Montane acidic oak-hickory forest occurring at higher elevations 550-1270 m (2,000 to >4,000 feet) primarily on sandstone, quartzite, metasiltstone, and phyllite; pines rare to absent; *Carya ovalis* (red hickory) is the most characteristic hickory; *Cornus florida* (flowering dogwood) not common, usually absent; occurs in the southern part of the Central Appalachians, on the northern VA Blue Ridge and higher ridges of the Ridge and Valley in western VA and adjacent WV (from the New River north); *Acer pensylvanicum* (striped maple) and *Vaccinium* (blueberry) spp. dominate the patchy shrub layer; patchy herb layer. .....
..... **Central Appalachian Montane Oak - Hickory Forest (Acidic Type) (CEGL008516)**
[*Quercus prinus* - *Quercus rubra* - *Carya ovalis* / *Carex pensylvanica* - (*Calamagrostis porteri*) Forest]

10. Rich Cove and Rich Boulderfield Forests

1a. Uneven-aged forests lacking an abundance of non-native or early-successional species. **2**
1b. Successional or even-aged forests occurring on altered, plowed, farmed, or planted lands; typically dominated solely or a mixture of *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust), *Acer rubrum* (red maple) and/or *Betula lenta* (sweet birch) and often with many invasive species. **13**

2a. Rich forests occurring from Shenandoah National Park (SHEN) in VA, north to PA in the Central Appalachians; lacking species characteristic of the Southern Appalachians such as *Aesculus flava* (yellow buckeye). **3**
2b. Rich forests occurring south of SHEN in VA, typically in southwestern VA and some extending south into the Southern Blue Ridge. **8**

3a. Boulderfield forests occurring on steep, boulder and stone deposits below cliffs; stream- or river-fronting boulder- and talus-strewn slopes; boulder-filled slope concavities and hollow-heads; and other very rocky, submesic to mesic habitats; rock cover nearly continuous; surface soils, if any, sparse and interstitial. **4**
3b. Cove and lower slope forests; surface rocks sparse to common but usually not forming a continuous substrate; well developed soils usually present, at least locally. **6**

4a. Central Appalachian northern hardwood forest characterized by *Betula alleghaniensis* (yellow birch) and *Quercus rubra* (northern red oak) occurring on weathered, north- or northwest-facing, high-elevation boulderfields from about 935 m to more than 1,300 m (3,000-4,300 feet); on base-rich substrates of the Central Appalachians (e.g., metabasalt, pyroxene-bearing granitic gneisses), *Tilia americana* (American basswood), *Fraxinus americana* (white ash), and *Acer saccharum* (sugar maple) may be common associates; *Acer pensylvanicum* (striped maple) and *Acer spicatum* (mountain maple) characteristic understory trees, although *Ilex montana* (mountain holly) may be locally abundant; *Hamamelis virginiana* (American witch-hazel) and *Sambucus racemosa* var. *racemosa* (red elderberry) are common shrubs; the herb layer may be lush with species such as *Oclemena acuminata* (whorled wood aster), *Dryopteris intermedia* (intermediate woodfern), *Impatiens pallida* (pale touch-me-not), *Aconitum reclinatum* (trailing white monkshood), and others.. ..... **Central Appalachian Northern Hardwood Forest (Yellow Birch - Northern Red Oak Type) (CEGL008502)**
[*Betula alleghaniensis* - *Quercus rubra* / *Acer spicatum* / *Dryopteris intermedia* - *Oclemena acuminata* Forest]
4b. Stand not on high-elevation boulderfield and not dominated by *Betula alleghaniensis* (yellow birch). **5**

5a. Middle-slope boulderfield forest occurring between 760 and 1,030 m (2,500-3,400 feet) elevation in the Northern Blue Ridge in VA, MD, and WV, and more locally in the western VA Ridge and Valley region usually above where *Liriodendron tulipifera* (tuliptree) grows; *Tilia americana* (American basswood) and *Fraxinus americana* (white ash) codominant in the canopy; *Quercus rubra* (northern red oak), *Carya ovata* (shagbark hickory), and *Betula lenta* (sweet birch) also common and sometimes codominant; *Ostrya virginiana* (hophornbeam) and *Acer pensylvanicum* (striped maple) common in the subcanopy; shrubs can include *Sambucus racemosa* var. *racemosa* (red elderberry), *Prunus virginiana* (chokecherry), and/or *Hamamelis virginiana* (American witch-hazel); herb layer is diverse with *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Hydrophyllum virginianum* (eastern waterleaf), *Dryopteris marginalis* (marginal woodfern), *Arisaema triphyllum* (Jack in the pulpit), and others. ..... **Central Appalachian Basic Boulderfield Forest (Montane Basswood - White Ash Type) (CEGL008528)**

[*Tilia americana* - *Fraxinus americana* / *Acer pensylvanicum* / *Parthenocissus quinquefolia* - *Impatiens pallida* Woodland]

5b. *Acer saccharum* (sugar maple) is dominant or codominant in canopy; boulderfield forest occurring on stream- or river-fronting boulder- and talus-strewn slopes characterized by a mixed canopy with *Tilia americana* (American basswood), *Fraxinus americana* (white ash), and *Acer saccharum* (sugar maple); *Acer saccharum* (sugar maple) is dominant in PA stands; *Staphylea trifolia* (American bladdernut) abundant in the shrub layer; minor overstory associates include *Quercus rubra* (northern red oak), *Liriodendron tulipifera* (tuliptree), and *Quercus prinus* (chestnut oak); *Sambucus nigra* ssp. *canadensis* (American black elderberry) and/or *Lindera benzoin* (northern spicebush) common shrubs; *Toxicodendron radicans* (eastern poison-ivy) is a common vine; *Impatiens pallida* (pale touch-me-not), *Collinsonia canadensis* (richweed), *Dryopteris marginalis* (marginal woodfern), *Dryopteris intermedia* (intermediate woodfern), *Polygonatum biflorum* (smooth Solomon's seal), *Maianthemum racemosum* (feathery false lily of the valley), *Eurybia divaricata* (white wood aster), and *Polystichum acrostichoides* (Christmas fern) common; occurs in the Central Appalachians of PA, MD, northern VA, and probably northeastern WV. ..... **Central Appalachian-Piedmont Rich Boulderfield Forest (CEGL006471)**

[*Acer saccharum* - *Tilia americana* / *Staphylea trifolia* / *Dryopteris marginalis* - (*Impatiens pallida*) Forest]

6a. *Liriodendron tulipifera* (tuliptree) sparse to absent; rich cove forest occurring along slope bases, on lower concave slopes, and in middle to upper-slope coves at elevations from 425 to 1,050 m (1,400-3,600 feet); canopy is mixed with *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Betula alleghaniensis* (yellow birch), *Quercus rubra* (northern red oak), *Tilia americana* (American basswood), and others; *Acer pensylvanicum* (striped maple) and *Hamamelis virginiana* (American witch-hazel) common in shrub layer; common herbs include *Impatiens pallida* (pale touch-me-not), *Laportea canadensis* (Canadian woodnettle), *Deparia acrostichoides* (silver false spleenwort), *Aconitum reclinatum* (trailing white monkshood), *Viola canadensis* var. *canadensis* (Canadian white violet), *Asarum canadense* (Canadian wildginger), and *Angelica triquinata* (filmy angelica); ranges from the High Alleghenies, Western Allegheny Plateau, Central Appalachians, and Cumberlands from NY and NJ south to WV and VA. ..... **Central Appalachian Rich Cove Forest (CEGL006237)**

[*Acer saccharum* - *Fraxinus americana* - *Tilia americana* - *Liriodendron tulipifera* / *Actaea racemosa* Forest]

6b. *Liriodendron tulipifera* (tuliptree) generally codominant or dominant, with 30 to 100% canopy cover; *Lindera benzoin* (northern spicebush) common or dominant in shrub layer. **7**

7a. Lower slope and cove forest ranging from northern VA to GA with *Tilia americana* (both vars.) (American basswood), *Fraxinus americana* (white ash), and/or *Aesculus flava* (yellow buckeye) (south of the James River in VA), typical canopy associates of *Liriodendron tulipifera* (tuliptree); low-elevation shrubs absent from most stands; montane rich-site herbs such as *Laportea canadensis* (Canadian woodnettle), *Osmorhiza claytonii* (Clayton's sweetroot), and *Caulophyllum thalictroides* (blue cohosh) usually among the patch-dominants of a lush and diverse herb layer. ..... **Southern Appalachian Rich Cove Forest (Typic Type) (CEGL007710)**[23]

[*Liriodendron tulipifera* - *Fraxinus americana* - (*Aesculus flava*) / *Actaea racemosa* - *Laportea canadensis* Forest]

7b. Lower slope and ravine forest at the lowest elevations of the Appalachians of VA and MD (more extensive in the Piedmont foothills) with *Fraxinus americana* (white ash), *Quercus rubra* (northern red oak), and *Carya* (hickory) spp. the most typical canopy associates of *Liriodendron* (tuliptree); *Tilia americana* (American basswood) and *Aesculus flava* (yellow buckeye) rare to absent; low-elevation shrubs such as *Asimina triloba* (pawpaw) and *Cercis canadensis* (eastern redbud) characteristic; herb layer patchy to lush, patch-dominated by widespread species such as *Actaea racemosa* (black baneberry) and *Uvularia perfoliata* (perfoliate bellwort); usually lacking montane rich-site herbs; occurring on mid to lower slopes and/or ravines on deep, fertile soils. ..... **Upper Piedmont-Northern Blue Ridge Basic Mesic Hardwood Forest (CEGL006186)**

[*Liriodendron tulipifera* - *Quercus rubra* - *Fraxinus americana* / *Asimina triloba* / *Actaea racemosa* Forest]

8a. Low-elevation (<700 m [2,200 feet]) rich forest occurring on limestone or dolomite talus and boulders in montane valleys, coves, gorges, or steep fertile slopes with many obligate calciphiles; canopy dominated by *Tilia americana* var. *heterophylla* (Appalachian basswood), *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), and/or *Aesculus flava* (yellow buckeye); patches of *Staphylea trifolia* (American bladdernut) and *Lindera benzoin* (northern spicebush) are frequent along with climbing lianas of *Aristolochia macrophylla* (pipevine); *Cystopteris bulbifera* (bulblet bladderfern) is consistently abundant; other common herbs include *Caulophyllum thalictroides* (blue cohosh), *Collinsia verna* (spring blue-eyed Mary), and *Trillium sessile* (toadshade); one plot from carbonate rock districts in the west-central and southwestern VA portions of the Ridge and Valley province..... **Southern Appalachian Limestone Rich Cove Forest (CEGL006472)**

[*Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* / *Cystopteris bulbifera* - *Asarum canadense* Forest]

8b. Montane protected mid- to low-slope (rarely upper-slope) cove and boulderfield forests occurring at middle elevations (425-1,400 m [1,400-4,600 feet]) in the Southern Blue Ridge and at low to high elevations (200-915 m [650-4,300 feet]) in the Northern Blue Ridge and adjacent Ridge and Valley. **9**

9a. Cove forest characterized by 30 to 100% canopy cover of *Liriodendron tulipifera* (tuliptree) ranging from northern VA to GA; other trees, including *Tilia americana* (American basswood) and *Tilia americana* var. *heterophylla* (Appalachian basswood), *Fraxinus americana* (white ash), *Carya cordiformis* (bitternut hickory), *Acer saccharum* (sugar maple), *Quercus rubra* (northern red oak), *Magnolia acuminata* (cucumber-tree), and *Aesculus flava* (yellow buckeye) [south of the James River in VA] may be canopy associates and often codominant with *Liriodendron tulipifera* (tuliptree); common herbs include *Laportea canadensis* (Canadian woodnettle), *Actaea racemosa* var. *racemosa* (black bugbane), *Arisaema triphyllum* (Jack in the pulpit), *Cardamine angustata*

[23] See Section **1b** for additional *Liriodendron tulipifera*- (tuliptree) dominated forests that do not fit these choices.

(slender toothwort), *Corydalis flavula* (yellow fumewort), *Circaea lutetiana* ssp. *canadensis* (broadleaf enchanter's nightshade), *Galearis spectabilis* (showy orchid), *Osmorhiza claytonii* (Clayton's sweetroot), *Polystichum acrostichoides* (Christmas fern), *Sanguinaria canadensis* (bloodroot), and *Stellaria pubera* (star chickweed). ..... **Southern Appalachian Rich Cove Forest (Typic Type) (CEGL007710)**

[*Liriodendron tulipifera - Fraxinus americana - (Aesculus flava)* / *Actaea racemosa - Laportea canadensis* Forest]

9b. *Liriodendron tulipifera* (tuliptree) minor to absent in canopy. **10**

10a. Mid- to high-elevation boulderfield forests. **11**
10b. Cove forests. **12**

11a. Central Appalachian northern hardwood forest characterized by *Betula alleghaniensis* (yellow birch) and *Quercus rubra* (northern red oak) occurring on weathered, north- or northwest-facing, high-elevation boulderfields from about 975 m to more than 1,300 m (3,000-4,300 feet); on base-rich substrates of the Central Appalachians (e.g., metabasalt, pyroxene-bearing granitic gneisses), *Tilia americana* (American basswood), *Fraxinus americana* (white ash), and *Acer saccharum* (sugar maple) may be common associates; *Acer pensylvanicum* (striped maple) and *Acer spicatum* (mountain maple) characteristic understory trees, although *Ilex montana* (mountain holly) may be locally abundant; *Hamamelis virginiana* (American witch-hazel) and *Sambucus racemosa* var. *racemosa* (red elderberry) are common shrubs; the herb layer may be lush with species such as *Oclemena acuminata* (whorled wood aster), *Dryopteris intermedia* (intermediate woodfern), *Impatiens pallida* (pale touch-me-not), *Aconitum reclinatum* (trailing white monkshood), and others.. ..... **Central Appalachian Northern Hardwood Forest (Yellow Birch - Northern Red Oak Type) (CEGL008502)**

[*Betula alleghaniensis - Quercus rubra* / *Acer spicatum* / *Dryopteris intermedia - Oclemena acuminata* Forest]

11b. Middle-slope boulderfield forest occurring between 760 and 1,030 m (2,500-3,400 feet) elevation in the Northern Blue Ridge in VA, MD, and WV, and more locally in the western VA Ridge and Valley region to the New River in VA; usually above where *Liriodendron tulipifera* (tuliptree) grows; *Tilia americana* (American basswood) and *Fraxinus americana* (white ash) codominant in the canopy; *Quercus rubra* (northern red oak), *Carya ovata* (shagbark hickory), and *Betula lenta* (sweet birch) also common and sometimes codominant; *Ostrya virginiana* (hophornbeam) and *Acer pensylvanicum* (striped maple) common in the subcanopy; shrubs can include *Sambucus racemosa* var. *racemosa* (red elderberry), *Prunus virginiana* (chokecherry), and/or *Hamamelis virginiana* (American witch-hazel); herb layer is diverse with *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Hydrophyllum virginianum* (eastern waterleaf), *Dryopteris marginalis* (marginal woodfern), *Arisaema triphyllum* (Jack in the pulpit), and others. ..... **Central Appalachian Basic Boulderfield Forest (Montane Basswood - White Ash Type) (CEGL008528)**

[*Tilia americana - Fraxinus americana* / *Acer pensylvanicum* / *Parthenocissus quinquefolia - Impatiens pallida* Woodland]

12a. Extremely diverse and rich montane Southern Appalachian cove forest ranging from eastern TN to western NC, and into southwestern VA characterized by canopy mixtures of *Acer saccharum* (sugar maple), *Tilia americana* var. *heterophylla* (American basswood), and *Aesculus flava* (yellow buckeye); *Carya cordiformis* (bitternut hickory) and *Fraxinus americana* (white ash) are constant but minor canopy associates; indicator herbaceous species include *Hydrophyllum canadense* (bluntleaf waterleaf), *Caulophyllum thalictroides* (blue cohosh), *Asplenium rhizophyllum* (walking fern), *Solidago flexicaulis* (zigzag goldenrod), and *Hepatica nobilis* var. *acuta* (sharplobe hepatica). ..... **Southern Appalachian Rich Cove Forest (Montane Calcareous Type) (CEGL007695)**
[*Aesculus flava* - *Acer saccharum* - (*Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense* - *Solidago flexicaulis* Forest]

12b. Rich cove forest lacking *Aesculus flava* (yellow buckeye) and distinctly Southern Appalachian herbs; ranging south to WV and VA in the Central Appalachians; canopy is mixed with a combination of *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Betula alleghaniensis* (yellow birch), *Quercus rubra* (northern red oak), *Tilia americana* (American basswood), and others; *Acer pensylvanicum* (striped maple) and *Hamamelis virginiana* (American witch-hazel) common in shrub layer; common herbs include *Impatiens pallida* (pale touch-me-not), *Laportea canadensis* (Canadian woodnettle), *Deparia acrostichoides* (silver false spleenwort), *Aconitum reclinatum* (trailing white monkshood), *Viola canadensis* var. *canadensis* (Canadian white violet), *Asarum canadense* (Canadian wildginger), and *Angelica triquinata* (filmy angelica); occurs along slope bases, lower concave slopes, and moderate slopes at elevations from 425 to 1,050 m (1,400-3,600 feet)..... **Central Appalachian Rich Cove Forest (CEGL006237)**
[*Acer saccharum* - *Fraxinus americana* - *Tilia americana* - *Liriodendron tulipifera* / *Actaea racemosa* Forest]

13a. *Liriodendron tulipifera* (tuliptree) dominated forests (>30% cover). **14**
13b. *Liriodendron tulipifera* (tuliptree) not dominant in canopy (<30% cover). **15**

14a. Widespread *Liriodendron tulipifera* (tuliptree) forest of relatively fertile substrates in all provinces of the Mid-Atlantic states and in parts of the Southeast; *Quercus* (oak) spp. generally absent, with a large presence of understory species indicative of high-calcium or base-rich soils such as *Cercis canadensis* (eastern redbud), *Symphoricarpos orbiculatus* (coralberry), or *Lindera benzoin* (northern spicebush); exotic shrubs, including *Rosa multiflora* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), and/or *Lonicera japonica* (Japanese honeysuckle), may be common; ground layer lush and diverse. ..... **Ruderal Tuliptree Forest (Rich Type) (CEGL007220)**
[*Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Ruderal Forest]

14b. Widespread typic acidic *Liriodendron tulipifera* (tuliptree) and *Quercus* (oak) spp. forest in areas that had stand-initiating disturbance such as logging in the past; oaks present in canopy and/or subcanopy (>10% cover); understory lacking calcium-rich indicators; additional associates may include *Acer rubrum* (red maple), *Carya* (hickory) spp., *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), *Betula lenta* (sweet birch), and/or *Robinia pseudoacacia* (black locust); shrub layers may include *Acer pensylvanicum* (striped maple), *Amelanchier arborea* (common serviceberry), *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush) (in small amounts), and *Vaccinium pallidum* (Blue Ridge blueberry); ground layer less diverse, not lush. ..... **Ruderal Tuliptree Forest (Typic Type) (CEGL007221)**
[*Liriodendron tulipifera* - *Quercus* spp. Ruderal Forest]

15a. *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) dominant in canopy with dense *Lycopodium* (clubmoss) spp. or *Dennstaedtia punctilobula* (eastern hayscented fern) ground cover; *Nyssa sylvatica* (blackgum) may be common; distribution is centered in the High Allegheny Mountains and Allegheny Plateau but extends north to NY, NJ and PA; common in WV, less common in VA; often originating after severe disturbance such as fire, clear-cutting, or gypsy moth outbreaks. ..... **Central Appalachian Ruderal Sweet Birch - Red Maple Forest (CEGL008503)**
[*Betula lenta* - *Acer rubrum* / *Lycopodium annotinum* - *Dennstaedtia punctilobula* Ruderal Forest]

15b. Stand with variable mixtures of young, even-aged hardwoods and/or pines, especially *Robinia pseudoacacia* (black locust), *Sassafras albidum* (sassafras), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Celtis occidentalis* (common hackberry), *Juglans nigra* (black walnut), *Pinus strobus* (eastern white pine) and/or *Ailanthus altissima* (tree of heaven), any one of which can dominate over small areas; understory heavily invaded by *Rosa multiflora* (multiflora rose), *Celastrus orbiculata* (Oriental bittersweet), and *Lonicera japonica* (Japanese honeysuckle); variable, widespread, disturbed forest of the Northeast; typically an upland forest, but may occur in floodplains or wet settings. .... **Northeastern Ruderal Hardwood Forest (CEGL006599)**
[*Prunus serotina* - *Liriodendron tulipifera* - *Acer rubrum* - *Fraxinus americana* - (*Robinia pseudoacacia*) Ruderal Forest]

11. Successional and Ruderal Vegetation

1a. Successional fields/meadows/marshes/shrublands/shrub swamps/woodlands (tree cover [height >6 m] less than 60% cover of canopy and subcanopy combined); occurring on altered, plowed, farmed, or planted lands. **2**
1b. Successional or planted forests (tree cover [height >6 m] greater than 60% cover of canopy and subcanopy combined). **13**

2a. Shrub- or vine-dominated (woody cover of shrub stratum greater than 25%; trees may be present at from 25-60% cover). **3**
2b. Herbaceous-dominated (greater than 60% herbaceous cover; shrubs less than 25% cover; trees less than 25% cover) vegetation that has been anthropogenically-altered and/or maintained, especially on old fields and pastures; shorter disturbance interval than 2a above, more frequently disturbed/managed, created and maintained by yearly mowing or grazing; scattered early-successional trees (<25% cover) possible. **9**

3a. *Pueraria montana* var. *lobata* (kudzu) dominant. ..... **Ruderal Kudzu Vineland (CEGL003882)**
.....[*Pueraria montana* var. *lobata* Ruderal Vine-Shrubland]
3b. *Pueraria montana* var. *lobata* (kudzu) sparse to absent **4**

4a. Shrubland dominated by a mix of species. **5**
4b. Shrubland or woodland dominated by one species. **8**

5a. Dominated by upland species. **6**
5b. Dominated by wetland species intermixed with upland species; successional wet meadows or shrub swamps dominated by an admixture of upland and wetland old-field species. **7**

6a. Tall, typically closed-canopy shrubland thicket occurring on old fields, pastures, or modified lands dominated by an admixture of non-native and native shrubs such as *Elaeagnus umbellata* (Autumn olive), *Rubus allegheniensis* (Allegheny blackberry), *Smilax rotundifolia* (roundleaf greenbrier), *Rosa multiflora* (multiflora rose), *Lonicera morrowii* (Morrow's honeysuckle), *Celastrus orbiculata* (Oriental bittersweet), *Lonicera japonica* (Japanese honeysuckle), *Ligustrum vulgare* (European privet), *Juniperus virginiana* (eastern red-cedar), and other early-successional trees such as *Liriodendron tulipifera* (tuliptree) (<25% in cover); old-field grasses and forbs are common in more open-canopied variants where shrubs cover at least 25% of the field. .....
..... **Northeastern Ruderal Shrubland (CEGL006451)**
[*Elaeagnus umbellata* - *Cornus racemosa* - *Rosa multiflora* - *Juniperus virginiana* Ruderal Shrubland]
6b. Native successional shrubland dominated by heath shrubs, including *Gaylussacia* (huckleberry) spp., *Vaccinium* (blueberry) spp., and *Kalmia latifolia* (mountain laurel); *Dennstaedtia punctilobula* (eastern hayscented fern); frequent along rights-of-way. .....
..... **Successional Heath Shrubland (CEGL006622)**
[*Gaylussacia baccata* - *Vaccinium pallidum* - *Vaccinium corymbosum* Shrubland]

7a. Successional wet meadow dominated by an admixture of upland and wetland old-field species; may be mowed annually, "wet old fields"; may have successional shrubs usually only about 1 m tall, *Rubus* (blackberry) and *Spiraea* (spirea) common; *Cornus* (dogwood) spp. may be present, but are not dominant. ..... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]

7b. Tall successional shrub swamp (2-4 m) occurring in low-lying areas of old fields or pastures, or the edges of beaver-impacted wetlands or impoundments; vegetation is highly variable with *Cornus amomum* (silky dogwood), *Cornus sericea* (red-osier dogwood), *Viburnum dentatum* (southern arrow-wood), *Spiraea alba* var. *latifolia* (white meadowsweet), *Rosa multiflora* (multiflora rose), *Rubus allegheniensis* (Allegheny blackberry), and *Rubus hispidus* (bristly dewberry) typically present and abundant; *Salix* (willow) spp. may also be present but are less common..... ..... **Ruderal Dogwood - Arrow-wood Shrub Swamp (CEGL006576)**
[*Cornus* (*amomum, sericea*) - *Viburnum dentatum* - *Rosa multiflora* Ruderal Shrub Swamp]

8a. *Crataegus punctata*- (dotted hawthorn) dominated successional woodland/forest/"orchard" of high elevations in the Southern and Central Appalachians; large patch along the AT corridor in the saddle between Beech Mountain and Whitetop in VA. .... **Southern & Central Appalachian Ruderal Hawthorn Forest (CEGL004184)**
[*Crataegus punctata* - *Crataegus flabellata* Ruderal Forest]

8b. *Juniperus virginiana* (eastern red-cedar) dominant. .... **Northeastern Ruderal Red-cedar Forest[24] (CEGL006024)**
[*Juniperus virginiana* Ruderal Forest]

9a. High-elevation pasture dominated by *Andropogon virginicus* var. *virginicus* (broomsedge bluestem); *Lolium pratense* (meadow ryegrass) can dominate fields early in the season. .... **Broomsedge Old-field Grassland (CEGL004044)**
[*Andropogon virginicus* var. *virginicus* Ruderal Grassland]

9b. Low-elevation old fields and/or pastures; wet meadows and marshes. **10**

10a. Herbaceous layer dominated by mixtures of introduced *Dactylis glomerata* (orchardgrass), *Bromus* spp. *Phleum pratense* (timothy), *Festuca* (fescue) spp., *Solidago* (goldenrod) spp., *Trifolium* (clover) spp., *Medicago* (alfalfa) spp., *Setaria* (bristlegrass) spp., and other grass and/or forb species. ..... **Northeastern Old-field Meadow (CEGL006107)**
[*Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Ruderal Meadow]

10b. Wet meadows and marshes. **11**

11a. Successional wet meadow dominated by an admixture of upland and wetland old-field species; may be mowed annually, "wet old fields"; may have successional shrubs (<50%). .... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]

11b. Marshes dominated by one species. **12**

12a. *Phragmites australis* (common reed) dominant. .... **Eastern Ruderal Common Reed Marsh (CEGL004141)**
[*Phragmites australis* ssp. *australis* Eastern Ruderal Marsh]

[24]This association can also be a woodland or shrubland despite the common name.

12b. Monocultural stands of the invasive grass *Phalaris arundinacea* (reed canarygrass) found in both basin wetlands and along rivershores. ..... **Eastern Ruderal Reed Canarygrass Marsh (CEGL006044)**
[*Phalaris arundinacea* Eastern Ruderal Marsh]

13a. Canopy dominated by evergreen trees (at least 50% evergreen trees in canopy). **14**
13b. Canopy dominated by deciduous hardwood trees (at least 50% deciduous canopy). **20**

14a. Canopy dominated by *Pinus* (pine) sp. **15**
14b. Canopy not dominated by *Pinus* (pine) spp. **18**

15a. *Pinus virginiana* (Virginia pine) a dominant component of stand (greater than 50% of canopy)... ..... **Ruderal Virginia Pine Forest (CEGL002591)**
[*Pinus virginiana* Ruderal Forest]
15b. *Pinus virginiana* (Virginia pine) not a dominant component. **16**

16a. *Pinus strobus* (eastern white pine) a dominant component of association (greater than 50% of canopy). **17**
16b. A mixture of pines and/or other planted native or non-native conifers) in canopy; not always mixed in the case of *Picea abies* (Norway spruce) and others. ..... **Mixed Pine Conifer Plantation (CST006313)**
[*Pinus* spp. Forest Plantation]

17a. Stands contain plantations of *Pinus strobus* (eastern white pine) that are maintained for the extraction of forest products. ..... **Eastern White Pine Plantation (CST007178)**[25]
[*Pinus strobus* Forest Plantation]
17b. Successional forest, trees usually of mixed -ages, and including a mixture of other successional species; *Pinus strobus* (eastern white pine) cover ranges from 50-90%. ..... **Ruderal Eastern White Pine Forest (CEGL007944)**
[*Pinus strobus* Ruderal Forest]

18a. *Juniperus virginiana* (eastern red-cedar) dominant. ..... **Northeastern Ruderal Red-cedar Forest (CEGL006024)**[26]
[*Juniperus virginiana* Ruderal Forest]
18b. Other conifers are dominant. **19**

19a. *Picea* (spruce) sp. plantations dominated by *Picea abies* (Norway spruce) and/or any combination of spruce species; successional understory may be present with *Prunus serotina* (black cherry), *Acer rubrum* (red maple), *Rubus* (blackberry) spp., *Dennstaedtia punctilobula* (eastern hayscented fern), and others..... **Norway Spruce Plantation (CST007167)**
Picea abies Forest Plantation]

[25]Stands that maintain the physical appearance of a plantation (i.e., rows or patterns) should be treated as plantations even after the cessation of management and should be classified as plantations until succession alters the stand structure and appearance from plantation to forest.

[26]This community may also occur as an open-canopy woodland with as little as 10% (and as much as 60%) red cedar canopy cover.

19b. A mixture of pines (and/or other planted native or non-native conifers) in canopy not always mixed in the case of *Picea abies* (Norway spruce) and others. ..... **Mixed Pine Conifer Plantation (CST006313)**
[*Pinus* spp. Forest Plantation]

20a. Canopy dominated or codominated by *Liriodendron tulipifera* (tuliptree) (greater than 30% of canopy) [Note: open disturbed forests with tuliptree and other early-successional species are not CEGL007220 nor CEGL007221, but follow the opposing lead to CEGL006599)]. **21**
20b. Canopy with less than 30% *Liriodendron tulipifera* (tuliptree) or tuliptree absent..... **22**

21a. Widespread *Liriodendron tulipifera* (tuliptree) forest of relatively fertile substrates in all provinces of the Mid-Atlantic states and in parts of the Southeast; oaks generally absent, with a large presence of understory species indicative of high-calcium or base-rich soils such as *Cercis canadensis* (eastern redbud), *Symphoricarpos orbiculatus* (coralberry), or *Lindera benzoin* (northern spicebush); exotic shrubs, including *Rosa multiflora* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), and/or *Lonicera japonica* (Japanese honeysuckle), may be common. ..... **Ruderal Tuliptree Forest (Rich Type) (CEGL007220)**
[*Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Ruderal Forest]
21b. Widespread typic acidic *Liriodendron tulipifera* (tuliptree) and *Quercus* (oak) spp. forest in areas that had stand-initiating disturbance such as logging in the past; oaks present in canopy and/or subcanopy (>10% cover); understory lacking calcium-rich indicators; additional associates may include *Acer rubrum* (red maple), *Carya* (hickory) spp., *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), and *Betula lenta* (sweet birch); shrub layers may include *Rubus allegheniensis* (Allegheny blackberry), *Lindera benzoin* (northern spicebush) (in small amounts), and *Vaccinium pallidum* (Blue Ridge blueberry). Vines including *Toxicodendron radicans* (eastern poison-ivy), *Smilax rotundifolia* (roundleaf greenbrier), and *Vitis* (grape) sp. common; *Dennstaedtia punctilobula* (eastern hayscented fern) is a common fern..... **Ruderal Tuliptree Forest (Typic Type) (CEGL007221)**
[*Liriodendron tulipifera* - *Quercus* spp. Ruderal Forest]

22a. Stand with variable mixtures of young, even-aged hardwoods and pines; oaks may be present but are not dominant. **23**
22b. Stand dominated by one species. **24**

23a. Forest dominated by a combination of *Robinia pseudoacacia* (black locust), *Sassafras albidum* (sassafras), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Celtis occidentalis* (common hackberry), *Juglans nigra* (black walnut), *Pinus strobus* (eastern white pine), and/or *Ailanthus altissima* (tree of heaven), any one of which can dominate over small areas; understory heavily invaded by exotics such as *Rosa multiflora* (multiflora rose), *Celastrus orbiculata* (Oriental bittersweet), and *Lonicera japonica* (Japanese honeysuckle); widespread, variable, disturbed forest of the Northeast; typically an upland forest but can occur in floodplains or wet settings. ..... **Northeastern Ruderal Hardwood Forest (CEGL006599)**
[*Prunus serotina* - *Liriodendron tulipifera* - *Acer rubrum* - *Fraxinus americana* - (*Robinia pseudoacacia*) Ruderal Forest]
23b. Successional Central Appalachian mesophytic hardwood forest codominated by *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) in the canopy and shrub layers. *Nyssa sylvatica* (blackgum) may also be common. Shrub associates include fire and disturbance tolerant heaths *Kalmia latifolia* (mountain laurel), *Gaylussacia frondosa* (blue huckleberry), and *Vaccinium*

pallidum (Blue Ridge blueberry) as well as *Rhus glabra* (smooth sumac); *Lycopodium* (clubmoss) spp., *Dennstaedtia punctilobula* (eastern hayscented fern), and *Polypodium virginianum* (rock polypody) may be found in the herb layer; distribution is centered in the High Allegheny Mountains and Allegheny Plateau but extends north to NY, NJ and PA; it is common in WV, less common in MD, and uncommon in VA; often originating after severe disturbance such as fire, clear-cutting, or gypsy moth outbreaks. ..... **Central Appalachian Ruderal Sweet Birch - Red Maple Forest (CEGL008503)**
[*Betula lenta - Acer rubrum* / *Lycopodium annotinum - Dennstaedtia punctilobula* Ruderal Forest]

24a. Dominated by *Ailanthus altissima* (tree of heaven) or *Juglans nigra* (black walnut). **25**
24b. Stand dominated by other species; *Robinia pseudoacacia* (black locust) and/or *Ailanthus altissima* (tree of heaven) may be present but <50% in cover. **26**

25a. Forest dominated by *Ailanthus altissima* (tree of heaven); ≥50% of canopy. ..... **Ruderal Tree-of-Heaven Forest (CEGL007191)**
[*Ailanthus altissima* Ruderal Forest]
25b. Forest dominated by *Juglans nigra* (black walnut); >50% of canopy; with an understory of *Verbesina* (crownbeard) spp. and/or *Symphoricarpos orbiculatus* (coralberry); frequently found on postcultivation soil or former orchard sites around old homesites. ..... **Ruderal Black Walnut Forest (CEGL007879)**
[*Juglans nigra* / *Verbesina alternifolia* Ruderal Forest]

26a. *Crataegus punctata*- (dotted hawthorn) dominated successional woodland/forest/"orchard" of high elevations in the Southern and Central Appalachians; large patch along the AT corridor in the saddle between Beech Mountain and Whitetop in VA. ..... **Southern & Central Appalachian Ruderal Hawthorn Forest (CEGL004184)**
[*Crataegus punctata - Crataegus flabellata* Ruderal Forest]
26b. *Crataegus punctata* (dotted hawthorn) not dominant. **27**

27a. *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) dominate canopy with dense *Lycopodium* (clubmoss) spp. or *Dennstaedtia punctilobula* (eastern hayscented fern) ground cover; *Nyssa sylvatica* (blackgum) may be common; distribution is centered in the High Allegheny Mountains and Allegheny Plateau but extends north to NY, NJ and PA; common in WV, uncommon in VA; often originating after severe disturbance such as fire, clear-cutting, or gypsy moth outbreaks. ..... **Central Appalachian Ruderal Sweet Birch - Red Maple Forest (CEGL008503)**
[*Betula lenta - Acer rubrum* / *Lycopodium annotinum - Dennstaedtia punctilobula* Ruderal Forest]
27b. Successional forest dominated by an admixture of *Acer rubrum* (red maple), *Prunus serotina* (black cherry), *Celtis occidentalis* (common hackberry), and/or *Fraxinus americana* (white ash); *Juglans nigra* (black walnut), *Robinia pseudoacacia* (black locust), *Pinus strobus* (eastern white pine), and/or *Ailanthus altissima* (tree of heaven) may also be present; understory typically heavily invaded by *Rosa multiflora* (multiflora rose), *Celastrus orbiculata* (Oriental bittersweet), and *Lonicera japonica* (Japanese honeysuckle); common disturbed forest of the Northeast; typically an upland forest, but can occur in floodplains or wet settings. ..... **Northeastern Ruderal Hardwood Forest (CEGL006599)**
[*Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana* - (*Robinia pseudoacacia*) Ruderal Forest]

Field Key to Vegetation Associations of the Lower New England Project Area

This field key provides classification to USNVC associations that were identified during the APPA vegetation mapping project for the LNE project area (see Figure D–3 in the "Key to Field Keys by Project Area"). The LNE project area includes APPA lands between the Delaware River (Pennsylvania-New Jersey State line along Interstate 80) and the Connecticut River (Vermont-New Hampshire State line between Norwich, Vermont, and Hanover, New Hampshire).

Notes about Scale for the Lower New England Project Area

All forest associations were mapped to a 0.5-ha MMU (a circle with a 40-m radius) and all nonforest associations were mapped to a 0.25-ha MMU (a circle with a 28-m radius).

Key to Keys for the Lower New England Project Area[27][28]

1a. Wetland vegetation. **2**
1b. Upland vegetation. **5**

2a. Alluvial forests, woodlands, shrublands and herbaceous communities occurring along banks or channels of rivers and streams and adjacent levees and bottomlands, at least occasionally flooded; includes beaver pond areas that are part of larger alluvial system. ..... **Alluvial Forest, Woodland, Shrubland, and Herbaceous Vegetation (Key #1, p. D-100)**
2b. Non-alluvial palustrine vegetation - substrate is saturated to the surface by groundwater for extended periods during the growing season; seepage-fed; or fed by ground and rainwater; rarely, if ever, flooded by alluvial waters, includes seepage-fed beaver pond impoundments, bottomlands, wet meadows, seeps, vernal pools, poorly-drained depressions, bogs, fens, and basin swamps..... **3**

3a. Forested sites and sites generally with overhanging canopy of trees (canopy cover >10%). ..... **Forested Basin Swamps, Forested Seeps, and Vernal Pools (Key #2, p. D-105)**
3b. Non-forested wetland communities (tree canopy cover ≤10%), including wooded marshes, shrub swamps, bogs, fens, and herbaceous-dominated wetlands, with deep saturated soils or seasonally flooded soils **4**

4a. Wetland vegetation dominated by shrubs (≥50% shrub cover) or with scattered tree cover (≤10%). ..... **Shrub Swamps, Fens, and Bogs (Key #3, p. D-113)**
4b. Wetland vegetation dominated by herbaceous species (>50% cover). ..... **Herbaceous Wetlands and Aquatic Vegetation (Key #4, p. D-117)**

[27]All of the vegetation associations have the potential to include non-native invasive species or other plant species that are indicators of disturbance which may or may not be in the USNVC description and key. Forests may have incomplete canopies interrupted by gypsy moth outbreaks, but these should be regarded as forests rather than woodlands. The key provides descriptions for relatively undisturbed associations as described in the USNVC.

[28]*Tsuga canadensis* (eastern hemlock) may be codominant in canopy usually >25% of canopy. For all *Tsuga canadensis* associations that have been impacted by the hemlock woolly adelgid, treat standing and fallen dead trees as part of *Tsuga canadensis* canopy cover.

5a. Vegetation dominated by trees, strongly altered by recent human disturbance, dominated by non-native tree species (e.g., *Acer platanoides* (Norway maple)) or certain disturbance-oriented (ruderal) native species; often in monotypic stands (e.g., *Acer rubrum* (red maple), *Liriodendron tulipifera* (Tuliptree), *Acer saccharum* (sugar maple), *Robinia pseudoacacia* (black locust), *Juglans nigra* (black walnut). Includes also evergreen plantations and pine successional forests. ..... **Successional and Ruderal Vegetation (Key #11, p. D-158)**
5b. Natural vegetation, dominated by trees, shrubs, forbs, grasses, and/or vines. **6**

6a. Non-forested (tree canopy cover ≤40%) or stunted forest vegetation. **7**
6b. Forested vegetation (tree canopy cover ≥40%)[29]. **8**

7a. Woodlands, stunted forests (trees may be 2m tall); shrublands, grasslands, nonvascular vegetation, or bare rock; associated with shallow soils or rock outcrops. ..... **Woodlands, Stunted Forests, Barrens, Rocky Outcrops, and Cliffs (Key #5, p. D-124)**
7b. Shrublands (<5m tall) or grasslands without substantial areas of exposed rock. Successional or altered (ruderal) vegetation resulting from human disturbance. ..... **Successional and Ruderal Vegetation (Key #11, p. D-158)**

8a. Evergreen or mixed evergreen-deciduous forest canopies (deciduous trees less than 70% cover). **9**
8b. Deciduous canopies; *Acer rubrum* (red maple) may be common in canopy; pines and hemlock generally absent to minor. **11**

9a. Spruce- and fir-dominated forests and woodlands. ..... **Spruce-Fir Forests (Key #6, p. D-131)**
9b. Pine- or hemlock-dominated canopies. **10**

10a. Hemlock-dominated canopies and mixed hemlock forests with *Tsuga canadensis* (eastern hemlock), *Pinus strobus* (eastern white pine), and/or northern hardwoods or oaks as codominant canopy species. ..... **Hemlock and Mixed Hemlock Forests (Key #7, p. D-133)**
10b. Pine-dominated or mixed pine-dominated canopies; includes *Pinus strobus* (eastern white pine) and *Pinus rigida* (pitch pine); canopies codominated by pine and *Tsuga canadensis* (eastern hemlock); and canopies codominated by pine, oaks, and northern hardwoods. ..... **Pine and Mixed Pine Shrublands, Woodlands, and Forests (Key #9, p. D-145)**

11a. Oak- and oak-hickory-dominated canopies. ..... **Mixed Oak - Conifer, Mixed Oak, and Oak - Hickory Forests (Key #10, p. D-148)**
11b. Hardwood deciduous trees such as northern hardwoods or early-successional hardwoods dominate canopy. **12**

[29]Typically >40% tree cover, except in obvious cases of severe disturbance from gypsy moth, hemlock woolly adelgid, windstorms, etc. Such disturbed stands are quite common. Key users should try to key to the pre-disturbance association if possible or identify the new, postdisturbance association if the pre-disturbance association diagnostic species are absent.

12a. Northern hardwoods such as *Betula alleghaniensis* (yellow birch), *Betula papyrifera* (paper birch), *Fagus grandifolia* (American beech), and *Acer saccharum* (sugar maple) and/or mesophytic tree species (e.g., *Tilia americana* (American basswood), *Fraxinus americana* (white ash), *Acer rubrum* (red maple), and/or *Liriodendron tulipifera* (tuliptree)) may be codominant in canopy. .... **Northern Hardwood Forests (Key #8, p. D-136)**

12b. Early-successional species such as *Acer rubrum* (red maple), *Betula lenta* (sweet birch), or *Prunus serotina* (black cherry), or in the northern portion of the range, *Acer saccharum* (sugar maple), or by non-native deciduous and/or conifer species; includes heavily invaded forests, altered (ruderal) forests and plantations resulting from human disturbance..... .....**Successional and Ruderal Vegetation (Key #11, p. D-158)**

1. Alluvial Forest, Woodland, Shrubland and Herbaceous Vegetation

1a. Forested communities, with greater than 40% tree canopy coverage. **2**
1b. Woodlands (<40% cover), shrublands, herbaceous, and sparse vegetation communities along narrow river margins; scattered trees (up to 25%) possible. **13**

2a. Floodplain forest canopy dominated by *Acer* (maple) spp. **3**
2b. Canopy dominants otherwise **10**

3a. Floodplain forest with abundant *Acer rubrum* (red maple) **4**
3b. Floodplain forest canopy not dominated by *Acer rubrum* (red maple) **5**

4a. Floodplain forest with abundant *Acer rubrum* (red maple) and significant component of *Quercus palustris* (pin oak), (either species may be dominant), on smaller rivers that have many canopy associates, including *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), *Salix nigra* (black willow), and occasionally *Quercus bicolor* (swamp white oak), the latter only with low abundance; shrubs include *Lindera benzoin* (northern spicebush), *Rosa multiflora* (multiflora rose), and other exotics; herb layer diverse with abundant *Carex grayi* (Gray's sedge), *Geum canadense* (white avens), *Impatiens capensis* (jewelweed), *Lysimachia nummularia* (creeping jenny), and *Boehmeria cylindrica* (small-spike false nettle); occurs in the southern portion of the project area at Delaware Water Gap National Recreation Area (DEWA) and in NJ. ..... **Pin Oak Small River Floodplain Forest (CEGL006185)**
[*Quercus palustris - Acer rubrum / Carex grayi - Geum canadense* Wet Forest]
4b. Obviously disturbed and widely variable woody vegetation with mixtures of young, even-aged native and non-native hardwoods, especially *Robinia pseudoacacia* (black locust), *Sassafras albidum* (sassafras), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Acer saccharum* (sugar maple) on calcareous soils, and *Ailanthus altissima* (tree of heaven), any one of which can dominate over small areas; understory heavily invaded by *Rosa multiflora* (multiflora rose), *Celastrus orbiculatus* (Oriental bittersweet), and *Lonicera japonica* (Japanese honeysuckle); can also occur in wet settings such as floodplains and seasonally or temporarily flooded lowlands; common throughout all of the states in the project area, especially PA, NJ, and CT. ..... **Northeastern Ruderal Hardwood Forest (CEGL006599)**
[*Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana - (Robinia pseudoacacia)* Ruderal Forest]

5a. Floodplain forest canopy dominated or codominated by *Acer saccharinum* (silver maple) **6**
5b. Floodplain forest canopy with an abundance of *Acer saccharum* (sugar maple) in the canopy; *Acer saccharinum* (silver maple) minor or absent **9**
6a. *Acer saccharinum* (silver maple) strongly dominant with *Acer negundo* (box-elder) present to abundant **7**
6b. *Acer saccharinum* (silver maple) strongly dominant without *Acer negundo* (box-elder) **8**

7a. *Acer negundo* (box-elder) codominant in subcanopy and/or canopy; restricted to large river floodplains, where it occurs on first bottoms and banks immediately adjacent to the river from MD north to MA; early-successional stands are usually strongly dominated by even-aged *Acer saccharinum* (silver maple); characteristic herbs are *Ageratina altissima* (white snakeroot), *Boehmeria cylindrica* (small-spike false nettle), *Laportea canadensis* (Canadian woodnettle), *Leersia virginica* (whitegrass), *Impatiens pallida* (pale touch-me-not), and *Elymus virginicus* (Virginia wildrye); *Microstegium vimineum* (Nepalese browntop) can be abundant..... ..... **Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217)**
[*Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Floodplain Forest]

7b. *Acer negundo* (box-elder) maybe a canopy associate but not dominant; *Acer saccharinum* (silver maple) forest restricted to DEWA in the project area; *Platanus occidentalis* (American sycamore) and *Betula nigra* (river birch) codominant in canopy; additional canopy associates include *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Salix nigra* (black willow), *Celtis occidentalis* (common hackberry), *Carya cordiformis* (bitternut hickory), *Juglans nigra* (black walnut), *Fraxinus pennsylvanica* (green ash), and occasionally *Halesia tetraptera* (mountain silverbell). The shrub and sapling layer is often open (<25% cover). Woody and herbaceous vines can be prominent. Grasses, forbs, and ferns dominate the ground layer. .... **Midwestern Silver Maple - Elm Floodplain Forest (CEGL002586)**
[*Acer saccharinum - Fraxinus pennsylvanica - Ulmus americana* Floodplain Forest]

8a. *Acer saccharinum* (silver maple) floodplain forest occurring on low terraces adjacent to medium to large, high-energy and moderate-gradient rivers with *Matteuccia struthiopteris* (ostrich fern) or *Laportea canadensis* (Canadian woodnettle) occupying coarse soils with a relatively short flood duration; ranges from VT south to PA in the project area. .... **Silver Maple Floodplain Levee Forest (CEGL006147)**
[*Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Floodplain Forest]

8b. *Acer saccharinum* (silver maple) floodplain forest occupying finer soils higher up in the floodplain and not immediately adjacent to river channel; *Matteuccia struthiopteris* (ostrich fern) or *Laportea canadensis* (Canadian woodnettle) if present are not dominant;; relatively long flood duration; well developed shrub layer present dominated by *Lindera benzoin* (northern spicebush) with other shrubs often prominent; lush herb layer dominated by *Onoclea sensibilis* (sensitive fern) also includes *Cinna arundinacea* (sweet woodreed), *Geum canadense* (white avens), *Chelone glabra* (white turtlehead), *Impatiens capensis* (jewelweed), *Carex lupulina* (hop sedge), *Carex crinita* (fringed sedge), *Carex grayi* (Gray's sedge), and others; occurring in MA and along the Housatonic River in CT and the Wallkill River in NJ. .... **Northeastern Silver Maple - Elm Floodplain Forest (CEGL006001)**
[*Acer saccharinum - Ulmus americana / Onoclea sensibilis* Floodplain Forest]

9a. Hardwood terrace floodplain forests in the mid-Atlantic states of NJ and PA, occurring on slightly elevated alluvial terraces and active floodplains of larger rivers; *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), and sometimes *Carya cordiformis* (bitternut hickory) are canopy dominants; canopy associates include *Quercus rubra* (northern red oak), *Juglans nigra* (black walnut), *Prunus serotina* (black cherry), *Fraxinus nigra* (black ash), *Liriodendron tulipifera* (tuliptree), *Ulmus americana* (American elm), *Tilia americana* (American basswood), *Acer negundo* (box-elder), and *Fagus grandifolia* (American beech); *Carpinus caroliniana* (American hornbeam) is often present; *Lindera benzoin* (northern spicebush) is the most common shrub; *Asimina triloba* (pawpaw) is characteristic in the southern portion of this type's range; characteristic herbs include *Arisaema triphyllum* (Jack in the pulpit) and *Podophyllum peltatum* (mayapple); similar vegetation/setting north of NJ should go to CEGL006114. ..... **Mid-Atlantic Hardwood High Terrace Floodplain Forest (CEGL006459)**
[*Acer saccharum - Fraxinus americana / Carpinus caroliniana / Podophyllum peltatum* Forest]

9b. Hardwood terrace floodplain forest of the glaciated Northeast from CT north to ME occurring on slightly elevated alluvial terraces and active floodplains of medium and larger rivers; *Acer saccharum* (sugar maple) dominates the canopy with associates *Tilia americana* (American basswood), *Quercus rubra* (northern red oak), *Ulmus americana* (American elm), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Juglans cinerea* (butternut), and *Prunus serotina* (black cherry); shrubs include *Corylus americana* (American hazelnut), *Viburnum lentago* (nannyberry), and *Prunus virginiana* (chokecherry); characteristic herbs include *Matteuccia struthiopteris* (ostrich fern) and *Ageratina altissima* (white snakeroot). ..... **Terrace Hardwood Floodplain Forest (CEGL006114)**
[*Acer saccharum - Fraxinus* spp. *- Tilia americana / Matteuccia struthiopteris - Ageratina altissima* Floodplain Forest]

10a. Floodplain forest dominated by *Juglans nigra* (black walnut) with an understory of *Lindera benzoin* (northern spicebush) and an herbaceous layer dominated by *Verbesina* (crownbeard) spp. or *Sanicula canadensis* (Canadian blacksnakeroot); *Celtis occidentalis* (common hackberry) may be abundant; ranges from DEWA in PA north to CT. ..... **Ruderal Black Walnut Forest (CEGL007879)**
[*Juglans nigra / Verbesina alternifolia* Ruderal Forest]

10b. Floodplain forest not dominated by *Juglans nigra* (black walnut). **11**

11a. Obviously disturbed and widely variable woody vegetation with mixtures of young, even-aged native and non-native hardwoods, especially *Robinia pseudoacacia* (black locust), *Sassafras albidum* (sassafras), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Acer saccharum* (sugar maple) on calcareous soils, and *Ailanthus altissima* (tree of heaven), any one of which can dominate over small areas; understory heavily invaded by *Rosa multiflora* (multiflora rose), *Celastrus orbiculatus* (Oriental bittersweet), and *Lonicera japonica* (Japanese honeysuckle); can also occur in wet settings such as floodplains and seasonally or temporarily flooded lowlands; common throughout all northeastern states especially PA, NJ, and CT. ..... **Northeastern Ruderal Hardwood Forest (CEGL006599)**
[*Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana - (Robinia pseudoacacia)* Ruderal Forest]

11b. Less disturbed floodplain forests. **12**

12a. *Fraxinus pennsylvanica* (green ash) and/or *Platanus occidentalis* (American sycamore) dominant with other mixed hardwoods; enrichment indicators such as *Juglans nigra* (black walnut) often present; occurring in the project area from DEWA north through NY and CT. .... **Green Ash - Mixed Hardwood Floodplain Forest (CEGL006575)**
[*Fraxinus pennsylvanica - (Juglans nigra, Platanus occidentalis)* Floodplain Forest]
12b. *Salix nigra* (black willow) dominant or mixed with *Populus deltoides* (eastern cottonwood); floodplain forests of low-gradient rivers; observed in the project area in CT. .... **Eastern Black Willow Floodplain Forest (CEGL006629)**
[*Salix nigra - (Populus deltoides)* Floodplain Forest]

13a. Woodlands and shrublands. **14**
13b. Herbaceous communities and sparse vegetation. **15**

14a. Riparian shrublands dominated by *Alnus* (alder) spp. occurring on river-margin alluvial deposits of moderate- to high-energy river reaches, where the flooding regime prevents forests from developing, and *Cornus* (dogwood) spp. and *Salix* (willow) spp. also often present and occasionally dominant; if alder-dominated swamp, occurring in saturated basins settings, in associations with beaver-impacted wetlands, and/or alongside small, low-velocity streams consider CEGL002381 in Shrub Swamp Key; observed in the project area in VT..... **Alluvial Alder Thicket (CEGL006062)**
[*Alnus incana - Cornus (amomum, sericea) / Clematis virginiana* Shrub Swamp]
14b. *Salix* (willow) spp. strongly dominant on cobble or gravel bars experiencing flood scour; lacking *Betula nigra* (river birch); wooded riparian vegetation characterized by widely variable physiognomy, ranging from woodland (can include small forest patches), or shrubland (1m - 5m in height); observed in the project area in DEWA, NY, MA and VT..... ..... **Black Willow Riverbar Shrubland (CEGL006065)**
[*Salix nigra / Phalaris arundinacea - Apocynum cannabinum* Wet Shrubland]

15a. Open flood-scoured bedrock exposures of major rivers, along river narrows; patchy sparse vegetation includes *Andropogon gerardii* (big bluestem), *Carex stricta* (upright sedge), *Poa palustris* (fowl bluegrass), and *Poa compressa* (Canada bluegrass); lacks *Vaccinium* (blueberry) spp.; observed in the project area at DEWA and in VT along the White River. .... **Northern Riverscour Rock Outcrop (CEGL006284)**
[*Andropogon gerardii - Campanula rotundifolia - Solidago simplex* Riverscour Sparse Vegetation]
15b. Herbaceous vegetation..... **16**

16a. Vegetation dominated by a single species **17**
16b. Vegetation dominated by a combination of multiple species **18**

17a. *Carex torta* (twisted sedge) dominant; occurs on cobble scour river shores along medium- to high-energy river channels and, less frequently, exposed lakeshores with heavy wave action; seasonal flooding and ice-scour maintain the open nature of these communities; characteristic perennial species that tolerate inundation and flood scouring include *Carex torta* (twisted sedge) and low *Salix* (willow) spp.; associated species tend to vary widely from site to site, can be diverse, and may be sparse; observed in VT in the project area. .... **Northeastern Temperate Cobble Scour Rivershore (CEGL006536)**
[*Carex torta - Apocynum cannabinum - Cyperus* spp. Riverbed Vegetation]

17b. *Calamagrostis canadensis* (bluejoint) dominant. ..... **Laurentian & Northeast Bluejoint Wet Meadow (CEGL005448)**
[*Calamagrostis canadensis* - *Carex* spp. Laurentian & Northeast Wet Meadow]

18a. Riverside grasslands dominated by tall prairie grasses such as *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass), and *Schizachyrium scoparium* (little bluestem); occurs along major rivers in flood-scoured areas; observed in VT. ..... **Riverside Prairie Grassland (CEGL006518)**
[*Prunus pumila / Andropogon gerardii* - *Sorghastrum nutans* Riverscour Wet Meadow]

18b. Herb-dominated seepage community that develops on discharge areas of the shores of larger rivers; circumneutral groundwater discharge supports a fen-like aspect, but on mineral rather than peat soils; semi-open conditions are maintained by ice-scouring and floodwaters; herbaceous species include *Juncus dudleyi* (Dudley's rush), *Eleocharis tenuis* (slender spikerush), *Andropogon gerardii* (big bluestem), *Agrostis stolonifera* (creeping bentgrass), *Carex garberi* (elk sedge), *Carex granularis* (limestone meadow sedge), *Carex pellita* (woolly sedge), and others; observed in VT where White River crosses AT. ..... **Boreal Circumneutral Riverside Seep (CEGL006142)**
[*Triantha glutinosa* - *Carex garberi* Riverscour Wet Meadow]

2. Forested Basin Swamps, Forested Seeps, and Vernal Pools

1a. Forested wetlands..... **2**
1b. Small-patch herbaceous seeps (1-6 acres) may be under forest cover, sparse wetland vegetation of vernal pools, and nonvascular wetland vegetation under tree canopy..... **26**

2a. Forested wetlands dominated by conifers; hardwoods may be present, but generally <40% total cover..... **3**
2b. Forested swamps characterized by hardwoods; conifers may be present, but <25% cover. **12**

3a. *Chamaecyparis thyoides*- (Atlantic white-cedar) or *Thuja occidentalis*- (arborvitae) dominated swamps..... **4**
3b. Canopy dominated by *Larix* (larch) spp., *Picea* (spruce) spp., or *Tsuga* (hemlock) spp. **5**

4a. *Chamaecyparis thyoides* (Atlantic white-cedar) swamp occurring on inland ridgetops; rare association; observed once in the project area in NY. ..... **Inland Atlantic White-cedar Swamp Forest (CEGL006189)**
[*Chamaecyparis thyoides - (Tsuga canadensis, Betula alleghaniensis) / Clethra alnifolia* Swamp Forest]
4b. *Thuja occidentalis* (arborvitae) prominent in the canopy, either clearly dominant or mixed with *Picea rubens* (red spruce), *Abies balsamea* (balsam fir), and/or *Acer rubrum* (red maple); *Alnus incana* (gray alder) and *Spiraea alba* (white meadowsweet) dominant shrubs; characteristic herbs include *Tiarella cordifolia* (heartleaf foamflower), *Ranunculus hispidus* var. *caricetorum* (bristly buttercup), *Solidago rugosa* (wrinkleleaf goldenrod), *Doellingeria umbellata* (parasol whitetop), *Chrysosplenium americanum* (American golden-saxifrage), and *Symphyotrichum puniceum* (purplestem aster); forests on gentle to moderate slopes with groundwater seepage maintaining moist to saturated conditions; mineral soils with little peat accumulation; most often where the substrate is not strongly acidic; more common in the NAP project area, observed once in VT. ..... **Northern White-cedar - Spruce Seepage Forest (CEGL006175)**
[*Thuja occidentalis - (Picea rubens) / Tiarella cordifolia* Swamp Forest]

5a. Forested wetlands dominated by *Larix* (larch) spp. or *Picea* (spruce) spp..... **6**
5b. Forested wetlands characterized by *Tsuga canadensis* (eastern hemlock)..... **9**

6a. Enriched *Larix laricina* (tamarack), *Acer rubrum - Fraxinus nigra* (red maple-black ash) seepage swamp north of extent of glaciation (approximate line runs roughly east-west through southern PA and northern NJ); *Pinus strobus* (eastern white pine) associate in canopy; *Alnus incana* (gray alder) and *Rhamnus alnifolia* (alderleaf buckthorn) in the shrub layer; with enriched seepage indicators frequent and often abundant, especially calciphiles such as *Saxifraga pensylvanica* (eastern swamp saxifrage), *Carex leptalea* (bristly-stalked sedge), *Carex flava* (yellow sedge), *Solidago patula* (roundleaf goldenrod), and *Ranunculus hispidus* var. *caricetorum* (bristly buttercup); ranges from PA north to VT..... **Red Maple - Black Ash Rich Seepage Swamp Forest (CEGL006009)**
[*Acer rubrum - Fraxinus nigra - (Larix laricina) / Rhamnus alnifolia* Swamp Forest]
6b. Forested wetlands dominated by *Picea* (spruce) spp..... **7**

7a. Forested bog dominated by *Picea mariana* (black spruce) over heath shrubs and sphagnum mosses; occurs in kettlehole basins and other well-defined topographic depressions; characterized by relatively deep peat accumulation, indicating acidic, nutrient-poor conditions; ranges from southern NH to just south of the glacial border in PA and NJ..... **Black Spruce Swamp Woodland (CEGL006098)**
[*Picea mariana* / (*Vaccinium corymbosum, Gaylussacia baccata*) / *Sphagnum* sp. Swamp Woodland]
7b. Forested swamps..... **8**

8a. *Picea rubens* (red spruce) basin swamp with a mixed canopy that includes *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum); *Abies balsamea* (balsam fir) may be present, but not dominant; shrubs include *Vaccinium corymbosum* (highbush blueberry) and *Rhododendron maximum* (great laurel) (more common in southern examples) and *Nemopanthus mucronatus* (catberry), *Ilex verticillata* (common winterberry), and *Thuja occidentalis* (arborvitae) more common in northern examples; herbs include *Carex trisperma* (three-seeded sedge), *Osmunda cinnamomea* (cinnamon fern), *Gaultheria hispidula* (creeping snowberry), and *Carex folliculata* (northern long sedge); *Sphagnum* (sphagnum moss) common; observed in NY, MA and VT. ..... **Red Spruce - Red Maple Acidic Swamp Forest (CEGL006198)**
[*Picea rubens - Acer rubrum / Nemopanthus mucronatus* Swamp Forest]
8b. Northern *Picea rubens - Abies balsamea* (red spruce-balsam fir) swamps with a continuous layer of *Sphagnum* (sphagnum moss); fir prevalent with tall shrubs such as *Viburnum lantanoides* (hobblebush), *Nemopanthus mucronatus* (catberry), *Sorbus americana* (American mountain-ash), *Alnus viridis* ssp. *crispa* (mountain alder), and *Viburnum nudum* var. *cassinoides* (withe-rod); characteristic herbs include *Carex disperma* (softleaf sedge), *Coptis trifolia* (threeleaf goldthread), *Cornus canadensis* (bunchberry dogwood), and *Gaultheria hispidula* (creeping snowberry). [Northern Appalachians endemic, peripheral to but present in Lower New England in MA and VT.] .. .. **Northern Appalachian Spruce - Fir Swamp Forest (CEGL006312)**
[*Picea rubens - Abies balsamea / Gaultheria hispidula / Osmunda cinnamomea / Sphagnum* spp. Swamp Forest]

9a. *Tsuga canadensis* (eastern hemlock) sole canopy dominant with *Rhododendron maximum* (great laurel) dominant in shrub layer; hardwoods such as *Acer rubrum* (red maple) and *Betula alleghaniensis* (yellow birch) may be present in canopy, but low in cover (<25%); saturated acidic muck to imperfectly-drained mineral soils; swamp more common in the Central Appalachians, observed in DEWA and NY in the project area..... **Eastern Hemlock / Great Laurel Swamp Forest (CEGL006279)**
[*Tsuga canadensis / Rhododendron maximum / Sphagnum* spp. Swamp Forest]
9b. Mixed hemlock - hardwood canopy. **10**

10a. Mixed hemlock - hardwood basin swamps [*Tsuga* (hemlock) spp. ≥25% of the canopy] with acidic, organic soils; canopy includes *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Pinus strobus* (eastern white pine), *Nyssa sylvatica* (blackgum), and *Fraxinus* (ash) spp.; shrubs sparse; herbs often dense, especially *Osmunda cinnamomea* (cinnamon fern) and several sedges (*Carex folliculata* (northern long sedge), *Carex trisperma* (three-seeded sedge), *Carex disperma* (softleaf sedge)); *Sphagnum* (sphagnum moss) tend to carpet the surface; saturated acidic, peaty, organic soils occupy poorly-drained basins over bedrock or compacted till; observed in MA..... **Hemlock - Hardwood Swamp Forest (CEGL006226)**
[*Tsuga canadensis - Betula alleghaniensis / Ilex verticillata / Sphagnum* spp. Swamp Forest]
10b. Mixed hardwood and *Tsuga* (hemlock) spp. (hemlock ≤25% of canopy) mineral-soil wetlands occurring in seepage-influenced areas, at wetland-upland ecotones, on slopes rather than in basins. **11**

11a. Mixed hardwood [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple)], *Tsuga* (hemlock) spp. (hemlock ≤25% of canopy) and occasionally *Abies balsamea* (balsam fir); plot elevations range from 295-611 m (968-2,000 feet); herbaceous layer more indicative of nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians; observed in NY, MA, and VT. ..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]

11b. *Acer rubrum - Fraxinus nigra* (red maple-black ash) - *Tsuga canadensis* (eastern hemlock) seepage swamp; northern conifers such as *Thuja occidentalis* (arborvitae) and *Abies balsamea* (balsam fir) may be present; enrichment indicators such as *Rhamnus alnifolia* (alderleaf buckthorn), *Tiarella cordifolia* (heartleaf foamflower), *Chrysosplenium americanum* (American golden-saxifrage) present but not necessarily abundant; calciphiles lacking; observed in VT. ..... **Northern Hardwood - Hemlock Seepage Swamp Forest (CEGL006502)**
[*Acer rubrum - Fraxinus nigra - (Tsuga canadensis) / Tiarella cordifolia* Swamp Forest]

12a. Hardwood forested swamps strongly dominated by *Acer rubrum* (red maple); canopy associates may be present but at relatively low cover. **13**
12b. Hardwood forested swamps codominated by other species [but may be codominated by *Acer rubrum* (red maple)]. **16**

13a. *Acer rubrum* (red maple) swamps receiving considerable groundwater seepage (although not very enriched) as evidenced by significant cover of *Lindera benzoin* (northern spicebush), *Onoclea sensibilis* (sensitive fern), *Symplocarpus foetidus* (skunk-cabbage), *Impatiens capensis* (jewelweed), and mosses such as *Mnium* (mnium calcareous moss) spp. or *Calliergon* (calliergon moss) spp.; canopy associates can include *Fraxinus* (ash) spp. and/or *Betula alleghaniensis* (yellow birch); dense shrub layer includes *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), *Viburnum lentago* (nannyberry), and others; occurs in saturated settings, along small streams, or in basins that receive overland flooding in addition to groundwater influence; ranges from southern New England south to the Piedmont of VA; observed in NJ, MA, and NY. ..... **Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest (CEGL006406)**
[*Acer rubrum - Fraxinus (pennsylvanica, americana) / Lindera benzoin / Symplocarpus foetidus* Swamp Forest]
13b. *Acer rubrum* (red maple) swamps lacking significant seepage indicators mentioned above. **14**

14a. *Acer rubrum* (red maple) wooded marsh characterized by an herbaceous layer strongly dominated by *Carex stricta* (upright sedge); *Vaccinium corymbosum* (highbush blueberry) often present; occurs on muck soils or mineral soils with a surface organic layer, in poorly-drained depressions influenced by groundwater; partly wooded wetland of central and northern New England; observed in NJ and NY. ..... **Red Maple / Upright Sedge Wet Woodland (CEGL006119)**
[*Acer rubrum / Carex stricta - Onoclea sensibilis* Wet Woodland]
14b. Forest canopy closed. **15**

15a. *Acer rubrum* (red maple) codominant with many possible associates most typically *Fraxinus nigra* (black ash) and/or *Ulmus americana* (American elm); diverse shrubs include but not limited to *Vaccinium corymbosum* (highbush blueberry), *Alnus* (alder) spp., *Lindera benzoin* (northern spicebush), and/or *Nemopanthus mucronatus* (catberry); the herb layer includes *Thelypteris palustris* (eastern marsh fern), *Osmunda regalis* (royal fern), *Osmunda claytoniana* (interrupted fern), *Carex stricta* (upright sedge), *Triadenum virginicum* (Virginia marsh St. Johnswort), and *Sphagnum* (sphagnum moss) frequent but necessarily abundant; observed in NY and NJ. ..... **Northern Red Maple Swamp Forest (CEGL006220)**
[*Acer rubrum / Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest]

15b. Hardwood forested swamps codominated by *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) with *Betula alleghaniensis* (yellow birch) common; *Tsuga canadensis* (eastern hemlock) and/or *Pinus strobus* (eastern white pine) can be minor canopy associates; generally occurring in small, isolated basins high in watersheds; shrub layer usually well-developed with, *Vaccinium corymbosum* (highbush blueberry), *Rhododendron maximum* (great laurel), *Kalmia* (laurel) spp., *Lyonia ligustrina* and other heaths; a diversity of ferns, *Carex* (sedge) spp. and a dense *Sphagnum* (sphagnum moss) carpet are characteristic in the herb layer; hummock-and-hollow microtopography is typical and found from the Central Appalachians north to central New England; observed in PA, NJ, and NY..... **Red Maple - Blackgum Basin Swamp Forest (CEGL006014)**
[*Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum* spp. Swamp Forest]

16a. *Acer rubrum* (red maple) swamps codominated by abundant conifers..... **17**
16b. Hardwood swamps dominated by other deciduous species in addition to *Acer rubrum* (red maple). **20**

17a. *Acer rubrum* (red maple) swamps with *Picea rubens* (red spruce) or *Tsuga canadensis* (eastern hemlock). **18**
17b. *Acer rubrum* (red maple) swamp with *Chamaecyparis thyoides* (Atlantic white-cedar) or *Larix laricina* (tamarack)..... **19**

18a. Mixed canopy codominated by *Acer rubrum* (red maple) and *Picea rubens* (red spruce); *Nyssa sylvatica* (blackgum) common; *Abies balsamea* (balsam fir) may be present; shrubs include *Vaccinium corymbosum* (highbush blueberry) and *Rhododendron maximum* (great laurel) (more common in southern examples) and *Nemopanthus mucronatus* (catberry), *Ilex verticillata* (common winterberry), and *Thuja occidentalis* (arborvitae) (more common in northern examples); herbs include *Carex trisperma* (three-seeded sedge), *Osmunda cinnamomea* (cinnamon fern), *Gaultheria hispidula* (creeping snowberry), and *Carex folliculata* (northern long sedge); *Sphagnum* (sphagnum moss) common; observed in NY, MA, and VT. ..... **Red Spruce - Red Maple Acidic Swamp Forest (CEGL006198)**
[*Picea rubens - Acer rubrum / Nemopanthus mucronatus* Swamp Forest]

18b. Mixed hardwood [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple)], *Tsuga* (hemlock) spp. (hemlock ≤25% of canopy), and occasionally *Abies balsamea* (balsam fir) mineral-soil wetlands occurring in seepage-influenced areas, at wetland-upland ecotones, usually on slopes rather than in basins; plot elevations range from 295-611 m (968-2,000 feet); herbaceous layer more indicative of nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians; observed in NY, MA and VT. ..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]

19a. Inland *Acer rubrum* (red maple) swamp with *Chamaecyparis thyoides* (Atlantic white-cedar) occurring on ridgetops; rare association; observed in NY at 370 m (1,213 feet). .... **Inland Atlantic White-cedar Swamp Forest (CEGL006189)**
[*Chamaecyparis thyoides - (Tsuga canadensis, Betula alleghaniensis) / Clethra alnifolia* Swamp Forest]

19b. Enriched *Acer rubrum - Fraxinus nigra* (red maple-black ash) seepage swamps north of extent of glaciation (approximate line runs roughly east-west through southern PA and northern NJ) often with *Larix laricina* (tamarack) and *Pinus strobus* (eastern white pine) in canopy and *Alnus incana* (gray alder) and *Rhamnus alnifolia* (alderleaf buckthorn) in the shrub layer; with enriched seepage indicators frequent and often abundant, especially calciphiles such as *Saxifraga pensylvanica* (eastern swamp saxifrage), *Carex leptalea* (bristly-stalked sedge), *Carex flava* (yellow sedge), *Solidago patula* (roundleaf goldenrod), and *Ranunculus hispidus* var. *caricetorum* (bristly buttercup); ranges from PA north to VT; observed in MA and VT..... ..... **Red Maple - Black Ash Rich Seepage Swamp Forest (CEGL006009)**
[*Acer rubrum - Fraxinus nigra - (Larix laricina) / Rhamnus alnifolia* Swamp Forest]

20a. Hardwood forested swamps codominated by *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum), or *Acer rubrum* (red maple) and *Betula alleghaniensis* (yellow birch)..... **21**
20b. Hardwood forested swamps and wet forests codominated by *Acer rubrum* (red maple) and *Fraxinus* (ash) spp. **and/or** *Quercus* (oak) spp..... **22**
21a. Hardwood forested swamps codominated by *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) with *Betula alleghaniensis* (yellow birch) common; generally occurring in small, isolated basins high in watersheds; shrub layer usually well-developed with *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), *Rhododendron viscosum* (swamp azalea), *Rhododendron maximum* (great laurel), and/or *Lindera benzoin* (northern spicebush); hummock-and-hollow microtopography and dense *Sphagnum* (sphagnum moss) carpet characteristic; found from the Central Appalachians north to central New England; observed in PA, NJ and NY. .... **Red Maple - Blackgum Basin Swamp Forest (CEGL006014)**
[*Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum* spp. Swamp Forest]

21b. Mixed hardwood (*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple)) and *Tsuga* (hemlock) spp. (hemlock ≤25% of canopy) and occasionally *Abies balsamea* (balsam fir) mineral-soil wetlands occurring in seepage-influenced areas, at wetland-upland ecotones usually on slopes rather than in basins; plot elevations range from 295-611 m (968-2,000 feet); herbaceous layer more indicative of nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians; observed in NY, MA and VT. .... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]

22a. Hardwood forests, wet at least seasonally, codominated by *Quercus* (oak) spp.; transitional upland / wetland forest occurring in a basin setting with a variable canopy typically including *Fraxinus* (ash) spp., *Quercus rubra* (northern red oak), *Acer rubrum* (red maple) and/or *Betula alleghaniensis* (yellow birch); *Lindera benzoin* (northern spicebush) dominates shrub layer; *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Osmunda claytoniana* (interrupted fern), *Thelypteris palustris* (eastern marsh fern), *Impatiens capensis* (jewelweed), *Aralia nudicaulis* (wild sarsaparilla), and *Symplocarpus foetidus* (skunk-cabbage) common in the herb layer; ranges from Southern New England north to ME (1 plot and 1 obs point in CT). ..... **Upland/Wetland Transitional Forest (CEGL006000)**
[*Quercus rubra - Betula alleghaniensis / Osmunda cinnamomea* Forest]

22b. Hardwood forested swamps codominated by *Acer rubrum* (red maple) and *Fraxinus* (ash) spp. **23**

23a. Hardwood swamps with *Acer rubrum* (red maple) and *Fraxinus pennsylvanica* (green ash) and/or *Fraxinus americana* (white ash); *Betula alleghaniensis* (yellow birch) may be dominant in some areas. **24**

23b. Hardwood swamps with *Acer rubrum* (red maple) and *Fraxinus nigra* (black ash) **25**

24a. *Acer rubrum - Fraxinus* spp. (red maple-ash) swamps occurring in saturated settings, along small streams, or in basins that receive overland flooding in addition to considerable groundwater seepage indicated by abundant *Lindera benzoin* (northern spicebush), *Onoclea sensibilis* (sensitive fern), *Symplocarpus foetidus* (skunk-cabbage), and mosses such as *Mnium* (mnium calcareous moss) spp. or *Calliergon* (calliergon moss) spp. characteristic; canopy associates can include *Betula alleghaniensis* (yellow birch) (in some cases may be strongly dominant), and *Fraxinus* (ash) spp.; dense shrub layer includes *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), *Viburnum lentago* (nannyberry), and others; ranges from southern New England south to the Piedmont of VA; observed in in MA, NY, and NJ. ..... **Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest (CEGL006406)**
[*Acer rubrum - Fraxinus (pennsylvanica, americana) / Lindera benzoin / Symplocarpus foetidus* Swamp Forest]

24b. *Acer rubrum - Fraxinus* spp. (red maple-ash) swamps occurring in basins; *Acer rubrum* (red maple) codominant with many possible associates; *Clethra alnifolia* (coastal sweet-pepperbush), *Vaccinium corymbosum* (highbush blueberry), *Ilex verticillata* (common winterberry), *Rhododendron viscosum* (swamp azalea), and *Nemopanthus mucronatus* (catberry) characteristic shrubs; herb layer includes *Thelypteris palustris* (eastern marsh fern), *Osmunda cinnamomea* (cinnamon fern), *Carex stricta* (upright sedge), *Triadenum virginicum* (Virginia marsh St. Johnswort), and *Sphagnum* (sphagnum moss); observed in NJ and NY. ..... **Northern Red Maple Swamp Forest (CEGL006220)**
[*Acer rubrum / Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest]

25a. *Acer rubrum - Fraxinus nigra* (red maple-black ash) seepage swamp with less enrichment; canopy often mixed with *Tsuga canadensis* (eastern hemlock); includes northern conifers such as *Thuja occidentalis* (arborvitae) and *Abies balsamea* (balsam fir); enrichment indicators such as *Rhamnus alnifolia* (alderleaf buckthorn), *Tiarella cordifolia* (heartleaf foamflower), *Chrysosplenium americanum* (American golden-saxifrage) present but not necessarily abundant; calciphiles lacking; observed in VT. ..... **Northern Hardwood - Hemlock Seepage Swamp Forest (CEGL006502)**
[*Acer rubrum - Fraxinus nigra - (Tsuga canadensis) / Tiarella cordifolia* Swamp Forest]

25b. Enriched *Acer rubrum - Fraxinus nigra* (red maple-black ash) seepage swamps north of extent of glaciation (approximate line runs roughly east-west through southern PA and northern NJ) often with *Larix laricina* (tamarack) and *Pinus strobus* (eastern white pine) in canopy and *Alnus incana* (gray alder) and *Rhamnus alnifolia* (alderleaf buckthorn) in the shrub layer; with enriched seepage indicators frequent and often abundant, especially calciphiles such as *Saxifraga pensylvanica* (eastern swamp saxifrage), *Carex leptalea* (bristly-stalked sedge), *Carex flava* (yellow sedge), *Solidago patula* (roundleaf goldenrod), and *Ranunculus hispidus* var. *caricetorum* (bristly buttercup); ranges from PA north to VT; observed in MA and VT..... **Red Maple - Black Ash Rich Seepage Swamp Forest (CEGL006009)**
[*Acer rubrum - Fraxinus nigra - (Larix laricina) / Rhamnus alnifolia* Swamp Forest]

26a. Vernal pools characterized by seasonally fluctuating water levels; species composition is variable among sites; many smaller, shaded vernal ponds are unvegetated, their bottoms consisting of dead leaves and algae; primarily in glaciated or periglacial areas, from Quebec and New Brunswick south through NY to northern PA and northern NJ..... **Eastern Woodland Vernal Pool (CEGL006453)**
[Eastern Woodland Vernal Pool]
26b. Small herbaceous seepage areas. **27**

27a. Small herbaceous seepage areas under forest canopy. **28**
27b. Vegetation of high elevations or adjacent to shores of large rivers in northern New England. .. **30**

28a. Uncommon, globally rare, rich seep occurring known only from off the trail at DEWA where calcareous groundwater discharge is present; highly variable species composition; typical species include *Vernonia noveboracensis* (New York ironweed), *Thelypteris palustris* (eastern marsh fern), *Viola* (violet) spp., *Packera aurea* (golden ragwort), *Symplocarpus foetidus* (skunk-cabbage), *Arisaema triphyllum* (Jack in the pulpit), *Hydrocotyle americana* (American marshpennywort), *Eupatorium* (thoroughwort) spp., *Impatiens* (touch-me-not) spp., *Pycnanthemum verticillatum* (whorled mountainmint), *Amphicarpaea bracteata* (American hogpeanut), *Mitella diphylla* (twoleaf miterwort), *Chelone glabra* (white turtlehead), *Carex debilis* (white edge sedge), *Microstegium vimineum* (Nepalese browntop), and *Leersia oryzoides* (rice cutgrass)..... **Mid-Atlantic Rich Seep (CEGL006448)**
[*Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Seepage Meadow]
28b. Common, wide ranging seeps found throughout the northeast; *Chrysosplenium americanum* (American golden-saxifrage), *Symplocarpus foetidus* (skunk-cabbage) and/ or *Impatiens capensis* (jewelweed) dominant. **29**

29a. *Chrysosplenium americanum* (American golden-saxifrage) characteristic; *Impatiens capensis* (jewelweed) and *Glyceria melicaria* (melic mannagrass) common in addition to *Scutellaria lateriflora* (blue skullcap), *Dryopteris intermedia* (intermediate woodfern), *Thuidium delicatulum* (delicate thuidium moss), *Cinna latifolia* (drooping woodreed), *Osmunda cinnamomea* (cinnamon fern), *Cardamine bulbosa* (bulbous bittercress), *Circaea alpina* (small enchanter's nightshade), *Viola cucullata* (marsh blue violet), and *Chelone glabra* (white turtlehead); can be fully shaded by overhanging *Betula alleghaniensis* (yellow birch) or other matrix forest canopy trees; occurs throughout the eastern United States; observed in VT. ..... **Golden-saxifrage Forested Seep (CEGL006193)**
[*Chrysosplenium americanum* Seepage Meadow]
29b. *Symplocarpus foetidus* (skunk-cabbage) and/or *Impatiens capensis* (jewelweed) dominant; occurs under canopy of matrix forest..... **Skunk-cabbage - Jewelweed Seep (CEGL006567)**
[*Symplocarpus foetidus - Impatiens capensis* Seepage Meadow]

30a. Shrubby to herbaceous seepage swamps or glades with an overhanging canopy within a forest or free of tree cover known from high elevations (>776 m [2,545 feet]) in the Coolidge Range of the Green Mountains in central VT, occurring on moderate to somewhat steep slopes; mineral soil, with little to no peat accumulation; open to dense shrub layer up to 5 m in height dominated by *Prunus virginiana* (chokecherry), *Acer spicatum* (mountain maple), and *Sambucus racemosa* (red elderberry); *Ribes triste* (red currant) is a constant short shrub; herb layer includes some combination of *Angelica atropurpurea* (purplestem angelica), *Heracleum maximum* (common cowparsnip), *Hydrophyllum virginianum* (eastern waterleaf), *Impatiens capensis* (jewelweed), *Thalictrum pubescens* (king-of-the-meadow), *Tiarella cordifolia* (heartleaf foamflower), *Ageratina altissima* (white snakeroot), *Glyceria striata* (fowl mannagrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Athyrium filix-femina* (common ladyfern), *Chelone glabra* (white turtlehead), *Dryopteris campyloptera* (mountain woodfern), *Ranunculus recurvatus* (blisterwort), *Tiarella cordifolia* (heartleaf foamflower),*Veratrum viride* (green false hellebore), *Laportea canadensis* (Canadian woodnettle), *Solidago macrophylla* (largeleaf goldenrod), *Symphyotrichum puniceum* (purplestem aster), *Dryopteris campyloptera* (mountain woodfern), *Milium effusum* (American milletgrass), *Rubus pubescens* (dwarf red blackberry), *Trillium erectum* (red trillium), *Actaea pachypoda* (white baneberry), *Carex leptonervia* (nerveless woodland sedge), *Dicentra cucullaria* (Dutchman's breeches), *Erythronium americanum* (dogtooth violet), and *Phegopteris connectilis* (long beechfern). ..... **Northern Appalachian High-Elevation Seepage Shrubland (CEGL006583)**

[*Prunus virginiana - Acer spicatum - Ribes triste / Angelica atropurpurea - Heracleum maximum* Seepage Shrubland]

30b. Graminoid-dominated seepage community in discharge areas of the shores of larger rivers; circumneutral groundwater discharge supports a fen-like aspect, but on mineral rather than peat soils; semi-open conditions are maintained by ice-scouring and floodwaters; herbaceous species include *Juncus dudleyi* (Dudley's rush), *Eleocharis tenuis* (slender spikerush), *Andropogon gerardii* (big bluestem), *Agrostis stolonifera* (creeping bentgrass), *Carex garberi* (elk sedge), *Carex granularis* (limestone meadow sedge), *Carex pellita* (woolly sedge), and others; observed where the White River crosses AT in VT. ..... **Boreal Circumneutral Riverside Seep (CEGL006142)**

[*Triantha glutinosa - Carex garberi* Riverscour Wet Meadow]

3. Shrub Swamps, Fens, and Bogs

1a. Successional, ruderal, or altered wet meadow or shrub swamp vegetation; wetlands impacted by beaver or anthropogenic activity; low-lying areas of old fields, impoundments. **2**
1b. Natural vegetation not highly impacted by beavers or anthropogenic activity. **3**

2a. Wet meadow of variable physiognomy and species composition; characterized by *Spiraea* (spirea) spp. and *Rubus* (blackberry) spp. and scattered non-native shrubs with variable combinations of wetland old-field species such as *Phalaris arundinacea* (reed canarygrass), *Juncus effusus* (common rush), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Solidago* (goldenrod) spp., *Impatiens capensis* (jewelweed), *Lycopus uniflorus* (northern bugleweed), and *Lythrum salicaria* (purple loosestrife); ranges from shrub thicket to herbaceous meadow with scattered shrubs; occurs in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands; known throughout the Northeast and broadly classified. ..... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa - Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]
2b. Tall successional shrub swamp (2-4 m) occurring in low-lying areas of old fields or pastures, or the edges of beaver-impacted wetlands or impoundments; vegetation is highly variable with *Cornus amomum* (silky dogwood), *Cornus sericea* (red-osier dogwood), *Viburnum dentatum* (southern arrow-wood), *Spiraea alba* var. *latifolia* (white meadowsweet), *Rosa multiflora* (multiflora rose), *Rubus allegheniensis* (Allegheny blackberry), and *Rubus hispidus* (bristly dewberry) typically present and abundant; *Salix* (willow) spp. may also be present but are less common. ..... **Ruderal Dogwood - Arrow-wood Shrub Swamp (CEGL006576)**
[*Cornus (amomum, sericea) - Viburnum dentatum - Rosa multiflora* Ruderal Shrub Swamp]

3a. Fen or bog vegetation of peat or mineral soils. **4**
3b. Non-peat-forming shrub swamps; *Sphagnum* (sphagnum moss) may be present (<20% cover), but seldom forming continuous carpet or mat; often on deep muck. **10**

4a. Calcareous indicators[30] present in quantity. **5**
4b. Calcareous indicators absent or uncommon. **6**

CALCAREOUS FENS

5a. Physiognomy generally shrub-dominated, clearly overtopping herbaceous layer; characteristic shrubs include *Juniperus virginiana* (eastern red-cedar), *Cornus amomum* (silky dogwood) and *Toxicodendron vernix* (poison-sumac); invasive *Rosa multiflora* (multiflora rose) and *Elaeagnus umbellata* (autumn olive) often present in quantity along with invasive herbaceous species; grazing an important factor, either currently or in recent past; observed in NY and NJ. ..... **Pasture Fen (CEGL006357)**
[*Juniperus virginiana / Dasiphora fruticosa* ssp. *floribunda / Carex flava - Carex tetanica* Fen]

[30] *Carex flava* (yellow sedge), *Dasiphora fruticosa* ssp. *floribunda* (shrubby-cinquefoil), *Carex hystericina* (bottlebrush sedge), *Carex leptalea* (bristly-stalked sedge), *Eriophorum viridicarinatum* (thinleaf cottonsedge), *Solidago patula* (roundleaf goldenrod), *Parnassia glauca* (fen grass of Parnassus), *Solidago uliginosa* (bog goldenrod), *Betula pumila* (bog birch), *Geum rivale* (purple avens), *Lobelia kalmii* (Ontario lobelia), *Castilleja coccinea* (scarlet Indian paintbrush), *Cypripedium reginae* (showy lady's slipper)

5b. Not as above; fens with shallow organic layer or mineral soil, tall shrubs and trees generally lacking; exotic species absent or rare; short cespitose sedges common; shrubs other than *Dasiphora fruticosa* ssp. *floribunda* (shrubby-cinquefoil) not abundant; fen forbs such as *Parnassia glauca* (fen grass of Parnassus), *Packera aurea* (golden ragwort), *Solidago uliginosa* (bog goldenrod), *Solidago patula* (roundleaf goldenrod), *Geum rivale* (purple avens), *Lobelia kalmii* (Ontario lobelia) present in quantity; observed in MA and VT. .....**Lower New England Sloping Fen (CEGL006326)**
[*Dasiphora fruticosa* ssp. *floribunda / Carex (sterilis, hystericina, flava)* Fen]

POOR (NON-CALCAREOUS) FENS AND BOGS

6a. *Sphagnum*-dominated peatlands with well-developed shrub layer, with or without scattered trees. **7**
6b. Shrub-herbaceous vegetation of nutrient-poor fens occurring on shallow to deep peat; vegetation in contact with groundwater..... **9**

7a. Wooded bog dominated by *Picea mariana* (black spruce) over heath shrubs and sphagnum mosses; occurs in kettlehole basins and other well-defined topographic depressions; characterized by relatively deep peat accumulation, indicating acidic, nutrient-poor conditions; ranges from central New England to just south of the glacial border in PA and NJ; possible for MA. ....**Black Spruce Swamp Woodland (CEGL006098)**
[*Picea mariana / (Vaccinium corymbosum, Gaylussacia baccata) / Sphagnum* sp. Swamp Woodland]
7b. Shrub-dominated vegetation; *Picea mariana* (black spruce) minor to absent (<10%). **8**

8a. *Vaccinium corymbosum* (highbush blueberry) dominant; common shrubs include *Nemopanthus mucronatus* (catberry), *Ilex verticillata* (common winterberry), *Photinia melanocarpa* (black chokeberry), *Kalmia latifolia* (mountain laurel), *Rhododendron viscosum* (swamp azalea), *Clethra alnifolia* (coastal sweet-pepperbush), *Gaylussacia baccata* (black huckleberry), *Kalmia angustifolia* (sheep laurel), and/or *Lyonia ligustrina* (maleberry); scattered trees include *Tsuga canadensis* (eastern hemlock), *Nyssa sylvatica* (blackgum), and/or *Acer rubrum* (red maple); sparse herb layer with *Carex trisperma* (three-seeded sedge), *Carex canescens* (silvery sedge), *Osmunda regalis* (royal fern), *Osmunda cinnamomea* (cinnamon fern), *Drosera rotundifolia* (roundleaf sundew), and thick *Sphagnum* (sphagnum moss) layer; occurs as a peat bog and/or border thicket around more open dwarf heath shrub peatlands or within small, isolated basins; observed in CT, NJ, NY and PA. .... **Highbush Blueberry Bog Thicket (CEGL006190)**
[*Vaccinium corymbosum / Sphagnum* spp. Acidic Peatland]
8b. *Chamaedaphne calyculata* (leatherleaf) and *Sphagnum* (sphagnum moss) strongly dominant; *Myrica gale* (sweetgale), *Kalmia angustifolia* (sheep laurel), or *Gaylussacia baccata* (black huckleberry), may be present and locally common, including *Decodon verticillatus* (swamp-loosestrife) along fringes of the peat mat; herbs generally very sparse and comprised of oligotrophic indicator species such as *Carex trisperma* (three-seeded sedge), *Eriophorum* (cottongrass) spp., *Drosera* (sundew) spp., and *Sarracenia purpurea* (purple pitcherplant); dwarf-shrub quaking or floating sphagnum bog occurs in the southern portion of the glaciated Northeast; observed in NY and NJ. .....**Southern New England Bog (CEGL006008)**
[*Chamaedaphne calyculata - (Gaylussacia dumosa) - Decodon verticillatus / Woodwardia virginica* Acidic Peatland]

9a. Mixed, relatively tall-shrub (often >1 m) fen codominated by *Myrica gale* (sweetgale), *Spiraea tomentosa* (steeplebush), *Chamaedaphne calyculata* (leatherleaf) and/or *Spiraea alba* (white meadowsweet); occurs in standing shallow water without a continuous *Sphagnum* (sphagnum moss) carpet; documented globally in NY, NH, ME and VT; observed in the project area in MA..... ..... **Sweetgale Mixed Shrub Fen (CEGL006512)**
[*Myrica gale - Spiraea alba - Chamaedaphne calyculata* Fen]

9b. *Chamaedaphne calyculata* (leatherleaf) dominates the dwarf-shrub layer (>25%); *Andromeda polifolia* (bog rosemary) usually present; *Myrica gale* (sweetgale), *Kalmia angustifolia* (sheep laurel), and *Ledum groenlandicum* (bog Labrador-tea) are frequent; *Carex* (sedge) spp., *Equisetum arvense* (field horsetail), *Lysimachia terrestris* (earth loosestrife), and *Triadenum virginicum* (Virginia marsh St. Johnswort) are characteristic herbs; *Sphagnum* (sphagnum moss) mat typical; occurs throughout the glaciated Northeast; observed in VT. .... **Leatherleaf Boggy Fen (CEGL006513)**
[*Chamaedaphne calyculata / Eriophorum virginicum / Sphagnum rubellum* Acidic Peatland]

SHRUB SWAMPS

10a. Shrubby to herbaceous seepage swamps or glades with an overhanging canopy within a forest or free of tree cover known from high elevations (>776 m [2,545 feet]) in the Coolidge Range of the Green Mountains in central VT, occurring on moderate to somewhat steep slopes; mineral soil, with little to no peat accumulation; open to dense shrub layer up to 5 m in height dominated by *Prunus virginiana* (chokecherry), *Acer spicatum* (mountain maple), and *Sambucus racemosa* (red elderberry); *Ribes triste* (red currant) is a constant short shrub; herb layer includes some combination of *Angelica atropurpurea* (purplestem angelica), *Heracleum maximum* (common cowparsnip), *Hydrophyllum virginianum* (eastern waterleaf), *Impatiens capensis* (jewelweed), *Thalictrum pubescens* (king-of-the-meadow), *Tiarella cordifolia* (heartleaf foamflower), *Ageratina altissima* (white snakeroot), *Glyceria striata* (fowl mannagrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Athyrium filix-femina* (common ladyfern), *Chelone glabra* (white turtlehead), *Dryopteris campyloptera* (mountain woodfern), *Ranunculus recurvatus* (blisterwort), *Veratrum viride* (green false hellebore), *Laportea canadensis* (Canadian woodnettle), *Solidago macrophylla* (largeleaf goldenrod), *Symphyotrichum puniceum* (purplestem aster), *Dryopteris campyloptera* (mountain woodfern), *Milium effusum* (American milletgrass), *Rubus pubescens* (dwarf red blackberry), *Trillium erectum* (red trillium), *Actaea pachypoda* (white baneberry), *Carex leptonervia* (nerveless woodland sedge), *Dicentra cucullaria* (Dutchman's breeches), *Erythronium americanum* (dogtooth violet), and *Phegopteris connectilis* (long beechfern); observed in VT. .... **Northern Appalachian High-Elevation Seepage Shrubland (CEGL006583)**
[*Prunus virginiana - Acer spicatum - Ribes triste / Angelica atropurpurea - Heracleum maximum* Seepage Shrubland]

10b. Shrub vegetation characterized by *Cephalanthus occidentalis* (common buttonbush), *Decodon verticillatus* (swamp-loosestrife), *Vaccinium corymbosum* (highbush blueberry), or *Alnus incana* (gray alder); habitat variable - low basins, pondshores, streamsides, riversides (but not bog mats[31]).**11**

[31]Swamp-loosestrife-dominated fringe of bog mats adjacent to water are considered part of the bog association, Southern New England Bog [*Chamaedaphne calyculata - (Gaylussacia dumosa) - Decodon verticillatus / Woodwardia virginica* Acidic Peatland (CEGL006008)].

11a. Wetlands dominated by shrubs of more or less low stature, usually 2m or less in height; *Cephalanthus occidentalis* (common buttonbush) **or** *Decodon verticillatus* (swamp-loosestrife) abundant **12**
11b. Wetlands dominated by tall shrubs (generally 1.5m–2m or higher); *Alnus incana* (gray alder) or *Vaccinium corymbosum* (highbush blueberry) dominant or abundant **13**

12a. Shrub swamp dominated by *Cephalanthus occidentalis* (common buttonbush); occurs in a variety of environmental settings, including backwater sloughs or oxbow ponds, wet swales in floodplains, pond and lake borders, and small, isolated depressions observed in the project area in PA; ranges throughout the Northeast. ..... **Northeastern Buttonbush Shrub Swamp (CEGL006069)**
[*Cephalanthus occidentalis - Decodon verticillatus* Shrub Swamp]
12b. Shrub border that occurs as a fringe along aquatic edges of lakes, and streams in Lower New England and elsewhere; *Decodon verticillatus* (swamp-loosestrife) forms a dense, often monotypic tangle; *Cephalanthus occidentalis* (common buttonbush) can occur, but with less abundance than *Decodon verticillatus* (swamp-loosestrife); observed in NY. ..... **Swamp-loosestrife Shrub Swamp (CEGL005089)**
[*Decodon verticillatus* Shrub Swamp]

13a. Alder swamps of saturated basins, beaver-impacted wetlands and small, low-velocity streams dominated by *Alnus incana* (gray alder); northern species such as *Nemopanthus mucronatus* (catberry) and *Myrica gale* (sweetgale) differentiate this type; other shrubs, such as *Cornus sericea* (red-osier dogwood), *Rubus idaeus* (American red raspberry), *Salix* (willow) spp., *Spiraea alba* (white meadowsweet), *Spiraea tomentosa* (steeplebush), and *Viburnum* (viburnum) spp., are common; if occurring adjacent to a high-velocity stream or river or an active floodplain consider CEGL006062 in the Alluvial Vegetation Key; observed in the project area in MA and VT. ..... **Gray Alder Shrub Swamp (CEGL002381)**
[*Alnus incana* Shrub Swamp]
13b. *Vaccinium corymbosum* (highbush blueberry) dominant or abundant **14**

14a. Blueberry wetland thicket of seasonally flooded basins with tall shrub associates including *Rhododendron viscosum* (swamp azalea), *Clethra alnifolia* (coastal sweet-pepperbush), *Ilex verticillata* (common winterberry) and others; ferns and forbs common; observed in south-central NY just to the east of the Hudson on the trail. ..... **Blueberry Wetland Thicket (CEGL006371)**
[*Vaccinium corymbosum - Rhododendron viscosum - Clethra alnifolia* Acidic Peatland]
14b. *Vaccinium corymbosum* (highbush blueberry) dominant over a thick *Sphagnum* (sphagnum moss) layer; occurs within peat bogs and/or as a border shrubland around more open dwarf heath shrub peatlands or within small, isolated saturated basins; scattered trees include *Tsuga canadensis* (eastern hemlock), *Nyssa sylvatica* (blackgum), and/or *Acer rubrum* (red maple); sparse herb layer with *Carex trisperma* (three-seeded sedge), *Carex canescens* (silvery sedge), *Drosera rotundifolia* (roundleaf sundew), and thick *Sphagnum* (sphagnum moss) layer; observed in CT, NJ, NY and PA. ..... **Highbush Blueberry Bog Thicket (CEGL006190)**
[*Vaccinium corymbosum / Sphagnum* spp. Acidic Peatland]

4. Herbaceous Wetlands and Aquatic Vegetation

1a. Tree cover present (>25%)..... **2**
1b. Tree cover absent or sparse; shrub cover <50%; herbaceous marshes and wetlands; herb cover >50% and aquatic vegetation. **7**

2a. *Acer rubrum* (red maple) wooded marshes characterized by an herbaceous layer strongly dominated by *Carex stricta* (upright sedge); *Vaccinium corymbosum* (highbush blueberry) often present; occurs on muck soils or mineral soils with a surface organic layer, in poorly-drained depressions influenced by groundwater; partly wooded wetland of central and northern New England; observed in NJ and NY..... **Red Maple / Upright Sedge Wet Woodland (CEGL006119)**
[*Acer rubrum / Carex stricta - Onoclea sensibilis* Wet Woodland]
2b. Forested seeps. **3**

3a. Small herbaceous seepage areas with scattered cover of forbs; characteristic species include *Chrysosplenium americanum* (American golden-saxifrage), *Impatiens capensis* (jewelweed), and *Glyceria melicaria* (melic mannagrass); other common species include *Scutellaria lateriflora* (blue skullcap), *Dryopteris intermedia* (intermediate woodfern), *Thuidium delicatulum* (delicate thuidium moss), *Cinna latifolia* (drooping woodreed), *Osmunda cinnamomea* (cinnamon fern), *Cardamine bulbosa* (bulbous bittercress), *Circaea alpina* (small enchanter's nightshade), *Viola cucullata* (marsh blue violet), and *Chelone glabra* (white turtlehead); can by fully shaded by overhanging matrix forest trees; observed in VT. ..... **Golden-saxifrage Forested Seep (CEGL006193)**
[*Chrysosplenium americanum* Seepage Meadow]
3b. *Chrysosplenium americanum* (American golden-saxifrage) sparse to absent. **4**

4a. Shrubby to herbaceous seepage swamps or glades with an overhanging canopy within a forest or free of tree cover known from high elevations (>776 m [2,545 feet]) in the Coolidge Range of the Green Mountains in central VT, occurring on moderate to somewhat steep slopes; mineral soil, with little to no peat accumulation; open to dense shrub layer up to 5 m in height dominated by *Prunus virginiana* (chokecherry), *Acer spicatum* (mountain maple), and *Sambucus racemosa* (red elderberry); *Ribes triste* (red currant) is a constant short shrub; herb layer includes some combination of *Angelica atropurpurea* (purplestem angelica), *Heracleum maximum* (common cowparsnip), *Hydrophyllum virginianum* (eastern waterleaf), *Impatiens capensis* (jewelweed), *Thalictrum pubescens* (king-of-the-meadow), *Tiarella cordifolia* (heartleaf foamflower), *Ageratina altissima* (white snakeroot), *Glyceria striata* (fowl mannagrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Athyrium filix-femina* (common ladyfern), *Chelone glabra* (white turtlehead), *Dryopteris campyloptera* (mountain woodfern), *Ranunculus recurvatus* (blisterwort), *Veratrum viride* (green false hellebore), *Laportea canadensis* (Canadian woodnettle), *Solidago macrophylla* (largeleaf goldenrod), *Symphyotrichum puniceum* (purplestem aster), *Dryopteris campyloptera* (mountain woodfern), *Milium effusum* (American milletgrass), *Rubus pubescens* (dwarf red blackberry), *Trillium erectum* (red trillium), *Actaea pachypoda* (white baneberry), *Carex leptonervia* (nerveless woodland sedge), *Dicentra cucullaria* (Dutchman's breeches), *Erythronium americanum* (dogtooth violet), and *Phegopteris connectilis* (long beechfern); observed in VT. ..... **Northern Appalachian High-Elevation Seepage Shrubland (CEGL006583)**
[*Prunus virginiana - Acer spicatum - Ribes triste / Angelica atropurpurea - Heracleum maximum* Seepage Shrubland]
4b. Seeps occurring under matrix forest cover. **5**

5a. Mixed hardwood [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple)] and *Tsuga* (hemlock) spp. (hemlock ≤25% of canopy) mineral-soil wetlands occurring in seepage-influenced areas, at wetland-upland ecotones, on slopes rather than in basins; plot elevations range from 295-611 m (968-2,000 feet); herbaceous layer more indicative of nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians; observed in NY, MA and VT. ..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]

5b. Herbaceous dominated seeps. **6**

6a. *Symplocarpus foetidus* (skunk-cabbage) and *Impatiens capensis* (jewelweed) dominant; occurs under canopy of matrix forest. ..... **Skunk-cabbage - Jewelweed Seep (CEGL006567)**
[*Symplocarpus foetidus - Impatiens capensis* Seepage Meadow]

6b. Uncommon, globally rare, rich seep occurring where calcareous groundwater discharge is present; highly variable species composition known only from off the trail at DEWA; typical species include *Vernonia noveboracensis* (New York ironweed), *Thelypteris palustris* (eastern marsh fern), *Viola* (violet) spp., *Packera aurea* (golden ragwort), *Symplocarpus foetidus* (skunk-cabbage), *Arisaema triphyllum* (Jack in the pulpit), *Hydrocotyle americana* (American marshpennywort), *Eupatorium* (thoroughwort) spp., *Impatiens* (touch-me-not) spp., *Pycnanthemum verticillatum* (whorled mountainmint), *Amphicarpaea bracteata* (American hogpeanut), *Mitella diphylla* (twoleaf miterwort), *Chelone glabra* (white turtlehead), *Carex debilis* (white edge sedge), *Microstegium vimineum* (Nepalese browntop), and *Leersia oryzoides* (rice cutgrass). ..... **Mid-Atlantic Rich Seep (CEGL006448)**
[*Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Seepage Meadow]

7a. Aquatic vegetation of ponds or slow-moving rivers; dominants are usually submerged macrophytes or floating-leaved forbs **8**
7b. Herb-dominated fens, marshes, and wetlands; herb cover >50% **9**

8a. Floating-leaved water-lilies dominant; common throughout the Northeast; observed in NJ. ..... **Water-lily Aquatic Wetland (CEGL002386)**
[*Nuphar advena - Nymphaea odorata* Aquatic Vegetation]

8b. Submerged macrophytes, including *Elodea canadensis* (Canadian waterweed) and/or *Potamogeton* (pondweed) spp. abundant; observed in NY ..... **Eastern Waterweed - Pondweed Aquatic Vegetation (CEGL006431)**
[*Elodea canadensis - Potamogeton* spp. Eastern Aquatic Vegetation]

9a. Naturally occurring wetlands dominated by native species. **10**
9b. Successional wet meadows and invaded marshes. **32**

10a. Fens, and alluvial and sparse riverine vegetation. **11**
10b. Herbaceous vegetation not as above. **18**

11a. Fen vegetation. **12**
11b. Alluvial and sparse riverine vegetation. **14**

12a. Physiognomy generally shrub-dominated, clearly overtopping herbaceous layer; characteristic shrubs include *Juniperus virginiana* (eastern red-cedar), *Cornus amomum* (silky dogwood) and *Toxicodendron vernix* (poison-sumac); invasive *Rosa multiflora* (multiflora rose) and *Elaeagnus umbellata* (autumn olive) often present in quantity along with invasive herbaceous species; grazing an important factor, either currently or in recent past; observed in NY and NJ. ..... **Pasture Fen (CEGL006357)**
[*Juniperus virginiana / Dasiphora fruticosa* ssp. *floribunda / Carex flava - Carex tetanica* Fen]
12b. Not as above; fens with shallow organic layer or mineral soil, tall shrubs and trees generally lacking; exotic species absent or rare..... **13**

13a. Short cespitose sedges common; shrubs other than *Dasiphora fruticosa* ssp. *floribunda* (shrubby-cinquefoil) not abundant; fen forbs such as *Parnassia glauca* (fen grass of Parnassus), *Packera aurea* (golden ragwort), *Solidago uliginosa* (bog goldenrod), *Solidago patula* (roundleaf goldenrod), *Geum rivale* (purple avens), *Lobelia kalmii* (Ontario lobelia) present in quantity; observed in MA and VT. ..... **Lower New England Sloping Fen (CEGL006326)**
[*Dasiphora fruticosa* ssp. *floribunda / Carex (sterilis, hystericina, flava)* Fen]
13b. *Dulichium arundinaceum* (threeway sedge), *Juncus pelocarpus* (brownfruit rush) [and other *Juncus* (rush) spp.), *Carex stricta* (upright sedge), *Carex lasiocarpa* (woollyfruit sedge), *Carex utriculata* (Northwest Territory sedge), *Carex canescens* (silvery sedge), and *Bidens* (beggarticks) spp. *Sphagnum* mosses, such as *Sphagnum cuspidatum* (toothed sphagnum), *Sphagnum papillosum* (papillose sphagnum), or *Sphagnum torreyanum* (Torrey's sphagnum), generally form a continuous, often monotypic carpet; occurs as a narrow zone in semipermanently flooded or saturated conditions along pond borders, bog moats, and other areas where minerotrophic conditions exist; observed in MA and VT. ..... **Southern New England Threeway Sedge Fen (CEGL006131)**
[*Dulichium arundinaceum / Sphagnum* spp. Fen]

14a. Sparse riverine vegetation of open flood-scoured bedrock exposures of major rivers, along river narrows; patchy vegetation includes *Andropogon gerardii* (big bluestem), *Carex stricta* (upright sedge), *Poa palustris* (fowl bluegrass), and *Poa compressa* (Canada bluegrass); lacks *Vaccinium* (blueberry) spp.; documented globally in VT, NH, ME, CT, NJ, PA and NY; observed at DEWA and in VT along the White River..... **Northern Riverscour Rock Outcrop (CEGL006284)**
[*Andropogon gerardii - Campanula rotundifolia - Solidago simplex* Riverscour Sparse Vegetation]
14b. Alluvial herbaceous vegetation..... **15**

15a. Vegetation dominated by one species..... **16**
15b. *Carex torta* (twisted sedge) not dominant; vegetation dominated by a combination of multiple species..... **17**

16a. *Calamagrostis canadensis* (bluejoint) dominant. ..... **Laurentian & Northeast Bluejoint Wet Meadow (CEGL005448)**
[*Calamagrostis canadensis - Carex* spp. Laurentian & Northeast Wet Meadow]
16b. *Carex torta* (twisted sedge) dominant; occurs on large coarse substrates deposited along medium- to high-energy river channels and, less frequently, exposed lakeshores with heavy wave action; seasonal flooding and ice-scour maintain the open nature of these communities; characteristic perennial species that tolerate inundation and flood scouring include *Carex torta* (twisted sedge) and low *Salix* (willow) spp.; associated species tend to vary widely from site to site, can be diverse, and may be sparse; globally occurs in NH, ME, VT; observed in VT. ..... **Northeastern Temperate Cobble Scour Rivershore (CEGL006536)**
[*Carex torta - Apocynum cannabinum - Cyperus* spp. Riverbed Vegetation]

17a. Riverside grasslands dominated by tall prairie grasses such as *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass), and *Schizachyrium scoparium* (little bluestem); generally occurs along major rivers in flood-scoured areas; observed in VT..... ..... **Riverside Prairie Grassland (CEGL006518)**
[*Prunus pumila / Andropogon gerardii - Sorghastrum nutans* Riverscour Wet Meadow]

17b. Herb-dominated seepage community that develops on discharge areas of the shores of larger rivers in the glaciated northeastern United States; circumneutral groundwater discharge supports a fen-like aspect, but on mineral rather than peat soils; semi-open conditions are maintained by ice-scouring and floodwaters; herbaceous species include *Juncus dudleyi* (Dudley's rush), *Eleocharis tenuis* (slender spikerush), *Andropogon gerardii* (big bluestem), *Agrostis stolonifera* (creeping bentgrass), *Carex garberi* (elk sedge), *Carex granularis* (limestone meadow sedge), *Carex pellita* (woolly sedge), and others; observed in VT where White River crosses AT; documented globally in ME, NH, VT, CT, and NY..... **Boreal Circumneutral Riverside Seep (CEGL006142)**
[*Triantha glutinosa - Carex garberi* Riverscour Wet Meadow]

18a. Freshwater wetlands dominated primarily by graminoids..... **19**
18b. Freshwater wetlands dominated by broad-leaved emergent herbs..... **29**

19a. Wet meadows dominated by a diversity of herbaceous species..... **20**
19b. Marshes dominated by one or two species..... **23**

20a. *Carex* (sedge) spp. or *Dulichium arundinaceum* (threeway sedge) characteristic..... **21**
20b. Not as above..... **22**

21a. *Carex utriculata* (Northwest Territory sedge) dominant or codominant with *Carex aquatilis* (water sedge), *Carex lacustris* (hairy sedge), *Carex lasiocarpa* (woollyfruit sedge), *Carex rostrata* (beaked sedge), *Carex vesicaria* (blister sedge), and locally *Carex stricta* (upright sedge); Shrubs can cover up to 25% of the area; *Sphagnum* (sphagnum moss) form a carpet under Carices; one obs point in VT..... **Northern Sedge Wet Meadow (CEGL002257)**
[*Carex utriculata - Carex lacustris - (Carex vesicaria, Carex stricta)* Wet Meadow]

21b. *Dulichium arundinaceum* (threeway sedge), *Juncus pelocarpus* (brownfruit rush) [and other *Juncus* (rush) spp.), *Carex stricta* (upright sedge), *Carex lasiocarpa* (woollyfruit sedge), *Carex utriculata* (Northwest Territory sedge), *Carex canescens* (silvery sedge), and *Bidens* (beggarticks) spp. *Sphagnum* mosses, such as *Sphagnum cuspidatum* (toothed sphagnum), *Sphagnum papillosum* (papillose sphagnum), or *Sphagnum torreyanum* (Torrey's sphagnum), generally form a continuous, often monotypic carpet; occurs as a narrow zone in semipermanently flooded or saturated conditions along pond borders, bog moats, and other areas where minerotrophic conditions exist; observed in MA and VT..... **Southern New England Threeway Sedge Fen (CEGL006131)**
[*Dulichium arundinaceum / Sphagnum* spp. Fen]

22a. Successional wet meadow vegetation of the low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands; variable composition can include wetland old-field species such as *Phalaris arundinacea* (reed canarygrass), *Juncus effusus* (common rush), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Solidago* (goldenrod) spp., *Impatiens capensis* (jewelweed), *Lycopus uniflorus* (northern bugleweed), and *Lythrum salicaria* (purple loosestrife); *Spiraea* (spirea) spp. and *Rubus* (blackberry) spp. are characteristic shrubs; herbaceous meadow with scattered shrubs; known throughout the Northeast; observed in NJ. .... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa - Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]

22b. Seasonally flooded wet meadow with some combination of *Calamagrostis canadensis* (bluejoint), *Scirpus cyperinus* (woolgrass), and/or *Schoenoplectus* (bulrush) spp., as well as *Leersia oryzoides* (rice cutgrass), *Carex stricta* (upright sedge), *Juncus* (rush) spp., *Lysimachia terrestris* (earth loosestrife), *Dulichium arundinaceum* (threeway sedge), *Lycopus uniflorus* (northern bugleweed), *Glyceria canadensis* (rattlesnake mannagrass), *Carex echinata* (star sedge); observed in MA and VT. ..... **Mixed Graminoid Wet Meadow (CEGL006519)**
[*Calamagrostis canadensis - Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow]

23a. Marshes dominated by tussock-forming species such as *Carex stricta* (upright sedge) or *Carex utriculata* (Northwest Territory sedge) or *Juncus effusus* (common rush); microtopography characterized by hummocks and hollows. **24**
23b. Marshes dominated by medium-tall and tall, non-hummock-forming graminoids such as *Typha* (cattail) spp., *Schoenoplectus* (bulrush) spp., *Phragmites australis* ssp. *australis* (European common reed), *Phalaris arundinacea* (reed canarygrass). **27**

24a. *Juncus effusus* (common rush) dominant, often admixed with other graminoids and forbs..... ..... **Common Rush Marsh (CEGL004112)**
[*Juncus effusus* Marsh]
24b. *Carex* (sedge) spp. or dominant or codominant. **25**

25a. *Carex stricta* (upright sedge) abundant (>15% coverage); other common herbaceous species include *Scirpus cyperinus* (woolgrass), *Carex canescens* (silvery sedge), *Triadenum virginicum* (Virginia marsh St. Johnswort), and *Sparganium americanum* (American bur-reed); scattered *Vaccinium corymbosum* (highbush blueberry), *Lyonia ligustrina* (maleberry), and other wetland shrubs possible; occurs in seasonally flooded basins or on stream or lake margins; substrate is muck or peat of variable depth overlying mineral soil; common throughout the Northeast; observed in NY and NJ. ..... **Eastern Upright Sedge Wet Meadow (CEGL006412)**
[*Carex stricta - Carex vesicaria* Wet Meadow]
25b. *Carex stricta* (upright sedge) not abundant. **26**

26a. *Dulichium arundinaceum* (threeway sedge), *Juncus pelocarpus* (brownfruit rush) [and other *Juncus* (rush) spp.), *Carex stricta* (upright sedge), *Carex lasiocarpa* (woollyfruit sedge), *Carex utriculata* (Northwest Territory sedge), *Carex canescens* (silvery sedge), and *Bidens* (beggarticks) spp. *Sphagnum* mosses, such as *Sphagnum cuspidatum* (toothed sphagnum), *Sphagnum papillosum* (papillose sphagnum), or *Sphagnum torreyanum* (Torrey's sphagnum), generally form a continuous, often monotypic carpet; occurs as a narrow zone in semipermanently flooded or saturated conditions along pond borders, bog moats, and other areas where minerotrophic conditions exist; observed in MA and VT. ..... **Southern New England Threeway Sedge Fen (CEGL006131)**
[*Dulichium arundinaceum / Sphagnum* spp. Fen]
26b. *Carex utriculata* (Northwest Territory sedge) dominant or codominant with *Carex aquatilis* (water sedge), *Carex lacustris* (hairy sedge), *Carex lasiocarpa* (woollyfruit sedge), *Carex rostrata* (beaked sedge), *Carex vesicaria* (blister sedge), and locally *Carex stricta* (upright sedge); Shrubs can cover up to 25% of the area; *Sphagnum* (sphagnum moss) form a carpet under Carices; observed in VT. ..... **Northern Sedge Wet Meadow (CEGL002257)**
[*Carex utriculata - Carex lacustris - (Carex vesicaria, Carex stricta)* Wet Meadow]

27a. Tall emergent marsh dominated by *Typha* (cattail) spp.; occurs in permanently flooded basins, often part of a larger wetland mosaic and associated with lakes, ponds, or slow-moving streams; very common throughout the Northeast; observed in NJ, MA and VT. ..... **Eastern Cattail Marsh (CEGL006153)**
[*Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Eastern Marsh]

27b. Marshes dominated by non-native exotic graminoids such as *Phragmites australis* ssp. *australis* (European common reed) or *Phalaris arundinacea* (reed canarygrass). **28**

28a. *Phragmites australis* ssp. *australis* (European common reed) dominant; occurs throughout the Northeast; observed in NY..... **Eastern Ruderal Common Reed Marsh (CEGL004141)**
[*Phragmites australis* ssp. *australis* Eastern Ruderal Marsh]

28b. *Phalaris arundinacea* (reed canarygrass) marsh found in both basin wetlands and along rivershores; other species present may include *Solidago canadensis* (Canada goldenrod), *Impatiens capensis* (jewelweed), *Onoclea sensibilis* (sensitive fern), *Euthamia graminifolia* (flat-top goldentop), and *Eupatorium maculatum* (spotted joe-pye-weed); occurs throughout the northeastern United States; observed in NJ, MA, and NY. ..... **Eastern Ruderal Reed Canarygrass Marsh (CEGL006044)**
[*Phalaris arundinacea* Eastern Ruderal Marsh]

29a. Shrubby to herbaceous seepage swamps or glades with an overhanging canopy within a forest or free of tree cover known from high elevations (>776 m [2,545 feet]) in the Coolidge Range of the Green Mountains in central VT, occurring on moderate to somewhat steep slopes; mineral soil, with little to no peat accumulation; open to dense shrub layer up to 5 m in height dominated by *Prunus virginiana* (chokecherry), *Acer spicatum* (mountain maple), and *Sambucus racemosa* (red elderberry); *Ribes triste* (red currant) is a constant short shrub; herb layer includes some combination of *Angelica atropurpurea* (purplestem angelica), *Heracleum maximum* (common cowparsnip), *Hydrophyllum virginianum* (eastern waterleaf), *Impatiens capensis* (jewelweed), *Thalictrum pubescens* (king-of-the-meadow), *Tiarella cordifolia* (heartleaf foamflower), *Ageratina altissima* (white snakeroot), *Glyceria striata* (fowl mannagrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Athyrium filix-femina* (common ladyfern), *Chelone glabra* (white turtlehead), *Dryopteris campyloptera* (mountain woodfern), *Ranunculus recurvatus* (blisterwort),*Veratrum viride* (green false hellebore), *Laportea canadensis* (Canadian woodnettle), *Solidago macrophylla* (largeleaf goldenrod), *Symphyotrichum puniceum* (purplestem aster), *Dryopteris campyloptera* (mountain woodfern), *Milium effusum* (American milletgrass), *Rubus pubescens* (dwarf red blackberry), *Trillium erectum* (red trillium), *Actaea pachypoda* (white baneberry), *Carex leptonervia* (nerveless woodland sedge), *Dicentra cucullaria* (Dutchman's breeches), *Erythronium americanum* (dogtooth violet), and *Phegopteris connectilis* (long beechfern); observed in VT. ..... **Northern Appalachian High-Elevation Seepage Shrubland (CEGL006583)**
[*Prunus virginiana - Acer spicatum - Ribes triste / Angelica atropurpurea - Heracleum maximum* Seepage Shrubland]

29b. Wetlands dominated by broad-leaved emergent vegetation of lower elevations. **30**

30a. Tall emergent marsh dominated by *Typha* (cattail) spp.; occurs in permanently flooded basins, often part of a larger wetland mosaic and associated with lakes, ponds, or slow-moving streams; very common throughout the Northeast; observed in NJ, MA, and VT. ..... **Eastern Cattail Marsh (CEGL006153)**
[*Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Eastern Marsh]

30b. Emergent wetlands not dominated by *Typha* (cattail) spp. **31**

31a. *Pontederia cordata* (pickerelweed), *Sagittaria* (arrowhead) spp., and/or *Peltandra virginica* (green arrow-arum); occurs along pondshores, lakeshores, impoundments; common throughout the Northeast from PA north to ME; seen along the NY/NJ line. ..... **Northeastern Leafy Forb Marsh (CEGL006191)**
[*Pontederia cordata - Peltandra virginica - Sagittaria latifolia* Marsh]

31b. Variable wetland occurring in depressions, drainages, and basins that contain ponded water throughout the year; common dominants include *Eleocharis acicularis* (needle spikerush), *Verbena hastata* (swamp verbena), *Bidens cernua* (nodding beggarticks), *Leersia oryzoides* (rice cutgrass), and *Polygonum* (knotweed) spp.; invasive species *Lythrum salicaria* (purple loosestrife) and *Microstegium vimineum* (Nepalese browntop) common; documented in PA, NY and NJ; likely in NH; seen along NY/CT line..... **Mixed Forb Marsh (CEGL006446)**
[*Bidens cernua - Verbena hastata - Polygonum* spp. Marsh]

32a. Successional wet meadow vegetation dominated by *Spiraea* (spirea) spp. and *Rubus* (blackberry) spp. with variable combinations of wetland old-field species such as *Phalaris arundinacea* (reed canarygrass), *Juncus effusus* (common rush), *Thelypteris palustris* (eastern marsh fern),*Onoclea sensibilis* (sensitive fern), *Solidago* (goldenrod) spp., *Impatiens capensis* (jewelweed), *Lycopus uniflorus* (northern bugleweed), and *Lythrum salicaria* (purple loosestrife); ranges from shrub thicket to herbaceous meadow with scattered shrubs; occurs in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands; known throughout the Northeast; observed in NJ. ..... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa - Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]

32b. Invaded marshes dominated by one species. **33**

33a. *Phragmites australis* ssp. *australis* (European common reed) dominant; occurs throughout the Northeast; observed in NY..... **Eastern Ruderal Common Reed Marsh (CEGL004141)**
[*Phragmites australis* ssp. *australis* Eastern Ruderal Marsh]

33b. *Phalaris arundinacea* (reed canarygrass) marsh found in both basin wetlands and along rivershores; other species present may include *Solidago canadensis* (Canada goldenrod), *Impatiens capensis* (jewelweed), *Onoclea sensibilis* (sensitive fern), *Euthamia graminifolia* (flat-top goldentop), and *Eupatorium maculatum* (spotted joe-pye-weed); occurs throughout the northeastern United States; observed in MA, NJ and NY. ..... **Eastern Ruderal Reed Canarygrass Marsh (CEGL006044)**
[*Phalaris arundinacea* Eastern Ruderal Marsh]

5. Woodlands, Stunted Forests, Barrens, Rocky Outcrops, and Cliffs

1a. Shrublands and woodlands. **2**
1b. Herbaceous vegetation communities or sparse vegetation of cliffs. **21**

2a. Shrublands (trees <5m may be common). **3**
2b. Woodlands (open stands of trees generally forming 20–60% cover) and stunted forests (trees generally >3 m tall). **7**

3a. Successional shrublands; shrubland thicket occurring on old fields, pastures, or modified lands dominated by an admixture of non-native and native shrubs such as *Elaeagnus umbellata* (Autumn olive), *Rubus allegheniensis* (Allegheny blackberry), *Rosa multiflora* (multiflora rose), *Lonicera morrowii* (Morrow's honeysuckle), *Celastrus orbiculatus* (Oriental bittersweet), *Lonicera japonica* (Japanese honeysuckle), *Ligustrum vulgare* (European privet), *Juniperus virginiana* (eastern red-cedar), *Prunus pensylvanica, Prunus serotina, Rhus typhina*, and other small trees (<25% in cover); old-field grasses, forbs, and ferns are common in more open-canopied variants where tall and short shrubs cover at least 25% of the field; wide-ranging in northeastern states; observed in CT and VT. ... . **Northeastern Ruderal Shrubland (CEGL006451)**
[*Elaeagnus umbellata - Cornus racemosa - Rosa multiflora - Juniperus virginiana* Ruderal Shrubland]
3b. Shrubland barrens, glades, and wooded vegetation. **4**

4a. *Pinus rigida* (pitch pine) rocky summits occurring at low to moderate elevations; plot elevations range from 387–792 m (1,270–2,598 feet); *Pinus rigida* (pitch pine) dominant (tree or shrub-sized) with highly variable canopy coverage and a variable mixture of canopy associates, such as *Quercus prinus* (chestnut oak), *Betula populifolia* (gray birch), *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and/or *Carya glabra* (pignut hickory); *Quercus ilicifolia* (bear oak) and *Photinia melanocarpa* (black chokeberry) characteristic in the tall-shrub layer; *Kalmia latifolia* (mountain laurel) often present; *Gaylussacia baccata* (black huckleberry) and *Vaccinium angustifolium* (lowbush blueberry) dominant short shrubs; *Deschampsia flexuosa* (wavy hairgrass) and *Maianthemum canadense* (Canada mayflower) common in the herb layer; high lichen cover characteristic; shallow acidic, well-drained sandy to gravelly soils; observed in CT, MA, NJ and NY. ..... **Pitch Pine Rocky Summit (CEGL006116)**
[*Pinus rigida / (Quercus ilicifolia) / Photinia melanocarpa / Deschampsia flexuosa* Woodland]
4b. *Quercus ilicifolia* (bear oak), *Carya glabra* (pignut hickory) and/or *Vaccinium* (blueberry) spp. and/or *Gaylussacia baccata* (black huckleberry) dominant. **5**

5a. Heath balds; northern or high-elevation acidic rock outcrops or summits characterized by abundant short *Vaccinium* (blueberry) spp., *Quercus ilicifolia* (bear oak), *Vaccinium pallidum* (Blue Ridge blueberry) and *Kalmia angustifolia* (sheep laurel); widely scattered trees possible with very dense heath shrubs observed in NY at 351 m (1,152 feet)..... ..... **Central Appalachian Blueberry Dwarf-shrubland (CEGL003958)**
[*Vaccinium (angustifolium, myrtilloides, pallidum*) Central Appalachian Dwarf-shrubland]
5b. Vegetation characterized by tall shrubs or woodland trees. **6**

6a. *Quercus ilicifolia* (bear oak) dominant; associated shrubs include *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), *Photinia melanocarpa* (black chokeberry), *Quercus prinoides* (dwarf chinquapin oak), and/or *Amelanchier arborea* (common serviceberry); typical herbs include *Deschampsia flexuosa* (wavy hairgrass), *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Schizachyrium scoparium* (little bluestem), and/or *Pteridium aquilinum* (western brackenfern); *Carya glabra* (pignut hickory) may be common in some NJ sites; occurs along ridgelines from southern New England south to interior NJ and PA; elevations range from 347-448 m (1,138-1,470 feet); observed in NJ and NY. ..... **Ridgetop Bear Oak Barrens (CEGL006121)**
[*Quercus ilicifolia - Prunus pumila* Shrubland]

6b. *Carya glabra* (pignut hickory) sole dominant in canopy; open woodland along ridgetops often with exposed bedrock; dominant shrubs include *Quercus ilicifolia* (bear oak), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), and *Gaylussacia baccata* (black huckleberry); *Carex pensylvanica* (Pennsylvania sedge) and *Deschampsia flexuosa* (wavy hair grass) also characteristic. ..... **Ridgetop Pignut Hickory Woodland (CEGL006640)**
[*Carya glabra* Woodland]

7a. Evergreen or mixed evergreen and deciduous trees dominant or codominant in canopy..... **8**
7b. Deciduous trees dominant in canopy. **14**

8a. *Juniperus virginiana* (eastern red-cedar) constant in the canopy. **9**
8b. *Juniperus virginiana* (eastern red-cedar) absent to sparse in canopy. **12**

9a. *Juniperus virginiana* (eastern red-cedar) dominated old fields; early-successional, can be an open woodland; common community throughout the Northeast.....
.....**Northeastern Ruderal Red-cedar Forest (CEGL006024)**
[*Juniperus virginiana* Ruderal Forest]
9b. *Juniperus virginiana* (eastern red-cedar) with associates in canopy. **10**

10a. *Pinus strobus* (eastern white pine) and *Juniperus virginiana* (eastern red-cedar) in canopy with *Quercus prinus* (chestnut oak), *Carya glabra* (pignut hickory), *Quercus rubra* (northern red oak), and *Quercus alba* (white oak); woodland occurring on unstable shale talus with shallow, very well-drained soils; characteristic shrubs and herbs include *Rhus glabra* (smooth sumac), *Quercus prinoides* (dwarf chinquapin oak), *Toxicodendron radicans* (eastern poison-ivy), *Penstemon hirsutus* (hairy beardtongue), *Antennaria plantaginifolia* (woman's tobacco), and *Carex pensylvanica* (Pennsylvania sedge); observed in in NY at 183 m (600 feet). .....
..... **Shale Talus Slope Woodland (CEGL006074)**
[*Quercus prinus / Rhus* spp. / *Deschampsia flexuosa* Woodland]
10b. *Juniperus virginiana* (eastern red-cedar) and deciduous trees codominant..... **11**

11a. *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Fraxinus americana* (white ash), and/or *Prunus serotina* (black cherry) in canopy with *Juniperus virginiana* (eastern red-cedar) over *Quercus ilicifolia* (bear oak) and *Vaccinium pallidum* (Blue Ridge blueberry); *Schizachyrium scoparium* (little bluestem), *Deschampsia flexuosa* (wavy hairgrass), and/or *Danthonia spicata* (poverty oatgrass) common grasses; occurs primarily on exposed outcrops known from mountainous sites in New England, NJ, and PA; observed in PA, NJ, and NY; elevations range from 281-396 m (922-1,299 feet)..... **Traprock Ridge (CEGL006002)**
[*Juniperus virginiana - Fraxinus americana / Danthonia spicata - Poa compressa* Woodland]

11b. Cliffs with dry vertical exposures of resistant acidic bedrock; overall vegetation coverage <20%; *Fraxinus americana* (white ash) and *Quercus prinus* (chestnut oak) present; herbaceous layer includes *Schizachyrium scoparium* (little bluestem), *Deschampsia flexuosa* (wavy hairgrass), and *Solidago ulmifolia* (elmleaf goldenrod); documented globally in MA, NY, NH, PA, and VT; observed off trail at DEWA; observed in NY.....**Eastern Temperate Acidic Cliff (CEGL006422)**
[*Juniperus virginiana / Corydalis sempervirens* Cliff Sparse Vegetation]

12a. Pines dominant or codominant in canopy. **13**
12b. Deciduous trees dominant in canopy. **14**

13a. *Pinus rigida* (pitch pine) dominant (tree or shrub-sized) with highly variable canopy coverage occurring on dry rocky ridges and summits of low to moderate elevations; plot elevations range from 387-792 m (1,270-2,598 feet); variable mixture of canopy associates including *Quercus prinus* (chestnut oak), *Betula populifolia* (gray birch), *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and/or *Carya glabra* (pignut hickory); *Quercus ilicifolia* (bear oak) and *Photinia melanocarpa* (black chokeberry) characteristic tall shrubs; *Kalmia latifolia* (mountain laurel) often present; *Gaylussacia baccata* (black huckleberry) and *Vaccinium angustifolium* (lowbush blueberry) dominant dwarf-shrubs; *Deschampsia flexuosa* (wavy hairgrass) and *Maianthemum canadense* (Canada mayflower) common herbs; high lichen cover characteristic; shallow acidic, well-drained sandy to gravelly soils; observed in NJ, NY, CT, and MA. .... **Pitch Pine Rocky Summit (CEGL006116)**
[*Pinus rigida / (Quercus ilicifolia) / Photinia melanocarpa / Deschampsia flexuosa* Woodland]
13b. *Pinus strobus* (eastern white pine) in canopy with *Quercus prinus* (chestnut oak), *Carya glabra* (pignut hickory), *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and *Juniperus virginiana* (eastern red-cedar); woodland occurring on unstable shale talus with shallow, very well-drained soils; known range restricted to NY; characteristic shrubs and herbs include *Rhus glabra* (smooth sumac), *Quercus prinoides* (dwarf chinquapin oak), *Toxicodendron radicans* (eastern poison-ivy), *Penstemon hirsutus* (hairy beardtongue), *Antennaria plantaginifolia* (woman's tobacco), and *Carex pensylvanica* (Pennsylvania sedge); observed in NY at 183 m (600 feet). .... **Shale Talus Slope Woodland (CEGL006074)**
[*Quercus prinus / Rhus* spp. / *Deschampsia flexuosa* Woodland]

14a. *Quercus* (oak) spp., *Carya glabra* (pignut hickory) **and/or** *Betula* (birch) spp. canopy dominants. **15**
14b. Enriched, dry-mesic to mesic woodlands on talus; *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), **and/or** *Tilia americana* (American basswood) in canopy. **20**

15a. *Carya glabra* (pignut hickory) sole dominant in canopy; open woodland often with exposed bedrock along ridgetops; dominant shrubs include *Quercus ilicifolia* (bear oak), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry). ..... **Ridgetop Pignut Hickory Woodland (CEGL006640)**
[*Carya glabra* Woodland]
15b. *Quercus* (oak) spp. **and/or** *Betula* (birch) spp. Dominant. **16**

16a. *Quercus* (oak) spp. dominant or codominant in canopy, *Betula* (birch) spp. Absent. **17**
16b. *Quercus* (oak) spp. and/or *Betula* (birch) spp. in canopy (>10%). **19**

17a. *Quercus rubra* (northern red oak) dominant or codominant with or without *Quercus prinus* (chestnut oak), *Quercus velutina* (black oak), and/or *Acer rubrum* (red maple); *Quercus coccinea* (scarlet oak) may be common to dominant in some stands in NY; *Pinus* (pine) spp. and *Betula* (birch) spp. may be present; *Sassafras albidum* (sassafras), *Castanea dentata* (American chestnut), and *Amelanchier laevis* (Allegheny serviceberry) are characteristic. Canopies are often composed of stunted individuals; *Quercus ilicifolia* (bear oak), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), and/or *Gaylussacia baccata* (black huckleberry) dominate the shrub layer; *Deschampsia flexuosa* (wavy hairgrass), *Danthonia spicata* (poverty oatgrass), *Cypripedium acaule* (moccasin flower), *Aralia nudicaulis* (wild sarsaparilla), and *Pteridium aquilinum* (western brackenfern) characteristic in the herb layer; woodland or stunted forest occurring on upper slopes and low- to mid-elevation summits; ranges from the Central Appalachians north through the Northern Appalachians; plot elevations range from 375-567 m (1,235-1,860 feet) in New England; observed in NY, MA and VT..... **Red Oak / Heath Woodland Rocky Summit (CEGL006134)**
[*Quercus rubra - (Quercus prinus) / Vaccinium* spp. / *Deschampsia flexuosa* Woodland]

17b. Canopy is composed of a combination of the any of the follow species: *Quercus prinus* (chestnut oak), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Ostrya virginiana* (hophornbeam), *Pinus strobus* (eastern white pine), and *Juniperus virginiana* (eastern red-cedar)..... **18**

18a. Rich oak-hickory forest occurring on low-elevation [285-478 m (935-1,561 feet)] ridgetops, upper slopes, south- or west-facing sideslopes from ME and VT to PA and northern NJ; dominated by a mixture of *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Carya alba* (mockernut hickory), *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and/or *Quercus prinus* (chestnut oak) often with *Acer saccharum* (sugar maple) and *Fraxinus americana* (white ash) over an *Ostrya virginiana* (hophornbeam) subcanopy and grassy herbaceous layer dominated by *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), and/or *Carex lucorum* (Blue Ridge sedge) (sedge lawn may or may not be present) with *Solidago caesia* (wreath goldenrod), *Solidago bicolor* (white goldenrod), and *Deschampsia flexuosa* (wavy hairgrass); tall shrubs include *Viburnum acerifolium* (mapleleaf viburnum) and *Amelanchier arborea* (common serviceberry); *Vaccinium pallidum* (Blue Ridge blueberry) is a common short shrub; observed on the trail in NJ, NY, PA, and CT.....**Oak - Hickory / Hophornbeam / Sedge Forest (CEGL006301)**
[*Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum* Forest]

18b. *Quercus prinus* (chestnut oak) woodland occurring on unstable shale talus with shallow, very well-drained soils; known range restricted to NY; *Carya glabra* (pignut hickory), *Quercus rubra* (northern red oak), and *Quercus alba* (white oak) in canopy with *Pinus strobus* (eastern white pine) and *Juniperus virginiana* (eastern red-cedar); characteristic shrubs and herbs include *Rhus glabra* (smooth sumac), *Quercus prinoides* (dwarf chinquapin oak), *Toxicodendron radicans* (eastern poison-ivy), *Penstemon hirsutus* (hairy beardtongue), *Antennaria plantaginifolia* (woman's tobacco), and *Carex pensylvanica* (Pennsylvania sedge); observed in NY at 183 m (600 feet. ..... **Shale Talus Slope Woodland (CEGL006074)**
[*Quercus prinus / Rhus* spp. / *Deschampsia flexuosa* Woodland]

19a. Acidic large-boulder talus slope woodland with *Quercus rubra* (northern red oak) and *Betula lenta* (sweet birch) codominant in canopy (**Note:** in the northern portion of this community's range, *Quercus rubra* (northern red oak) may drop out entirely, with *Betula* (birch) spp. and *Acer* (maple) spp. dominant); *Acer spicatum* (mountain maple) dominant tall shrub; occurs in Lower New England and south to the northern Piedmont; low to mid elevations, from near sea level to about 520 m (0-1,700 feet); observed in PA and NY. ..... **Oak - Birch Talus Slope Woodland (CEGL006585)**
[*Quercus rubra - Betula lenta / Polypodium virginianum* Woodland]

19b. *Betula alleghaniensis* (yellow birch) absent from canopy; *Betula lenta* (sweet birch) **and/or** *Betula populifolia* (gray birch) and *Betula papyrifera* (paper birch) common with *Quercus* (oak) spp. **20**

20a. Stunted *Quercus rubra* (northern red oak) [sometimes with *Quercus prinus* (chestnut oak), *Quercus coccinea* (scarlet oak) may be common to dominant in some stands in NY] woodland or forest occurring on rocky upper slopes and low- to mid-elevation summits from the Central Appalachians north through the Northern Appalachians; Lower New England elevations range from 375-567 m (1,235-1,860 feet); *Quercus velutina* (black oak), *Betula populifolia* (gray birch), *Betula papyrifera* (paper birch), *Betula lenta* (sweet birch), and/or *Acer rubrum* (red maple) associates; *Pinus* (pine) spp. may be present; *Castanea dentata* (American chestnut), *Amelanchier laevis* (Allegheny serviceberry), and *Sassafras albidum* (sassafras) characteristic; *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Quercus ilicifolia* (bear oak), and/or *Gaylussacia baccata* (black huckleberry) dominate the shrub layer; *Deschampsia flexuosa* (wavy hairgrass), *Danthonia spicata* (poverty oatgrass), *Cypripedium acaule* (moccasin flower), *Aralia nudicaulis* (wild sarsaparilla) and *Pteridium aquilinum* (western brackenfern) are characteristic herbs; observed on trail in NY, MA and VT. ..... **Red Oak / Heath Woodland Rocky Summit (CEGL006134)**
[*Quercus rubra - (Quercus prinus) / Vaccinium* spp. / *Deschampsia flexuosa* Woodland]

20b. Boulderfield or talus slope woodland communities. **21**

21a. Sweet birch - chestnut oak talus woodland occurring on fractured rock from 336-462 m (1,104-1,515 feet) elevation along the PA-NJ border; gnarled specimens of *Betula lenta* (sweet birch), *Quercus prinus* (chestnut oak), and/or *Quercus rubra* (northern red oak) characteristic; *Hamamelis virginiana* (American witch-hazel), *Sorbus americana* (American mountain-ash), and/or *Kalmia latifolia* (mountain laurel) common tall shrubs, and *Vaccinium pallidum* (Blue Ridge blueberry) common short-shrub; *Parthenocissus quinquefolia* (Virginia creeper) characteristic vine; *Polypodium virginianum* (rock polypody) characteristic fern; high lichen cover ;can have low vegetation cover and high rock cover; observed off trail at DEWA and in NJ and NY. ..... **Sweet Birch - Chestnut Oak Talus Woodland (CEGL006565)**
[*Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland]

21b. Oak - birch acidic large-boulder talus slope woodland with *Quercus rubra* (northern red oak) and *Betula lenta* (sweet birch) codominant in canopy (**Note:** in the northern portion of this community's range, *Quercus rubra* (northern red oak) may drop out entirely, with *Betula* (birch) spp. and *Acer* (maple) spp. dominant); *Acer spicatum* (mountain maple) dominant tall shrub; occurs in Lower New England and south to the northern Piedmont; low to mid elevations, from near sea level to about 520 m (0-1,700 feet); observed in PA and NY. ..... **Oak - Birch Talus Slope Woodland (CEGL006585)**
[*Quercus rubra - Betula lenta / Polypodium virginianum* Woodland]

22a. Enriched, dry-mesic to mesic forest on talus or shallow, very rocky soils dominated by *Acer saccharum* (sugar maple) and *Fraxinus americana* (white ash) and with many canopy associates including *Tilia americana* (American basswood); some stands are dominated by *Betula lenta* (sweet birch) and have these enrichment indicators present at lower cover; shrub layer is characterized by *Staphylea trifolia* (American bladdernut); herb layer is characterized by *Cystopteris* (bladderfern) spp., *Woodsia* (cliff fern) spp., *Asarum canadense* (Canadian wildginger), and others; tends to have more southern species that drop out at the northern edge of the range; ranges from VA northward with limited occurrences in New England; observed off trail at DEWA; NY/NJ State line. .... **Northern Calcareous Talus Slope Forest (CEGL006577)**
[*Acer saccharum - Fraxinus americana - Juglans cinerea / Staphylea trifolia / Adlumia fungosa* Forest]

22b. Northern, enriched, dry-mesic forest/woodland occurring from 150 to 610 m (500-2,000 feet); dominated by *Acer saccharum* (sugar maple) and *Fraxinus americana* (white ash) with *Ostrya virginiana* (hophornbeam) in the subcanopy, and species of non-enriched bedrock such as *Acer pensylvanicum* (striped maple) and *Acer spicatum* (mountain maple); shrub and herb layers with circumneutral-calcareous indicators such as *Sambucus racemosa* (red elderberry), *Impatiens pallida* (pale touch-me-not), *Caulophyllum thalictroides* (blue cohosh), *Geranium robertianum* (Robert's geranium), *Arabis drummondii* (Drummond's rockcress), *Asarum canadense* (Canadian wildginger), or the sedges *Carex rosea* (rosy sedge), *Carex sprengelii* (Sprengel's sedge), or *Carex platyphylla* (broadleaf sedge); ranges from VT south to NJ; observed in MA and VT. .... **Rich Northern Hardwood Talus Woodland (CEGL005058)**
[*Acer saccharum - Tilia americana - Fraxinus americana / Ostrya virginiana / Geranium robertianum* Woodland]

23a. Herbaceous vegetation communities not on cliffs. **24**
23b. Sparse vegetation. **27**

24a. Naturally occurring patchy grassy openings, on rock; expanses of bare rock common. **25**
24b. Successional grasslands, not on rock outcrops. **26**

25a. Open flood-scoured bedrock exposures of major rivers, along river narrows; patchy vegetation includes *Andropogon gerardii* (big bluestem), *Carex stricta* (upright sedge), *Poa palustris* (fowl bluegrass), *Poa compressa* (Canada bluegrass); documented in throughout the Northeast; observed at DEWA and in VT where White River crosses AT. .... **Northern Riverscour Rock Outcrop (CEGL006284)**
[*Andropogon gerardii - Campanula rotundifolia - Solidago simplex* Riverscour Sparse Vegetation]

25b. Rock outcrops not associated with rivers; Grassy openings found on rock outcrops and summits at 202 to 417 m (663-1,368 feet) in elevation; *Schizachyrium scoparium* (little bluestem), *Danthonia spicata* (poverty oatgrass), and *Carex pensylvanica* (Pennsylvania sedge) are diagnostic; *Deschampsia flexuosa* (wavy hair grass), *Dichanthelium boscii* (Bosc's panicgrass), and *Potentilla simplex* (common cinquefoil) characteristic with high *Cladonia* (cup lichen) spp. cover on exposed rocks; *Vaccinium pallidum* (Blue Ridge blueberry) and *Gaylussacia baccata* (black huckleberry) common; tall shrubs may include *Amelanchier* (serviceberry) spp. and *Quercus ilicifolia* (bear oak); observed in NJ, NY and MA. .... **Low- to Mid-Elevation Little Bluestem - Poverty Oatgrass Outcrop Opening (CEGL006544)**
[*Schizachyrium scoparium - Danthonia spicata - Carex pensylvanica / Cladonia* spp. Grassland]

26a. Herbaceous layer varies widely in composition and can include or be dominated by one or more of the following: *Solidago* (goldenrod) spp., *Dactylis glomerata* (orchardgrass), *Phleum pratense* (timothy), *Anthoxanthum odoratum* (sweet vernalgrass), *Festuca* (fescue) spp., *Dichanthelium clandestinum* (deertongue), *Poa pratensis* (Kentucky bluegrass), *Euthamia graminifolia* (flat-top goldentop), *Dennstaedtia punctilobula* (eastern hayscented fern), and other grass, forb, and/or fern species; scattered trees and shrubs possible; wide-ranging in northeastern states; observed in DEWA, NJ and VT. ..... **Northeastern Old-field Meadow (CEGL006107)**
[*Dactylis glomerata - Phleum pratense - Festuca* spp. - *Solidago* spp. Ruderal Meadow]

26b. *Schizachyrium scoparium* (little bluestem) dominant; wide-ranging in northeastern states; observed at DEWA. ..... **Little Bluestem Old-field Meadow (CEGL006333)**
[*Schizachyrium scoparium - (Andropogon virginicus) - Solidago* spp. Ruderal Meadow]

27a. Sparse vegetation of cliffs; dry vertical exposures of resistant acidic bedrock; overall vegetation coverage <20%; *Fraxinus americana* (white ash) and *Quercus prinus* (chestnut oak) generally present; herbaceous layer includes *Schizachyrium scoparium* (little bluestem), *Deschampsia flexuosa* (wavy hairgrass), and *Solidago ulmifolia* (elmleaf goldenrod); documented in throughout the northeast, observed at DEWA and in VT. ..... **Eastern Temperate Acidic Cliff (CEGL006422)**
[*Juniperus virginiana / Corydalis sempervirens* Cliff Sparse Vegetation]

27b. Quartzite and sandstone boulderfields covered with *Lasallia papulosa* (blistered naval lichen) and/or *Lasallia pensylvanica* (Pennsylvania blistered naval lichen) either singly or together along with *Dimelaena oreina* (mountain lichen); *Melanelia culbersonii* (Culberson's black-parmelia) is diagnostic; stunted *Betula lenta* (sweet birch) sometimes present in very low numbers; occurs at elevations from about 300 to 1,000 m (1,000-3,300 feet); restricted to Delaware Water Gap National Recreation Site within the LNE project area. ..... **Central Appalachian Acidic Boulderfield (CEGL004142)**
[*Lasallia (papulosa, pensylvanica) - Dimelaena oreina - (Melanelia culbersonii)* Nonvascular Vegetation]

6. Spruce-Fir Forests

1a. *Picea* (spruce) sp. plantations dominated by *Picea abies* (Norway spruce) **or** *Picea glauca* (white spruce), and/or any combination of spruce species; successional understory may be present with *Prunus serotina* (black cherry), *Acer rubrum* (red maple), *Rubus* (blackberry) spp., *Dennstaedtia punctilobula* (eastern hayscented fern), and others..... **Norway Spruce Plantation (CST007167)**
[*Picea abies* Forest Plantation]
1b. Spruce-fir, fir, and mixed spruce and/or fir - deciduous forests; sometimes deciduous [*Betula papyrifera* var. *cordifolia* (heart-leaved paper birch)] at high elevations..... **2**

2a. Subalpine forests dominated by *Abies balsamea* (balsam fir) (or rarely by *Betula papyrifera* var. *cordifolia (*heart-leaved paper birch)) near treeline on upper mountain slopes and ridgetops above 914 m (3,000 feet); *Picea rubens* (red spruce) may be present but <20% cover; shrub layer is predominantly *Abies* (fir) seedlings with occasional patches of *Sorbus americana* (American mountain-ash) and *Betula alleghaniensis* (yellow birch); characteristic herbs include *Dryopteris campyloptera* (mountain woodfern) and *Oxalis montana* (mountain woodsorrel); peripheral in the LNE project area, common in the NAP project area; observed in MA and VT. .... **Montane Balsam Fir - Birch Forest (CEGL006112)**
[*Abies balsamea - (Betula papyrifera* var. *cordifolia*) Forest]
2b. *Picea rubens* (red spruce) dominant or codominant in the canopy. **3**

3a. Dry-mesic pine - hemlock forest codominated by *Tsuga canadensis* (eastern hemlock) and *Pinus strobus* (eastern white pine); *Picea rubens* (red spruce) and northern hardwoods typical in understory; occurs on lower-elevation slopes and flats from MA to ME on sheltered slopes with sandy or stony, acidic, moderately well-drained soils; observed in VT. .... **White Pine - Hemlock - Red Spruce Forest (CEGL006324)**
[*Pinus strobus - Tsuga canadensis - Picea rubens* Forest]
3b. *Tsuga canadensis* (eastern hemlock) and *Pinus strobus* (eastern white pine) sparse to absent **4**

4a. Mixed deciduous - spruce forests; *Picea rubens* (red spruce) [and in logged stands, *Abies balsamea* (balsam fir)], comprises at least 25-50% total cover, deciduous hardwood species abundant (>50%). **5**
4b. Evergreen spruce-fir-dominated canopy; deciduous hardwoods <25%. **6**

5a. Transitional northern hardwoods - red spruce forest with *Betula alleghaniensis* (yellow birch) and *Acer rubrum* (red maple) characteristic; lacks *Betula papyrifera* var. *cordifolia* (mountain paper birch), and *Sorbus americana* (American mountain-ash) is sparse to absent; other northern hardwoods *Acer saccharum* (sugar maple) and *Fagus grandifolia* (American beech) may be common; *Acer pensylvanicum* (striped maple), *Viburnum lantanoides* (hobblebush), and *Acer spicatum* (mountain maple) common; herbs include *Clintonia borealis* (bluebead), *Dennstaedtia punctilobula* (eastern hayscented fern), *Coptis trifolia* (threeleaf goldthread), *Oxalis montana* (mountain woodsorrel), *Oclemena acuminata* (whorled wood aster), *Maianthemum canadense* (Canada mayflower), and *Dryopteris intermedia* (intermediate woodfern); most extensive at middle elevations, plot/obs point elevations range from 460-929 m (1,509-3,047 feet) on rocky slopes; observed in MA and VT. .... **Transitional Northern Hardwood - Red Spruce Forest (CEGL006267)**
[*Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest]

5b. Successional mixed spruce-fir-hardwoods forest made up of *Picea rubens* (red spruce) and/or *Abies balsamea* (balsam fir) (>50% total cover) and early-successional trees including *Acer rubrum* (red maple), *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), and *Betula papyrifera* (paper birch), or, less commonly, *Betula populifolia* (gray birch) or *Betula papyrifera* var. *cordifolia* (mountain paper birch); usually lacks any appreciable amount of *Betula alleghaniensis* (yellow birch) and *Fagus grandifolia* (American beech); *Acer pensylvanicum* (striped maple) characteristic shrub; common herbs include *Uvularia sessilifolia* (sessileleaf bellwort), *Maianthemum canadense* (Canada mayflower), and *Trientalis borealis* (starflower) in northern New England and NY. This also includes post disturbance stands where the hardwood species form the main canopy and spruce and/or fir form a "dog hair" subcanopy of samplings; observed in MA and VT; elevation ranges from 601-798 m (1,972-2,618 feet)..... **Successional Mixed Spruce - Fir - Hardwood Forest (CEGL006505)**
[*Picea rubens - Abies balsamea - Betula* spp. - *Acer rubrum* Forest]

6a. Widespread on lower-elevation slopes between 244 and 687 m (800-2,254 feet); canopy dominated by *Picea rubens* (red spruce) with variable amounts of *Abies balsamea* (balsam fir) and *Betula papyrifera* (paper birch); lower-elevation species such as *Aralia nudicaulis* (wild sarsaparilla), *Tiarella cordifolia* (heartleaf foamflower), and *Trillium erectum* (red trillium) may be abundant; high-elevation species such as *Dryopteris campyloptera* (mountain woodfern) and *Sorbus americana* (American mountain-ash) are less abundant; occurs across boreal regions of the northeastern United States and adjacent Canada; observed in MA and VT..... **Low-Elevation Spruce - Fir Forest (CEGL006273)**
[*Picea rubens - Abies balsamea - Betula papyrifera* Forest]

6b. Spruce-fir forests of high elevations, generally a matrix forest between 609 and 1,067 m (2,000-3,500 feet); *Picea rubens* (red spruce) and *Abies balsamea* (balsam fir) dominant (usually 70-80% of the canopy); canopy associates include *Sorbus americana* (American mountain-ash) and *Betula papyrifera* var. *cordifolia* (mountain paper birch); herb layer patchy with *Oxalis montana* (mountain woodsorrel), *Clintonia borealis* (bluebead), *Streptopus lanceolatus* var. *roseus* (twisted-stalk), and/or *Dryopteris campyloptera* (mountain woodfern); lush carpet of mosses and liverworts characteristic; ranges from NY north to ME; peripheral in the LNE project area; common in the NAP project area; observed in VT..... **Montane Spruce - Fir Forest (CEGL006128)**
[*Picea rubens - Abies balsamea / Sorbus americana* Forest]

7. Hemlock and Mixed Hemlock Forests[32]

1a. *Tsuga canadensis* (eastern hemlock) - mixed evergreen canopy; conifer trees >75% of canopy cover. **2**
1b. Mixed canopy hemlock-hardwood forests. **3**

2a. Dry-mesic hemlock-pine forest codominated by *Tsuga canadensis* (eastern hemlock), *Pinus strobus* (eastern white pine), and *Picea rubens* (red spruce) at least present, even if in understory; northern hardwoods typical in the understory; occurs on lower-elevation slopes and flats from MA to ME on sheltered slopes with sandy or stony, acidic, moderately well-drained soils. .... **White Pine - Hemlock - Red Spruce Forest (CEGL006324)**
[*Pinus strobus - Tsuga canadensis - Picea rubens* Forest]
2b. *Picea rubens* (red spruce) absent to minor; *Tsuga canadensis* (eastern hemlock) forests with abundant or codominant *Pinus strobus* (eastern white pine); *Acer rubrum* (red maple) and *Quercus rubra* (northern red oak) common associates; *Acer pensylvanicum* (striped maple) is a common, though rarely abundant small tree; *Kalmia latifolia* (mountain laurel) common shrub; occurs on sloping sites and in sheltered ravines; from PA and NJ north to ME. .... **Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest (CEGL006328)**
[*Pinus strobus - Tsuga canadensis* Lower New England-Northern Piedmont Forest]

3a. Forest with a strong component of *Picea rubens* (red spruce) **and/or** northern hardwood species, especially *Acer saccharum* (sugar maple) **and/or** *Betula alleghaniensis* (yellow birch). **4**
3b. Mixed *Tsuga canadensis* (eastern hemlock) - hardwood forest with a strong component of *Fagus grandifolia* (American beech), *Quercus* (oak) spp., or *Betula lenta* (sweet birch); *Acer saccharum* (sugar maple) and/or *Betula alleghaniensis* (yellow birch) absent or rare. **8**

4a. Mixed hardwood [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple)] and *Tsuga* (hemlock) spp. (hemlock ≤25% of canopy) and occasionally *Abies balsamea* (balsam fir) mineral-soil wetlands occurring in seepage-influenced areas, at wetland-upland ecotones, on slopes rather than in basins; plot elevations range from 295-611 m (968-2,000 feet); herbaceous layer more indicative of nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians; observed in MA and VT. .... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]
4b. Upland forests lacking seepage indicators. **5**

5a. Plantations and ruderal forests. **6**
5b. Hemlock forests that are not plantations or ruderal. **7**

[32]*Tsuga canadensis* (eastern hemlock) may be codominant in canopy usually >25% of canopy. For all *Tsuga canadensis* associations that have been impacted by the hemlock woolly adelgid, treat standing and fallen dead trees as part of *Tsuga canadensis* canopy cover.

6a. Hemlock plantations. ..... **Mixed Pine Conifer Plantation (CST006313)**
[*Pinus* spp. Forest Plantation]
6b. Successional stands of *Pinus strobus* (eastern white pine), or as in VT, *Tsuga canadensis* (eastern hemlock) replaces eastern white pine in the canopy; *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Fraxinus americana* (white ash), and/or *Prunus serotina* (black cherry) may be common in canopy and/or subcanopy; observed in CT and VT. ..... **Ruderal Eastern White Pine Forest (CEGL007944)**
[*Pinus strobus* Ruderal Forest]

7a. Transitional *Tsuga canadensis* (eastern hemlock) - northern hardwood forest that lacks a significant presence of *Quercus* (oak) spp. and *Pinus strobus* (eastern white pine); *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Betula papyrifera* (paper birch), *Betula lenta* (sweet birch), *Fagus grandifolia* (American beech), and *Fraxinus americana* (white ash) common; *Acer pensylvanicum* (striped maple) characteristic tall shrub; sparse herb layer but *Dryopteris intermedia* (intermediate woodfern), *Mitchella repens* (partridgeberry), *Clintonia borealis* (bluebead), *Trientalis borealis* (starflower), and *Lycopodium obscurum* (rare clubmoss) are common; occurs on acidic soils, often on rocky, north-facing slopes; distributed in large patches from VT south through DEWA. ..... **Hemlock - Transitional Northern Hardwood Forest (CEGL006639)**
[*Tsuga canadensis - Acer saccharum - Fagus grandifolia / Dryopteris intermedia* Forest]
7b. *Tsuga canadensis* (eastern hemlock) - northern hardwood forest with *Picea rubens* (red spruce) present (<45% cover); herb layer may contain more boreal species such as *Dryopteris campyloptera* (mountain woodfern), *Huperzia lucidula* (shining clubmoss), *Oxalis montana* (mountain woodsorrel), and *Trillium undulatum* (painted trillium); from northern and central New England and NY; occurs globally on sheltered slopes at moderate elevations of 30-610 m (100-2,000 feet); observed in VT and MA. ..... **Hemlock - Spruce - Hardwood Forest (CEGL006129)**
[*Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest]

8a. *Liriodendron tulipifera* (tuliptree) in canopy along with *Quercus rubra* (northern red oak), *Tsuga canadensis* (eastern hemlock), *Betula lenta* (sweet birch), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), and/or *Pinus strobus* (eastern white pine); *Hamamelis virginiana* (American witch-hazel) is the dominant shrub; *Polystichum acrostichoides* (Christmas fern) is the dominant herb; occurs on northern and eastern midslopes and in coves; plot/obs point elevation ranges from 384-797 m (1,261-2,614 feet). ..... **Red Oak - Hemlock - Mixed Hardwood Forest (CEGL006566)**
[*Quercus rubra - Tsuga canadensis - Liriodendron tulipifera / Hamamelis virginiana* Forest]
8b. *Liriodendron tulipifera* (tuliptree) absent from canopy. **9**

9a. Mixture of *Tsuga canadensis* (eastern hemlock) with *Fagus grandifolia* (American beech) and/or *Quercus rubra* (northern red oak) in canopy; canopy associates and subcanopy include *Betula lenta* (sweet birch), *Pinus strobus* (eastern white pine), *Prunus serotina* (black cherry), and/or *Acer rubrum* (red maple); *Hamamelis virginiana* (American witch-hazel), *Acer pensylvanicum* (striped maple), *Viburnum acerifolium* (mapleleaf viburnum), and *Kalmia latifolia* (mountain laurel) are common shrubs; herbs sparse; nutrient-poor, well-drained, often stony sandy loams or loamy sands; widespread in southern New England; observed in NY, NJ, MA, CT, and VT; elevation of plots/obs points ranges from 360-544 m (1,181-1,785 feet); successional monocultures of *Tsuga canadensis* (eastern hemlock) altered by hemlock woolly adelgid are mapped as this association. ..... **Hemlock - Beech - Red Oak Forest (CEGL006088)**
[*Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest]

9b. *Quercus prinus* (chestnut oak) codominant with *Tsuga canadensis* (eastern hemlock); *Quercus rubra* (northern red oak) is an overstory associate; *Betula lenta* (sweet birch), *Acer rubrum* (red maple), and *Tsuga canadensis* (eastern hemlock) common in subcanopy; *Rhododendron maximum* (great laurel) and/or *Kalmia latifolia* (mountain laurel) common; occurs on moderately steep sheltered slopes with northern exposures at lower elevations globally from 170-880 m (550-2,900 feet); ranges from the NJ Highlands south to the Central Appalachians; observed in NJ and NY. .....**Central Appalachian Hemlock - Chestnut Oak Forest (CEGL006923)**
[*Tsuga canadensis - Quercus prinus - Betula lenta* Forest]

8. Northern Hardwood Forests[33]

1a. Forests with enrichment indicators[34]. **2**
1b. Forests not as above; northern hardwoods dominant; enrichment indicators lacking. **10**

2a. Enriched northern hardwood forests with a 25-50% *Quercus* (oak) spp. Component. **3**
2b. Enriched northern hardwood forests without abundant *Quercus* (oak) spp.; oaks may be present but in low quantities (<25% cover). **6**

3a. Rich red oak - sugar maple forest dominated by *Quercus rubra* (northern red oak) and *Acer saccharum* (sugar maple) with *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), and/or *Fraxinus americana* (white ash) common and abundant (usually >20% relative cover); *Hamamelis virginiana* (American witch-hazel) and *Lindera benzoin* (northern spicebush) common shrubs; ranges from MA to PA and the Central Appalachians; plot/obs point elevations range from 230-309 m (755-1,014 feet). ..... **High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125)**
[*Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest]
3b. Deciduous forest lacking *Liriodendron tulipifera* (tuliptree). **4**

4a. Rich oak-hickory forest dominated by a mixture of *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Carya alba* (mockernut hickory), *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and/or *Quercus prinus* (chestnut oak) often with *Acer saccharum* (sugar maple) and *Fraxinus americana* (white ash) over an *Ostrya virginiana* (hophornbeam) subcanopy and grassy herbaceous layer dominated by *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), and/or *Carex lucorum* (Blue Ridge sedge) (sedge lawn may or may not be present) with *Solidago caesia* (wreath goldenrod), *Solidago bicolor* (white goldenrod), and *Deschampsia flexuosa* (wavy hairgrass); tall shrubs include *Viburnum acerifolium* (mapleleaf viburnum) and *Amelanchier arborea* (common serviceberry); *Vaccinium pallidum* (Blue Ridge blueberry) is common dwarf-shrub; occurs on low-elevation ridgetops, upper slopes, south- or west-facing sideslopes; extends from ME and VT to PA and northern NJ; plot/obs point elevation ranges from 285-478 m (935-1,561 feet). ..... **Oak - Hickory / Hophornbeam / Sedge Forest (CEGL006301)**
[*Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum* Forest]
4b. *Acer saccharum* (sugar maple) - *Quercus* (oak) spp. Forest. **5**

[33]Deciduous northern hardwood forests; *Tsuga canadensis* (eastern hemlock) low in cover to absent (<25%).

[34]*Acer saccharum* (sugar maple), *Tilia americana* (American basswood), *Fraxinus americana* (white ash), *Ostrya virginiana* (hophornbeam), *Carya* (hickory) spp., *Cornus alternifolia* (alternateleaf dogwood), *Caulophyllum thalictroides* (blue cohosh), *Panax quinquefolius* (American ginseng), *Dryopteris goldiana* (Goldie's woodfern), *Adiantum pedatum* (northern maidenhair), *Viola rotundifolia* (roundleaf yellow violet), *Hepatica nobilis* (hepatica), wide-leaved sedges (*Carex* Section Laxiflorae), *Geranium robertianum* (Robert's geranium), *Woodsia* (cliff fern) spp., *Arabis canadensis* (sicklepod)

5a. Semi-rich, dry to dry-mesic forest of calcareous environments, with *Quercus muehlenbergii* (chinquapin oak) and *Acer saccharum* (sugar maple) in the canopy; *Fraxinus americana* (white ash) may also be in canopy, with *Ostrya virginiana* (hophornbeam) common; herb layer diverse with forbs, ferns, and graminoids; occurs on upper slopes and wooded summits on limestone, dolomite or marble bedrock from NJ north to VT; plot/obs point elevations range from 120-290 m (394-951 feet). ..... **Sugar Maple - Chinquapin Oak / Sedge Forest (CEGL006162)**
[*Acer saccharum - Quercus muehlenbergii / Carex platyphylla* Forest]

5b. *Quercus muehlenbergii* (chinquapin oak) absent; semi-rich, dry-mesic forest with some combination of *Quercus rubra* (northern red oak), *Acer saccharum* (sugar maple), and *Fraxinus americana* (white ash) in canopy, with *Carya glabra* (pignut hickory) and *Betula lenta* (sweet birch) as canopy and subcanopy associates; *Tsuga canadensis* (eastern hemlock) can be occasional; *Ostrya virginiana* (hophornbeam) and *Viburnum acerifolium* (mapleleaf viburnum) characteristic; *Arisaema triphyllum* (Jack in the pulpit), *Polystichum acrostichoides* (Christmas fern), *Eurybia divaricata* (white wood aster), and *Polygonatum biflorum* (smooth Solomon's seal) common in diverse herb layer; occurs on rocky slopes; observed in NJ, NY and CT. ..... **Sugar Maple - Ash - Oak - Hickory Mesic Forest (CEGL006046)**
[*Acer saccharum - Quercus rubra / Hepatica nobilis* var. *obtusa* Forest]

6a. Enriched forest occurring on talus or sloping rocky soils; enrichment indicators present in addition to vines. **7**
6b. Enriched northern hardwood forests of seepage areas or deeper upland soils. **8**

7a. Enriched, dry-mesic to mesic forest on talus or shallow, very rocky soils dominated by *Acer saccharum* (sugar maple) and *Fraxinus americana* (white ash) and with many canopy associates including *Tilia americana* (American basswood); some stands are dominated by *Betula lenta* (sweet birch) and have these enrichment indicators present at lower cover shrub layer is characterized by *Staphylea trifolia* (American bladdernut); herb layer is characterized by *Cystopteris* (bladderfern) spp., *Woodsia* (cliff fern) spp., *Asarum canadense* (Canadian wildginger), and others; tends to have more southern species that drop out at the northern edge of the range; ranges from VA northward with limited occurrences in New England; observed off trail at DEWA and at NY/NJ line. ..... **Northern Calcareous Talus Slope Forest (CEGL006577)**
[*Acer saccharum - Fraxinus americana - Juglans cinerea / Staphylea trifolia / Adlumia fungosa* Forest]

7b. Northern, enriched, dry-mesic forest/woodland dominated by *Acer saccharum* (sugar maple) and *Fraxinus americana* (white ash) with *Ostrya virginiana* (hophornbeam) in the subcanopy; and species of non-enriched bedrock such as *Acer pensylvanicum* (striped maple) and *Acer spicatum* (mountain maple); shrub and herb layers with circumneutral-calcareous indicators such as *Sambucus racemosa* (red elderberry), *Impatiens pallida* (pale touch-me-not), *Caulophyllum thalictroides* (blue cohosh), *Geranium robertianum* (Robert's geranium), *Arabis drummondii* (Drummond's rockcress), *Asarum canadense* (Canadian wildginger), or the sedges *Carex rosea* (rosy sedge), *Carex sprengelii* (Sprengel's sedge), or *Carex platyphylla* (broadleaf sedge); ranges from New Brunswick and VT south to NJ; global elevation ranges from 150-610 m (500-2,000 feet); observed in MA and VT. ..... **Rich Northern Hardwood Talus Woodland (CEGL005058)**
[*Acer saccharum - Tilia americana - Fraxinus americana / Ostrya virginiana / Geranium robertianum* Woodland]

8a. Mixed hardwood [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple)] and *Tsuga* (hemlock) spp. (hemlock ≤25% of canopy) and occasionally *Abies balsamea* (balsam fir) mineral-soil wetlands occurring in seepage-influenced areas, at wetland-upland ecotones, on slopes rather than in basins; plot elevations range from 295-611 m (968-2,000 feet); herbaceous layer more indicative of nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians; observed in NY, MA and VT. ..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]
8b. Seepage indicators absent; enriched upland northern hardwood forests. **9**

9a. Enriched transitional deciduous forests dominated by *Acer saccharum* (sugar maple) and *Tilia americana* (American basswood); *Ostrya virginiana* (hophornbeam) is very common as a small tree; *Acer pensylvanicum* (striped maple) is a characteristic shrub; strong-enrichment indicator herbs such as *Caulophyllum thalictroides* (blue cohosh), *Adiantum pedatum* (northern maidenhair), *Asarum canadense* (Canadian wildginger), and *Panax quinquefolius* (American ginseng), often with abundant spring ephemerals; from New England west to Michigan and south to NJ and NY; observed in CT, MA, and VT. ..... **Transitional Northern Sugar Maple - Ash Rich Mesic Forest (CEGL006637)**
[*Acer saccharum - Tilia americana / Acer pensylvanicum / Caulophyllum thalictroides* Forest]
9b. Canopy is dominated by a combination of *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), *Fraxinus americana* (white ash), and/or less commonly *Fagus grandifolia* (American beech); lacks the strong-enrichment indicator species mentioned above; *Acer pensylvanicum* (striped maple) and *Acer spicatum* (mountain maple) common in understory; herbs are semi-rich, including *Viola rotundifolia* (roundleaf yellow violet), *Athyrium filix-femina* (common ladyfern), *Arisaema triphyllum* (Jack in the pulpit), *Maianthemum racemosum* (feathery false lily of the valley), *Tiarella cordifolia* (heartleaf foamflower), *Actaea pachypoda* (white baneberry), *Medeola virginiana* (Indian cucumber), wide-leaved sedges such as *Carex laxiculmis* (spreading sedge) and *Carex platyphylla* (broadleaf sedge), *Botrychium* (grapefern) spp., *Solidago flexicaulis* (zigzag goldenrod), *Osmunda claytoniana* (interrupted fern), and *Osmunda cinnamomea* (cinnamon fern); occurs globally at moderate elevations of 245-610 m (800-2,000 feet) on slightly enriched soils often in cove and toeslope settings, from PA north to ME; observed in NJ, NY, MA, and VT. ..... **Semi-rich Northern Hardwood Forest (CEGL006211)**
[*Acer saccharum - (Fraxinus americana) / Arisaema triphyllum* Forest]

10a. Northern hardwood forests with 25-50% conifer cover in the canopy. **11**
10b. Northern hardwood forests with deciduous associates in the canopy; conifers <25% of canopy. **20**

11a. Northern hardwood forest codominated by *Acer saccharum* (sugar maple) and *Pinus strobus* (eastern white pine); *Tsuga canadensis* (eastern hemlock) minor component; occurring on well-drained, acidic, sandy or gravelly soil over glacial till, in general a less mesic setting than northern hardwoods lacking white pine; observed in MA and VT. ..... **Northern Hardwood - White Pine Forest (CEGL005005)**
[*Acer saccharum - Pinus strobus / Acer pensylvanicum* Forest]
11b. Not as above. **12**

12a. Mixed hardwood [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple)] and *Tsuga* (hemlock) spp., and occasionally *Abies balsamea* (balsam fir) mineral-soil wetlands occurring in seepage-influenced areas, at wetland-upland ecotones, on slopes rather than in basins; plot/obs point elevations range from 295-610 m (968-2,000 feet); herbaceous layer more indicative of nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians; observed in MA, NY and VT. ..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]
12b. Seepage indicators lacking; upland forests. **13**

13a. Early- to mid-successional native forest that may or may not appear disturbed with variable canopy composition depending on site history; *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), *Fagus grandifolia* (American beech), and *Quercus rubra* (northern red oak) (at <25% relative cover) occur in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry); *Betula papyrifera* (paper birch) and *Picea rubens* (red spruce) occasional minor associates in northern examples; trees 40-100 years old; ground cover may be represented by a diverse range of species based on sites history and disturbance pattern; forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development; widespread throughout northern and central New England; observed in MA and VT. ..... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest]
13b. Later-successional and mature forests. **14**

14a. *Liriodendron tulipifera* (tuliptree) in canopy along with *Quercus rubra* (northern red oak), *Tsuga canadensis* (eastern hemlock), *Betula lenta* (sweet birch), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), and/or *Pinus strobus* (eastern white pine); *Hamamelis virginiana* (American witch-hazel) is the dominant shrub; *Polystichum acrostichoides* (Christmas fern) is the dominant herb; occurs on northern and eastern midslopes and in coves; plot/obs point elevation ranges from 384-797 m (1,261-2,614 feet); observed in NJ and NY. ..... **Red Oak - Hemlock - Mixed Hardwood Forest (CEGL006566)**
[*Quercus rubra - Tsuga canadensis - Liriodendron tulipifera / Hamamelis virginiana* Forest]
14b. *Liriodendron tulipifera* (tuliptree) absent. **15**

15a. *Picea rubens* (red spruce) common. **16**
15b. *Picea rubens* (red spruce) sparse to absent; *Tsuga canadensis* (eastern hemlock) most abundant conifer. **17**

16a. Mixed deciduous hardwoods - spruce forest most extensive at middle elevations, plot/obs point elevations range from 460-929 m (1,509-3,047 feet) on rocky slopes; *Picea rubens* (red spruce) [and in logged stands, *Abies balsamea* (balsam fir)], comprises at least 25-50% total cover, *Betula alleghaniensis* (yellow birch) and *Acer rubrum* (red maple) characteristic; other northern hardwoods *Acer saccharum* (sugar maple) and *Fagus grandifolia* (American beech) may be common; *Acer pensylvanicum* (striped maple), *Viburnum lantanoides* (hobblebush), and *Acer spicatum* (mountain maple) common; herbs include *Clintonia borealis* (bluebead), *Dennstaedtia punctilobula* (eastern hayscented fern), *Coptis trifolia* (threeleaf goldthread), *Oxalis montana* (mountain woodsorrel), *Oclemena acuminata* (whorled wood aster), *Maianthemum canadense* (Canada mayflower), and *Dryopteris intermedia* (intermediate woodfern); lacks *Betula papyrifera* var. *cordifolia* (mountain paper birch) and *Sorbus americana* (American mountain-ash) is sparse to absent; observed in MA and VT. ..... **Transitional Northern Hardwood - Red Spruce Forest (CEGL006267)**
[*Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest]

16b. *Tsuga canadensis* (eastern hemlock) - northern hardwood forest with *Picea rubens* (red spruce) present (<45% cover); herb layer may contain more boreal species such as *Dryopteris campyloptera* (mountain woodfern), *Huperzia lucidula* (shining clubmoss), *Oxalis montana* (mountain woodsorrel), and *Trillium undulatum* (painted trillium); from northern and central New England and NY; occurs globally on sheltered slopes at moderate elevations 30-610 m (100-2,000 feet); observed in MA and VT. ..... **Hemlock - Spruce - Hardwood Forest (CEGL006129)**
[*Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest]

17a. *Tsuga canadensis* (eastern hemlock) - northern hardwood forests lacking abundant *Betula lenta* (sweet birch), *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), and *Pinus strobus* (eastern white pine) in canopy. **18**

17b. Mixed *Tsuga canadensis* (eastern hemlock) with *Betula lenta* (sweet birch), *Quercus rubra* (northern red oak), and/or *Quercus prinus* (chestnut oak) in canopy. **19**

18a. *Tsuga canadensis* (eastern hemlock) - northern hardwood forest with *Picea rubens* (red spruce) present (<45% cover); herb layer may contain more boreal species such as *Dryopteris campyloptera* (mountain woodfern), *Huperzia lucidula* (shining clubmoss), *Oxalis montana* (mountain woodsorrel), and *Trillium undulatum* (painted trillium); from northern and central New England and NY; occurs globally on sheltered slopes at moderate elevations 30-610 m (100-2,000 feet); observed in MA and VT. ..... **Hemlock - Spruce - Hardwood Forest (CEGL006129)**
[*Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest]

18b. Transitional *Tsuga canadensis* (eastern hemlock) - northern hardwood forest; *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Betula papyrifera* (paper birch), *Fagus grandifolia* (American beech), and *Fraxinus americana* (white ash) common; *Acer pensylvanicum* (striped maple) characteristic tall shrub; sparse herb layer but *Dryopteris intermedia* (intermediate woodfern), *Mitchella repens* (partridgeberry), *Clintonia borealis* (bluebead), *Trientalis borealis* (starflower), and *Lycopodium obscurum* (rare clubmoss) are common; occurs on acidic soils, often on rocky, north-facing slopes; distributed in large patches from NH south through PA (DEWA); elevation of plots/obs points ranges from 350-543 m (1,148-1,782 feet). ..... **Hemlock - Transitional Northern Hardwood Forest (CEGL006639)**
[*Tsuga canadensis - Acer saccharum - Fagus grandifolia / Dryopteris intermedia* Forest]

19a. Canopy associates and subcanopy include *Fagus grandifolia* (American beech), *Betula lenta* (sweet birch), *Pinus strobus* (eastern white pine), *Prunus serotina* (black cherry), and/or *Acer rubrum* (red maple); *Hamamelis virginiana* (American witch-hazel), *Acer pensylvanicum* (striped maple), *Viburnum acerifolium* (mapleleaf viburnum), and *Kalmia latifolia* (mountain laurel) are common shrubs; herbs sparse; nutrient-poor, well-drained, often stony sandy loams or loamy sands; widespread in southern New England; observed in NY, MA, CT, and VT; elevation of plots/obs points ranges from 360-544 m (1,181-1,785 feet); successional monocultures of *Tsuga canadensis* (eastern hemlock) altered by hemlock woolly adelgid are mapped as this association. ..... **Hemlock - Beech - Red Oak Forest (CEGL006088)**
[*Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest]

19b. *Quercus prinus* (chestnut oak) codominant with *Tsuga canadensis* (eastern hemlock); *Quercus rubra* (northern red oak) is an overstory associate; *Betula lenta* (sweet birch), *Acer rubrum* (red maple), and *Tsuga canadensis* (eastern hemlock) common in subcanopy; *Rhododendron maximum* (great laurel) and/or *Kalmia latifolia* (mountain laurel) common; occurs globally on moderately steep sheltered slopes with northern exposures at lower elevations from 170-880 m (550-2,900 feet); ranges from the NJ Highlands south to the Central Appalachians; observed in NJ and NY. ..... **Central Appalachian Hemlock - Chestnut Oak Forest (CEGL006923)**
[*Tsuga canadensis - Quercus prinus - Betula lenta* Forest]

20a. Mixed hardwood [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple)] and *Tsuga* (hemlock) spp. and occasionally *Abies balsamea* (balsam fir) mineral-soil wetlands occurring in seepage-influenced areas, at wetland-upland ecotones, on slopes rather than in basins; plot/obs point elevations range from 295-610 m (968-2,000 feet); herbaceous layer more indicative of nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians. ..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]

20b. Upland forests; seepage indicators lacking. **21**

21a. Oak - birch woodland occurring on talus slopes; *Quercus rubra* (northern red oak) and *Betula lenta* (sweet birch) codominant in canopy; acidic large-boulder talus slope woodland occurs in Lower New England, and south to the northern Piedmont; low to mid elevations, from near sea level to about 520 m (0-1,700 feet); observed in NY and PA. ..... **Oak - Birch Talus Slope Woodland (CEGL006585)**
[*Quercus rubra - Betula lenta / Polypodium virginianum* Woodland]

21b. Northern hardwood forest not on talus. **22**

22a. Early-successional northern hardwood forests and woodlands (young / even-aged stands of *Acer saccharum* (sugar maple) with depauperate shrub and herb layers or abundance of early-successional trees such as *Populus* (cottonwood) spp., *Betula populifolia* (gray birch), or *Prunus serotina* (black cherry). **23**

22b. Later-successional or mature northern hardwood forests. **24**

23a. Successional northern hardwoods dominated by some combination of *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Populus alba* (white poplar), *Betula papyrifera* (paper birch), and/or *Betula populifolia* (gray birch); *Populus balsamifera* (balsam poplar), *Acer rubrum* (red maple), *Prunus serotina* (black cherry), and/or *Prunus pensylvanica* (pin cherry) may also be common; shrub layer can be sparse or include *Lonicera morrowii* (Morrow's honeysuckle), *Frangula alnus* (glossy buckthorn), *Rubus* (blackberry) spp., and/or *Viburnum dentatum* (southern arrow-wood); old-field grasses and herbs and/or herbs typical of northern hardwood forests common in herb layer; ranges from closed-canopy forests to open woodlands; observed in MA and VT. .....**Ruderal Aspen - Birch Woodland (CEGL006303)**
[*Populus (tremuloides, grandidentata) - Betula (populifolia, papyrifera)* Ruderal Woodland]

23b. Early-successional variant of widespread typic northern hardwood forest occurring on acidic soils in central New England and at lower elevations in northern New England and upstate NY dominated by a monotypic canopy of *Acer saccharum* (sugar maple) or some combination of young, small-diameter *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech) and/or *Betula papyrifera* (paper birch); arises from cutting, farming, or extended grazing; disturbed shrub layer with exotics or no shrub layer; herb layer patchy and most often a mix of ferns, clubmosses (Lycopodiaceae), and other herbs. ....**Ruderal Sugar Maple - Northern Hardwood Forest (CEGL006628)**
[*Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest]

24a. Northern hardwood forest lacking a significant component of *Quercus rubra* (northern red oak), *Liriodendron tulipifera* (tuliptree), **or** *Prunus serotina* (black cherry)..... **25**
24b. Northern hardwood forest with significant component of *Quercus rubra* (northern red oak), *Liriodendron tulipifera* (tuliptree), **or** *Prunus serotina* (black cherry)..... **28**

25a. Northern Hardwood Forest characterized by mix of *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), and/or *Betula alleghaniensis* (yellow birch); herb and shrub layers well developed, occurs as matrix or large patch forest. **26**
25b. Northern hardwood forest strongly dominated by *Acer saccharum* (sugar maple) or *Fagus grandifolia* (American beech); depauperate forest with poorly developed shrub and herb layers. **27**

26a. Northern hardwood forest with *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), and occasionally *Prunus serotina* (black cherry); conifers including *Pinus strobus* (eastern white pine), *Tsuga canadensis* (eastern hemlock), and in the northern portion of the range, *Picea rubens* (red spruce) and/or *Abies balsamea* (balsam fir) may be present but not abundant (<25%); tall shrubs include *Acer pensylvanicum* (striped maple), *Acer spicatum* (mountain maple), and *Viburnum lantanoides* (hobblebush); herb layer patchy and most often a mix of *Dryopteris intermedia* (intermediate woodfern) and other ferns, clubmosses (Lycopodiaceae), *Trillium erectum* (red trillium), *Maianthemum racemosum* (feathery false lily of the valley), *Trientalis borealis* (starflower), *Arisaema triphyllum* (Jack in the pulpit), and other herbs; occurring on acidic soils; widespread matrix forest in central New England and at lower elevations in northern New England and upstate NY; very common observed in MA and VT. ....**Transitional Northern Hardwood Forest (CEGL006632)**
[*Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest]

26b. Canopy dominated by a combination of *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), *Fraxinus americana* (white ash), and/or less commonly *Fagus grandifolia* (American beech); *Acer pensylvanicum* (striped maple) and *Acer spicatum* (mountain maple) common in understory; herb layer similar to above but also characterized by a small number of rich indicators, including *Viola rotundifolia* (roundleaf yellow violet), *Tiarella cordifolia* (heartleaf foamflower), *Actaea pachypoda* (white baneberry), wide-leaved sedges such as *Carex laxiculmis* (spreading sedge) and *Carex platyphylla* (broadleaf sedge), *Botrychium* (grapefern) spp., and *Solidago flexicaulis* (zigzag goldenrod), occurs globally at moderate elevations of 245-610 m (800-2,000 feet) on slightly enriched soils often in cove and toeslope settings, from PA north to ME; common, observed in NJ, NY, MA, and VT. ..... **Semi-rich Northern Hardwood Forest (CEGL006211)**
[*Acer saccharum - (Fraxinus americana) / Arisaema triphyllum* Forest]

27a. Northern hardwood forest dominated by *Fagus grandifolia* (American beech) (>30% cover); *Acer saccharum* (sugar maple), *Prunus serotina* (black cherry), *Fraxinus americana* (white ash), and/or *Betula alleghaniensis* (yellow birch) also in canopy; *Dennstaedtia punctilobula* (eastern hayscented fern) and *Dryopteris intermedia* (intermediate woodfern) common ferns; occurs on low-nutrient sites; includes high elevation (968 m) "elfin" stunted, multi-trunked montane northern hardwood forests in MA and VT. ..... **Transitional Northern Hardwood Forest (CEGL006632)**
[*Acer saccharum - Fagus grandifolia - Fraxinus americana / Arisaema triphyllum* Forest]

27b. Early-successional variant of widespread typic northern hardwood forest occurring on acidic soils in central New England and at lower elevations in northern New England and upstate NY. dominated by some combination of young, small-diameter *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech) and/or *Betula papyrifera* (paper birch) or monotypic *Acer saccharum* (sugar maple); arises from cutting; disturbed shrub layer with exotics or no shrub layer; herb layer patchy and most often a mix of ferns, clubmosses (Lycopodiaceae), and other herbs. ....**Ruderal Sugar Maple - Northern Hardwood Forest (CEGL006628)**
[*Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest]

28a. *Liriodendron tulipifera* (tuliptree) common. **29**
28b. *Liriodendron tulipifera* (tuliptree) sparse or absent..... **31**

29a. *Tsuga canadensis* (eastern hemlock) and/or *Pinus strobus* (eastern white pine) significant canopy components; *Tsuga canadensis* (eastern hemlock) up to 25% of canopy; *Liriodendron tulipifera* (tuliptree) in canopy along with *Quercus rubra* (northern red oak), *Tsuga canadensis* (eastern hemlock), *Betula lenta* (sweet birch), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), and/or *Pinus strobus* (eastern white pine); *Hamamelis virginiana* (American witch-hazel) is the dominant shrub; *Polystichum acrostichoides* (Christmas fern) is the dominant herb; occurs on northern and eastern midslopes and in coves; plot/obs point elevation ranges from 384-797 m (1,261-2,614 feet); observed in NY and NJ. ....**Red Oak - Hemlock - Mixed Hardwood Forest (CEGL006566)**
[*Quercus rubra - Tsuga canadensis - Liriodendron tulipifera / Hamamelis virginiana* Forest]
29b. Conifers sparse or lacking. **30**

30a. *Quercus rubra* (northern red oak) absent from canopy; canopy characterized by a mixture of *Liriodendron tulipifera* (tuliptree), *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), and *Betula lenta* (sweet birch); occurs on deep soils that are not strongly acidic; mid- to lower-slope forest of the mid-Atlantic region; documented in PA and NJ; common off trail at DEWA..... **Beech - Tuliptree - Sugar Maple Forest (CEGL006296)**
[*Fagus grandifolia - Betula lenta - Liriodendron tulipifera - Acer saccharum* Forest]

30b. Deciduous forest dominated by *Quercus rubra* (northern red oak) and *Acer saccharum* (sugar maple) with *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), and/or *Fraxinus americana* (white ash) common and abundant (usually >20% relative cover); *Hamamelis virginiana* (American witch-hazel) and *Lindera benzoin* (northern spicebush) common shrubs; ranges from MA to PA and the Central Appalachians; plot/obs point elevations range from 230-309 m (755-1,014 feet). ..... **High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125)**
[*Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest]

31a. Northern hardwood forest with significant component of *Prunus serotina* (black cherry); Early-successional variant of widespread typic northern hardwood forest occurring on acidic soils in central New England and at lower elevations in northern New England and upstate NY; either monotypic *Acer saccharum* (sugar maple), or dominated by some combination of young, small-diameter *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech) and/or *Betula papyrifera* (paper birch); arises from cutting; disturbed shrub layer with exotics or no shrub layer; herb layer patchy and most often a mix of ferns, clubmosses (Lycopodiaceae), and other herbs. .....**Ruderal Sugar Maple - Northern Hardwood Forest (CEGL006628)**
[*Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest]
31b. *Quercus rubra* (northern red oak) abundant in mixed canopy. **32**

32a. Canopy composition is a **variable** mixture of *Quercus rubra* (northern red oak) (usually at least 30% of the canopy), *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), and in some stands *Pinus strobus* (eastern white pine) or *Tsuga canadensis* (eastern hemlock) (conifers generally make up less than 20% of the canopy cover); *Picea rubens* (red spruce) may occur sporadically at the northern extent, and *Nyssa sylvatica* (blackgum) may occur to the south; *Fraxinus americana* (white ash) and/or *Betula alleghaniensis* (yellow birch) are canopy associates; *Acer pensylvanicum* (striped maple), *Viburnum acerifolium* (mapleleaf viburnum), and *Lindera benzoin* (northern spicebush) are common shrubs; *Aralia nudicaulis* (wild sarsaparilla), *Dennstaedtia punctilobula* (eastern hayscented fern), *Athyrium filix-femina* (common ladyfern), and *Polystichum acrostichoides* (Christmas fern) are common herbs; occurs on sideslopes at low to mid elevations, usually under 550 m (1,800 feet) but can range up to 655 m (2,148 feet); observed in NJ, NY, CT MA, VT..... ..... **Red Oak - Transitional Northern Hardwood Forest (CEGL006635)**
[*Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest]
32b. Early- to mid-successional native forest (trees 40-100 years old) with canopy composition variable depending on site history; *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), *Fagus grandifolia* (American beech), and *Quercus rubra* (northern red oak) (<25%) occur in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry); *Betula papyrifera* (paper birch) and *Picea rubens* (red spruce) are minor associates in northern examples; ground cover may be represented by a diverse range of species based on sites history and disturbance pattern; forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or heavily fragmented residential development; widespread throughout northern and central New England; observed in MA and VT. .... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest]

9. Pine and Mixed Pine Shrublands, Woodlands, and Forests

1a. *Pinus rigida* (pitch pine) dominant with highly variable canopy coverage; *Pinus rigida - Quercus ilicifolia* (pitch pine-bear oak) woodland barrens and shrublands occurring on shallow soils over bedrock and on dry rocky ridges and summits of low to moderate elevations; plot elevations range from 387-792 m (1,270-2,598 feet); *Pinus rigida* (pitch pine) dominant (tree or shrub-sized) with a variable mixture of canopy associates, such as *Quercus prinus* (chestnut oak), *Betula populifolia* (gray birch), *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and/or *Carya glabra* (pignut hickory); *Quercus ilicifolia* (bear oak) and *Photinia melanocarpa* (black chokeberry) characteristic in the tall-shrub layer; *Kalmia latifolia* (mountain laurel) often present; *Gaylussacia baccata* (black huckleberry) and *Vaccinium angustifolium* (lowbush blueberry) dominant dwarf-shrubs; *Deschampsia flexuosa* (wavy hairgrass) and *Maianthemum canadense* (Canada mayflower) common in the herb layer; high lichen cover characteristic; shallow acidic, well-drained sandy to gravelly soils; observed in NJ, NY, CT and MA. ..... **Pitch Pine Rocky Summit (CEGL006116)**
[*Pinus rigida / (Quercus ilicifolia) / Photinia melanocarpa / Deschampsia flexuosa* Woodland]
1b. *Pinus strobus* (eastern white pine) dominant or codominant. **2**

2a. Shale talus woodland with *Pinus strobus* (eastern white pine) and *Juniperus virginiana* (eastern red-cedar) in canopy with *Quercus prinus* (chestnut oak), *Carya glabra* (pignut hickory), *Quercus rubra* (northern red oak), and *Quercus alba* (white oak); characteristic shrubs and herbs include *Rhus glabra* (smooth sumac), *Quercus prinoides* (dwarf chinquapin oak), *Toxicodendron radicans* (eastern poison-ivy), *Penstemon hirsutus* (hairy beardtongue), *Antennaria plantaginifolia* (woman's tobacco), and *Carex pensylvanica* (Pennsylvania sedge); occurs on unstable shale talus with shallow, very well-drained soils; known range restricted to NY at 183 m (600 feet); rare association. .... **Shale Talus Slope Woodland (CEGL006074)**
[*Quercus prinus / Rhus* spp. / *Deschampsia flexuosa* Woodland]
2b. Other *Pinus strobus* (eastern white pine) forests. **3**

3a. Early- and mid-successional, ruderal or planted *Pinus strobus* (eastern white pine) and mixed pine forests. **4**
3b. Later-successional and mixed canopy *Pinus strobus* (eastern white pine) forests **8**

4a. Evergreen-dominated canopy. **5**
4b. Mixed evergreen-deciduous canopy with *Pinus strobus* (eastern white pine) and *Quercus* (oak) spp. **and/or** early-successional hardwoods. **7**

5a. Multiple *Pinus* (pine) species in canopy; other conifers sometimes present in smaller amounts; planted in postagricultural fields and pastures; plantations of mixed pines or pine mixed with other non-native planted conifers; common throughout the Northeast; along entire length of trail. .... **Mixed Pine Conifer Plantation (CST006313)**
[*Pinus* spp. Forest Plantation]
5b. Planted and successional, even-aged stands of *Pinus strobus* (eastern white pine), and sometimes with *Tsuga canadensis* (eastern hemlock) replacing eastern white pine in the canopy; widespread throughout the Northeast. **6**

6a. *Pinus strobus* (eastern white pine) plantations; observed in CT..... .....**Eastern White Pine Plantation (CST007178)**
[*Pinus strobus* Forest Plantation]
6b. Successional stands of *Pinus strobus* (eastern white pine), [or as in VT, *Tsuga canadensis* (eastern hemlock) replaces eastern white pine in the canopy]; *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Fraxinus americana* (white ash), and/or *Prunus serotina* (black cherry) may be common in canopy and/or subcanopy; observed in CT and VT..... .....**Ruderal Eastern White Pine Forest (CEGL007944)**
[*Pinus strobus* Ruderal Forest]

7a. Composition is variable depending on site history; canopy is a mixture of *Quercus rubra* (northern red oak) [<25% cover], *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and *Fagus grandifolia* (American beech) occurring in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry); trees 40-100 years old; ground cover may be represented by a diverse range of species based on sites history and disturbance pattern; forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development; widespread throughout northern and central New England; observed in MA and VT. ..... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest]
7b. Mid-successional forests developing after heavy cutting or other disturbance in southern New England and NY south through Delaware Water Gap; *Pinus strobus* (eastern white pine) emergent (may or may not be present) over a layer of young, small-diameter hardwoods, such as *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Prunus serotina* (black cherry), and mesic oaks, including *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and *Quercus velutina* (black oak); heath shrubs <25%; plots off trail at DEWA. ....**Mid-Atlantic Mid-Successional Oak - Pine Forest (CEGL006454)**
[*Quercus (rubra, velutina, alba) - Betula lenta - (Pinus strobus)* Forest]

8a. *Pinus strobus* (eastern white pine) forests with *Quercus* (oak) spp. and/or northern hardwoods codominant in canopy. **9**
8b. *Pinus strobus* (eastern white pine) - mixed evergreen canopy; conifer trees >75% of canopy cover..... **11**

9a. *Liriodendron tulipifera* (tuliptree) in canopy along with *Quercus rubra* (northern red oak), *Tsuga canadensis* (eastern hemlock), *Betula lenta* (sweet birch), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), and/or *Pinus strobus* (eastern white pine); *Hamamelis virginiana* (American witch-hazel) is the dominant shrub; *Polystichum acrostichoides* (Christmas fern) is the dominant herb; occurs on northern and eastern midslopes and in coves; plot/obs point elevation ranges from 384-797 m (1,261-2,614 feet); observed in NY and NJ..... .....**Red Oak - Hemlock - Mixed Hardwood Forest (CEGL006566)**
[*Quercus rubra - Tsuga canadensis - Liriodendron tulipifera / Hamamelis virginiana* Forest]
9b. *Liriodendron tulipifera* (tuliptree) absent from canopy..... **10**

10a. *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), *Quercus alba* (white oak), *Quercus velutina* (black oak), and/or *Quercus coccinea* (scarlet oak) share canopy dominance with *Pinus strobus* (eastern white pine); *Fagus grandifolia* (American beech) and *Tsuga canadensis* (eastern hemlock) can be common and abundant; *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) are characteristic; *Kalmia latifolia* (mountain laurel) is a tall shrub; a heath layer may be extensive and includes *Vaccinium angustifolium* (lowbush blueberry) and *Gaylussacia baccata* (black huckleberry); common herbs include *Aralia nudicaulis* (wild sarsaparilla), *Pteridium aquilinum* (western brackenfern), and *Gaultheria procumbens* (eastern teaberry); ranges throughout the Northeast from WV north to ME at elevations below 915 m (3,000 feet); observed in NJ, NY, CT, and MA. ..... **Northeastern White Pine - Oak Forest (CEGL006293)**
[*Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest]

10b. Northern hardwood forests with 25-50% conifer cover in the canopy codominated by *Acer saccharum* (sugar maple) and *Pinus strobus* (eastern white pine); *Tsuga canadensis* (eastern hemlock) minor component; occurring on well-drained, acidic, sandy or gravelly soil over glacial till, in general a less mesic setting than northern hardwoods lacking white pine; observed in MA and VT. ..... **Northern Hardwood - White Pine Forest (CEGL005005)**
[*Acer saccharum - Pinus strobus / Acer pensylvanicum* Forest]

11a. Dry-mesic pine - hemlock forest codominated by *Tsuga canadensis* (eastern hemlock) and *Pinus strobus* (eastern white pine); *Picea rubens* (red spruce) and northern hardwoods typical in understory; occurs on lower-elevation slopes and flats from MA to ME on sheltered slopes with sandy or stony, acidic, moderately well-drained soils. .... **White Pine - Hemlock - Red Spruce Forest (CEGL006324)**
[*Pinus strobus - Tsuga canadensis - Picea rubens* Forest]

11b. *Picea rubens* (red spruce) absent to minor; *Pinus strobus* (eastern white pine) forests with abundant or codominant *Tsuga canadensis* (eastern hemlock); *Acer rubrum* (red maple) and *Quercus rubra* (northern red oak) common associates; *Acer pensylvanicum* (striped maple) is a common, though rarely abundant small tree; *Kalmia latifolia* (mountain laurel) common shrub; occurs on sloping sites and in sheltered ravines; from PA and NJ north to ME. ....**Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest (CEGL006328)**
[*Pinus strobus - Tsuga canadensis* Lower New England-Northern Piedmont Forest]

10. Mixed Oak - Conifer, Mixed Oak, and Oak - Hickory Forests

1a. Later-successional forests dominated by *Quercus* (oak) spp. and/or *Quercus* (oak) spp. and *Carya* (hickory) spp. **2**
1b. Successional forests; young, even-aged native and non-native hardwoods and/or light-requiring, wind-dispersed trees such as *Populus* (cottonwood) spp., *Betula* (birch) spp., and/or *Acer rubrum* (red maple) characteristic. **31**

2a. Mixed conifer-deciduous forests, *Quercus* (oak) spp. codominant with conifers (>30% cover) **3**
2b. Oak and oak-hickory forests and woodlands with conifers much less frequent (≤30% cover to absent), may be codominated by other deciduous trees. **6**

3a. Oak - pine forests. **4**
3b. Mixed *Quercus* (oak) spp. - *Tsuga canadensis* (eastern hemlock) forests; *Tsuga canadensis* (eastern hemlock) codominant (>25% cover). **5**

4a. Mixed *Quercus* (oak) spp. - *Pinus strobus* (eastern white pine) forest; *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), *Quercus alba* (white oak), *Quercus velutina* (black oak), and/or *Quercus coccinea* (scarlet oak) share canopy dominance with *Pinus strobus* (eastern white pine); *Fagus grandifolia* (American beech) and *Tsuga canadensis* (eastern hemlock) can be common and abundant; *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) are characteristic; *Kalmia latifolia* (mountain laurel) is a tall shrub; a heath layer may be extensive and includes *Vaccinium angustifolium* (lowbush blueberry) and *Gaylussacia baccata* (black huckleberry); common herbs include *Aralia nudicaulis* (wild sarsaparilla), *Pteridium aquilinum* (western brackenfern), and *Gaultheria procumbens* (eastern teaberry); ranges throughout the Northeast from WV north to ME at elevations below 915 m (3,000 feet); observed NJ, NY, CT, and MA. ..... **Northeastern White Pine - Oak Forest (CEGL006293)**
[*Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest]
4b. *Pinus rigida - Quercus ilicifolia* (pitch pine-bear oak) woodlands with up to 60% canopy cover occurring on shallow soils over bedrock and on dry rocky ridges and summits of low to moderate elevations; plot elevations range from 387-792 m (1,270-2,598 feet); *Pinus rigida* (pitch pine) dominant (tree or shrub-sized) with a variable mixture of canopy associates, such as *Quercus prinus* (chestnut oak), *Betula populifolia* (gray birch), *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and/or *Carya glabra* (pignut hickory); *Quercus ilicifolia* (bear oak) and *Photinia melanocarpa* (black chokeberry) characteristic in the tall-shrub layer; *Kalmia latifolia* (mountain laurel) often present; *Gaylussacia baccata* (black huckleberry) and *Vaccinium angustifolium* (lowbush blueberry) dominant dwarf-shrubs; *Deschampsia flexuosa* (wavy hairgrass) and *Maianthemum canadense* (Canada mayflower) common in the herb layer; high lichen cover characteristic; shallow acidic, well-drained sandy to gravelly soils; observed in NJ, NY, CT and MA. ..... **Pitch Pine Rocky Summit (CEGL006116)**
[*Pinus rigida / (Quercus ilicifolia) / Photinia melanocarpa / Deschampsia flexuosa* Woodland]

5a. *Fagus grandifolia* (American beech) present in canopy; mixture of *Tsuga canadensis* (eastern hemlock) with *Fagus grandifolia* (American beech) and/or *Quercus rubra* (northern red oak) in canopy; canopy associates and subcanopy include *Betula lenta* (sweet birch), *Pinus strobus* (eastern white pine), *Prunus serotina* (black cherry), and/or *Acer rubrum* (red maple); *Hamamelis virginiana* (American witch-hazel), *Acer pensylvanicum* (striped maple), *Viburnum acerifolium* (mapleleaf viburnum), and *Kalmia latifolia* (mountain laurel) are common shrubs; herbs sparse; nutrient-poor, well-drained, often stony sandy loams or loamy sands; widespread in southern New England; observed in NY, MA, CT and VT; elevation of plots/obs points ranges from 360-544 m (1,181-1,785 feet); successional monocultures of *Tsuga canadensis* (eastern hemlock) altered by hemlock woolly adelgid are mapped as this association. ..... **Hemlock - Beech - Red Oak Forest (CEGL006088)**
[*Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest]
5b. *Fagus grandifolia* (American beech) absent to sparse. **6**

6a. *Liriodendron tulipifera* (tuliptree) in canopy along with *Quercus rubra* (northern red oak), *Tsuga canadensis* (eastern hemlock), *Betula lenta* (sweet birch), *Betula alleghaniensis* (yellow birch), and/or *Pinus strobus* (eastern white pine); *Hamamelis virginiana* (American witch-hazel) is the dominant shrub; *Polystichum acrostichoides* (Christmas fern) is the dominant herb; occurs on northern and eastern midslopes and in coves; plot/obs point elevation ranges from 384-797 m (1,261-2,614 feet); occurs in NJ and NY..... **Red Oak - Hemlock - Mixed Hardwood Forest (CEGL006566)**
[*Quercus rubra - Tsuga canadensis - Liriodendron tulipifera / Hamamelis virginiana* Forest]
6b. *Quercus prinus* (chestnut oak) codominant with *Tsuga canadensis* (eastern hemlock); *Quercus rubra* (northern red oak) is an overstory associate; *Betula lenta* (sweet birch), *Acer rubrum* (red maple), and *Tsuga canadensis* (eastern hemlock) common in subcanopy; *Kalmia latifolia* (mountain laurel) common, and *Rhododendron maximum* (great laurel) possible in more southern examples; *Liriodendron tulipifera* (tuliptree) lacking. Occurs globally on moderately steep sheltered slopes with northern exposures at lower elevations from 170-880 m (550-2,900 feet); ranges from the NJ Highlands south to the Central Appalachians; observed in NJ and NY. ..... **Central Appalachian Hemlock - Chestnut Oak Forest (CEGL006923)**
[*Tsuga canadensis - Quercus prinus - Betula lenta* Forest]

7a. Hardwood forests, wet at least seasonally, codominated by *Quercus* (oak) spp.; transitional upland / wetland forest occurring in a basin setting with a variable canopy typically including *Fraxinus* (ash) spp., *Quercus rubra* (northern red oak), *Acer rubrum* (red maple) and/or *Betula alleghaniensis* (yellow birch); *Lindera benzoin* (northern spicebush) dominates shrub layer; *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Osmunda claytoniana* (interrupted fern), *Thelypteris palustris* (eastern marsh fern), *Impatiens capensis* (jewelweed), *Aralia nudicaulis* (wild sarsaparilla), and *Symplocarpus foetidus* (skunk-cabbage) common in the herb layer; ranges from Southern New England north to ME; observed in CT..... **Upland/Wetland Transitional Forest (CEGL006000)**
[*Quercus rubra - Betula alleghaniensis / Osmunda cinnamomea* Forest]
7b. Upland forests..... **8**

8a. Enriched forests and woodlands with frequent and sometimes abundant enrichment indicators in canopy, such as *Carya ovalis* (red hickory), *Carya ovata* (shagbark hickory), *Acer saccharum* (sugar maple), *Tilia americana* (American basswood), *Fraxinus americana* (white ash), *Ostrya virginiana* (hophornbeam), and/or herbs such as *Viola rotundifolia* (roundleaf yellow violet), *Hepatica nobilis* (hepatica), wide-leaved *Carex* (sedge) spp., *Geranium robertianum* (Robert's geranium), and/or *Woodsia* (cliff fern) spp., among others..... **9**
8b. Acidic oak and oak-hickory forests and woodlands lacking significant cover of enrichment indicators..... **13**

9a. Rich oak-hickory forest dominated by a mixture of *Carya glabra* (pignut hickory), *Carya alba* (mockernut hickory), *Carya ovata* (shagbark hickory), *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and/or *Quercus prinus* (chestnut oak) often with *Acer saccharum* (sugar maple) and *Fraxinus americana* (white ash) over an *Ostrya virginiana* (hophornbeam) subcanopy and grassy herbaceous layer dominated by *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), and/or *Carex lucorum* (Blue Ridge sedge) (sedge lawn may or may not be present) with *Solidago caesia* (wreath goldenrod), *Solidago bicolor* (white goldenrod), and *Deschampsia flexuosa* (wavy hairgrass); tall shrubs include *Viburnum acerifolium* (mapleleaf viburnum) and *Amelanchier arborea* (common serviceberry); *Vaccinium pallidum* (Blue Ridge blueberry) is common dwarf-shrub; occurs on low-elevation ridgetops, upper slopes, south- or west-facing sideslopes at elevations ranging from 285-478 m (935-1,561 feet); extends from ME and VT to PA and northern NJ; observed in NJ, NY, PA, and CT..... **Oak - Hickory / Hophornbeam / Sedge Forest (CEGL006301)**
[*Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum* Forest]
9b. Enriched *Quercus* (oak) spp. forests with *Acer saccharum* (sugar maple) and/or *Liriodendron tulipifera* (tuliptree) codominant or common; lacks abundant *Carya* (hickory) spp. **10**

10a. *Quercus* (oak) spp. forests with *Liriodendron tulipifera* (tuliptree) common and abundant (greater than 20% cover); dominated by *Quercus rubra* (northern red oak) and *Acer saccharum* (sugar maple) with *Fagus grandifolia* (American beech) and *Liriodendron tulipifera* (tuliptree) common and abundant (usually >20% relative cover); *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) common in the subcanopy; sparse shrub layer; *Hamamelis virginiana* (American witch-hazel) and *Lindera benzoin* (northern spicebush) common shrubs; *Vaccinium pallidum* (Blue Ridge blueberry) common dwarf-shrub; *Dryopteris intermedia* (intermediate woodfern) common herb; found in coves, on moist north- and east-facing slopes and on well-drained flats at elevations ranging from 230-309 m (755-1,014 feet), often covered by bouldery colluvia; ranges from MA to PA and the Central Appalachians; observed in NY, MA. ..... **High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125)**
[*Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest]
10b. *Quercus* (oak) spp. - *Acer saccharum* (sugar maple) forest lacking *Liriodendron tulipifera* (tuliptree)..... **11**

11a. Semi-rich, dry to dry-mesic forest of calcareous settings, with *Quercus muehlenbergii* (chinquapin oak) and *Acer saccharum* (sugar maple) in canopy; *Fraxinus americana* (white ash) may also be in canopy; with *Ostrya virginiana* (hophornbeam) common; herb layer diverse with forbs, ferns, and graminoids; occurs on upper slopes and wooded summits on limestone, dolomite or marble bedrock at elevations ranging from 120-290 m (394-951 feet); observed in NJ, CT and MA..... **Sugar Maple - Chinquapin Oak / Sedge Forest (CEGL006162)**
[*Acer saccharum - Quercus muehlenbergii / Carex platyphylla* Forest]
11b. *Quercus muehlenbergii* (chinquapin oak) absent. **12**

12a. Semi-rich, dry-mesic with some combination of *Quercus rubra* (northern red oak), *Acer saccharum* (sugar maple), and *Fraxinus americana* (white ash) common in canopy, with *Carya glabra* (pignut hickory) and *Betula lenta* (sweet birch) as canopy and subcanopy associates; *Ostrya virginiana* (hophornbeam) and *Viburnum acerifolium* (mapleleaf viburnum) characteristic; *Arisaema triphyllum* (Jack in the pulpit), *Polystichum acrostichoides* (Christmas fern), *Eurybia divaricata* (white wood aster), and *Polygonatum biflorum* (smooth Solomon's seal) common in diverse herb layer; occurs on rocky slopes; CT obs points have *Pinus strobus* (eastern white pine) above canopy; observed in NY, NJ, and CT..... **Sugar Maple - Ash - Oak - Hickory Mesic Forest (CEGL006046)**
[*Acer saccharum - Quercus rubra / Hepatica nobilis* var. *obtusa* Forest]
12b. Canopy composition is a variable mixture of *Quercus rubra* (northern red oak) (usually at least 30% of the canopy), *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), and in some stands *Pinus strobus* (eastern white pine) or *Tsuga canadensis* (eastern hemlock) (conifers generally make up less than 20% of the canopy cover); *Picea rubens* (red spruce) may occur sporadically at the northern extent of this community, and *Nyssa sylvatica* (blackgum) may occur to the south; *Fraxinus americana* (white ash) and/or *Betula alleghaniensis* (yellow birch) are canopy associates; *Acer pensylvanicum* (striped maple),*Viburnum acerifolium* (mapleleaf viburnum), and *Lindera benzoin* (northern spicebush) are common shrubs; *Aralia nudicaulis* (wild sarsaparilla), *Dennstaedtia punctilobula* (eastern hayscented fern), *Athyrium filix-femina* (common ladyfern), and *Polystichum acrostichoides* (Christmas fern) are common herbs; occurs on sideslopes at low to mid elevations, usually under 550 m (1,800 feet) but can range up to 655 m (2,148 feet); observed in NJ, NY, CT, MA, and VT..... **Red Oak - Transitional Northern Hardwood Forest (CEGL006635)**
[*Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest]

13a. *Quercus* (oak) spp. forests and woodlands; several oak species can be dominant in the canopy; with ericaceous species cover ≥10%..... **14**
13b. Oak, oak-hickory, oak-northern hardwood forests and woodlands (several oaks can be dominant in the canopy) with low ericaceous species cover (<10% cover). **22**

14a. Mixed *Quercus* (oak) spp. - *Pinus strobus* (eastern white pine) forest; *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), *Quercus alba* (white oak), *Quercus velutina* (black oak), and/or *Quercus coccinea* (scarlet oak) share canopy dominance with *Pinus strobus* (eastern white pine); *Fagus grandifolia* (American beech) and *Tsuga canadensis* (eastern hemlock) can be common and abundant; *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) are characteristic; *Kalmia latifolia* (mountain laurel) is a tall shrub; a heath layer may be extensive and includes *Vaccinium angustifolium* (lowbush blueberry) and *Gaylussacia baccata* (black huckleberry); common herbs include *Aralia nudicaulis* (wild sarsaparilla), *Pteridium aquilinum* (western brackenfern), and *Gaultheria procumbens* (eastern teaberry); ranges throughout the Northeast from WV north to ME at elevations below 915 m (3,000 feet); observed in NJ, NY, CT, and MA..... **Northeastern White Pine - Oak Forest (CEGL006293)**
[*Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest]
14b. *Pinus strobus* (eastern white pine) sparse to absent **15**

15a. *Quercus* (oak) spp. forests and woodlands dominated or codominated (≥20% cover) by *Quercus prinus* (chestnut oak) [or by *Quercus rubra* (northern red oak) from southwestern VT and north, beyond range of *Quercus prinus* (chestnut oak)]..... **16**
15b. Oak forests or woodlands and oak-hickory forests (from southwestern VT and south) not dominated by *Quercus prinus* (chestnut oak); other oaks such as *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), and/or *Quercus rubra* (northern red oak) more abundant. **18**

16a. *Quercus prinus* (chestnut oak) dominant with *Quercus rubra* (northern red oak) an overstory associate; scattered *Tsuga canadensis* (eastern hemlock) in canopy; *Betula lenta* (sweet birch), *Acer rubrum* (red maple), and *Tsuga canadensis* (eastern hemlock) common in subcanopy; *Rhododendron maximum* (great laurel) or *Kalmia latifolia* (mountain laurel) common; occurs globally on moderately steep sheltered slopes with northern exposures at lower elevations from 170-880 m (550-2,900 feet); ranges from the NJ Highlands south to the Central Appalachians; observed in NJ and NY. ..... **Central Appalachian Hemlock - Chestnut Oak Forest (CEGL006923)**
[*Tsuga canadensis - Quercus prinus - Betula lenta* Forest]
16b. *Tsuga canadensis* (eastern hemlock) absent or sparse..... **17**

17a. Gnarled specimens of *Betula lenta* (sweet birch), *Quercus prinus* (chestnut oak), and/or *Quercus rubra* (northern red oak) characteristic; *Hamamelis virginiana* (American witch-hazel), *Sorbus americana* (American mountain-ash), and/or *Kalmia latifolia* (mountain laurel) common tall shrubs, and *Vaccinium pallidum* (Blue Ridge blueberry) common dwarf-shrub; *Parthenocissus quinquefolia* (Virginia creeper) characteristic vine; *Polypodium virginianum* (rock polypody) characteristic fern; high lichen cover typical; boulderfield or talus slope association occurring on fractured rock from 336-462 m (1,104-1,515 feet) along the PA-NJ border; can have low vegetation cover and high rock cover; observed off trail at DEWA and on trail in NJ and NY. ..... **Sweet Birch - Chestnut Oak Talus Woodland (CEGL006565)**
[*Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland]
17b. Widespread *Quercus prinus* (chestnut oak) forest of Lower New England (New England and NY); *Quercus rubra* (northern red oak), *Quercus coccinea* (scarlet oak), and/or *Quercus velutina* (black oak) may be common in the canopy in the northern portion of the range; understory with dense *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium angustifolium* (lowbush blueberry), and/or *Gaylussacia baccata* (black huckleberry); herbaceous layer poorly-developed and depauperate but includes *Danthonia spicata* (poverty oatgrass), *Carex pensylvanica* (Pennsylvania sedge), and *Aralia nudicaulis* (wild sarsaparilla); occurs on xeric upper slopes and ridgetops and steep sideslopes with shallow, acidic, infertile soils; ranges from ME to VA; observed in NJ, NY, CT and MA on the trail. ..... **Lower New England High Slope Chestnut Oak Forest (CEGL006282)**
[*Quercus prinus - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum)* Forest]

18a. *Pinus strobus* (eastern white pine) in canopy. **19**
18b. Oak-hickory or oak / heath forests; *Pinus strobus* (eastern white pine) sparse to absent..... **20**

19a. Mixed *Quercus* (oak) spp. - *Pinus strobus* (eastern white pine) forest; *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), *Quercus alba* (white oak), *Quercus velutina* (black oak), and/or *Quercus coccinea* (scarlet oak) share canopy dominance with *Pinus strobus* (eastern white pine); *Fagus grandifolia* (American beech) and *Tsuga canadensis* (eastern hemlock) can be common and abundant; *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) are characteristic; *Kalmia latifolia* (mountain laurel) is a tall shrub; a heath layer may be extensive and includes *Vaccinium angustifolium* (lowbush blueberry) and *Gaylussacia baccata* (black huckleberry); common herbs include *Aralia nudicaulis* (wild sarsaparilla), *Pteridium aquilinum* (western brackenfern), and *Gaultheria procumbens* (eastern teaberry); ranges throughout the Northeast from WV north to ME at elevations below 915 m (3,000 feet); observed in NJ, NY, CT, and MA. ..... **Northeastern White Pine - Oak Forest (CEGL006293)**
[*Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest]

19b. Rocky summit woodland; *Quercus rubra* (northern red oak) dominant or codominant with *Quercus prinus* (chestnut oak), *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), and/or *Acer rubrum* (red maple); *Quercus coccinea* (scarlet oak) may be common to dominant in some stands in NY; *Pinus* (pine) spp. and *Betula* (birch) spp. may be present; *Sassafras albidum* (sassafras), *Castanea dentata* (American chestnut), and *Amelanchier laevis* (Allegheny serviceberry) are characteristic. Canopies are often composed of stunted individuals; *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), and/or *Gaylussacia baccata* (black huckleberry) dominate the shrub layer; *Deschampsia flexuosa* (wavy hairgrass), *Danthonia spicata* (poverty oatgrass), *Cypripedium acaule* (moccasin flower), *Aralia nudicaulis* (wild sarsaparilla), and *Pteridium aquilinum* (western brackenfern) are characteristic herbs; woodland or stunted forest occurring on rocky upper slopes and low- to mid-elevation summits; ranges from the Central Appalachians north through the Northern Appalachians; elevations range from 375-567 m (1,235-1,860 feet) in New England; observed in NY, MA and VT. ..... **Red Oak / Heath Woodland Rocky Summit (CEGL006134)**
[*Quercus rubra - (Quercus prinus) / Vaccinium* spp. / *Deschampsia flexuosa* Woodland]

20a. Oaks predominant; understory characterized by heaths and/or graminoids. **21**
20b. Oaks present but mixed with other tree genera..... **26**

21a. *Quercus prinus* (chestnut oak) strongly dominant in forest stand or mixed with other species in open, often gnarled, canopy on steep slopes. **22**
21b. *Quercus prinus* (chestnut oak) sparse to absent; canopy dominated by *Quercus velutina* (black oak), *Quercus alba* (white oak), or *Quercus rubra* (northern red oak); scattered pines may be present. **24**

22a. *Quercus rubra* (northern red oak), *Quercus coccinea* (scarlet oak), and/or *Quercus velutina* (black oak) often codominant canopy with *Quercus prinus* (chestnut oak), understory with dense *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium angustifolium* (lowbush blueberry), and/or *Gaylussacia baccata* (black huckleberry); herbaceous layer poorly-developed and depauperate but includes *Danthonia spicata* (poverty oatgrass), *Carex pensylvanica* (Pennsylvania sedge), and *Aralia nudicaulis* (wild sarsaparilla); occurs on xeric upper slopes and ridgetops and steep sideslopes with shallow, acidic, infertile soils; ranges from ME to VA; observed in NJ, NY, CT and MA on trail. .....**Lower New England High Slope Chestnut Oak Forest (CEGL006282)**
[*Quercus prinus - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum)* Forest]
22b. Canopy open, often gnarled; substrate shale or boulder talus on slopes. **23**

23a. Shale talus woodland with known range restricted to NY with *Pinus strobus* (eastern white pine) and *Juniperus virginiana* (eastern red-cedar) in canopy with *Quercus prinus* (chestnut oak), *Carya glabra* (pignut hickory), *Quercus rubra* (northern red oak), and *Quercus alba* (white oak); characteristic shrubs and herbs include *Rhus glabra* (smooth sumac), *Quercus prinoides* (dwarf chinquapin oak), *Toxicodendron radicans* (eastern poison-ivy), *Penstemon hirsutus* (hairy beardtongue), *Antennaria plantaginifolia* (woman's tobacco), and *Carex pensylvanica* (Pennsylvania sedge); occurring on unstable shale talus with shallow, very well-drained soils; rare association; observed in NY at 183 m (600 feet)..... **Shale Talus Slope Woodland (CEGL006074)**
[*Quercus prinus / Rhus* spp. / *Deschampsia flexuosa* Woodland]

23b. Gnarled specimens of *Betula lenta* (sweet birch), *Quercus prinus* (chestnut oak), and/or *Quercus rubra* (northern red oak) characteristic; *Hamamelis virginiana* (American witch-hazel), *Sorbus americana* (American mountain-ash), and/or *Kalmia latifolia* (mountain laurel) common tall shrubs, and *Vaccinium pallidum* (Blue Ridge blueberry) common dwarf-shrub; *Parthenocissus quinquefolia* (Virginia creeper) characteristic vine; *Polypodium virginianum* (rock polypody) characteristic fern; high lichen cover typical; boulderfield or talus slope association occurring on fractured rock from 336-462 m (1,104-1,515 feet) along the PA-NJ border; can have low vegetation cover and high rock cover; observed off trail at DEWA and in NJ and NY..... **Sweet Birch - Chestnut Oak Talus Woodland (CEGL006565)**
[*Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland]

24a. Dominant species in canopy are monotypic or mixtures of *Quercus velutina* (black oak), *Quercus alba* (white oak), and *Quercus rubra* (northern red oak); low-shrub layer dominated by *Vaccinium* (blueberry) spp. and *Gaylussacia* (huckleberry) spp. and tall-shrub layer includes *Kalmia latifolia* (mountain laurel); herbaceous layer may include *Pteridium aquilinum* (western brackenfern), *Cypripedium acaule* (moccasin flower); observed in PA, NJ, NY, and MA..... **Allegheny Plateau Oak Forest (CEGL006018)**
[*Quercus (velutina, alba) / Vaccinium pallidum / Pteridium aquilinum* High Allegheny Plateau, Western Allegheny Plateau Forest]

24b. Composition is variable depending on site history, canopy is a mixture of *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and *Fagus grandifolia* (American beech)..... **25**

25a. Light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry) occur in subcanopy or canopy; *Betula papyrifera* (paper birch) and *Picea rubens* (red spruce) are occasional minor associates in northern examples; trees 40-100 years old; ground cover may be represented by a diverse range of species based on sites history and disturbance pattern; forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development; widespread throughout northern and central New England; observed in MA and VT. ..... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest]

25b. Canopy composition is a variable mixture of *Quercus rubra* (northern red oak) (usually at least 30% of the canopy), *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), and in some stands *Pinus strobus* (eastern white pine) or *Tsuga canadensis* (eastern hemlock) (conifers generally make up less than 20% of the canopy cover); *Picea rubens* (red spruce) may occur sporadically at the northern extent of this community, and *Nyssa sylvatica* (blackgum) may occur to the south; *Fraxinus americana* (white ash) and/or *Betula alleghaniensis* (yellow birch) are canopy associates; *Acer pensylvanicum* (striped maple) and *Viburnum acerifolium* (mapleleaf viburnum), and *Lindera benzoin* (northern spicebush) are common shrubs; *Aralia nudicaulis* (wild sarsaparilla), *Dennstaedtia punctilobula* (eastern hayscented fern), *Athyrium filix-femina* (common ladyfern), and *Polystichum acrostichoides* (Christmas fern) are common herbs; occurs on sideslopes at low to mid elevations, usually under 550 m (1,800 feet) but can range up to 655 m (2,148 feet); observed in NJ, NY, CT, MA, and VT. ..... **Red Oak - Transitional Northern Hardwood Forest (CEGL006635)**
[*Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest]

26a. Oaks and hickories prevalent in canopy; northern hardwoods generally absent. **27**
26b. Oaks other than *Quercus rubra* (northern red oak) generally sparse to absent; northern hardwoods and/or early-successional trees, such as *Acer rubrum* (red maple), *Prunus serotina* (black cherry), present in abundance. **28**

27a. Acidic, dry oak-hickory forest of the Northeast (from ME to MD) occurring on well-drained loamy sand of midslopes with heath dominated understory where cover of herbs rarely exceeds shrubs; *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and *Quercus velutina* (black oak) prominent in the canopy; *Quercus prinus* (chestnut oak) and *Quercus coccinea* (scarlet oak) are canopy associates in the southern portion of the range; hickories include *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Carya alba* (mockernut hickory), and *Carya ovalis* (red hickory); *Acer saccharum* (sugar maple), *Betula lenta* (sweet birch), and *Nyssa sylvatica* (blackgum) may be common; *Carpinus caroliniana* (American hornbeam), *Ostrya virginiana* (hophornbeam), and *Cornus florida* (flowering dogwood) common understory trees; shrub layer is characterized by *Viburnum acerifolium* (mapleleaf viburnum); *Kalmia latifolia* (mountain laurel) common in some stands; patchy low-shrub layer of *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), and/or *Gaylussacia baccata* (black huckleberry); patchy herb layer with *Solidago caesia* (wreath goldenrod), *Eurybia divaricata* (white wood aster), *Aralia nudicaulis* (wild sarsaparilla), and *Dryopteris marginalis* (marginal woodfern); elevations range from 190-463 m (623-1,519 feet); observed in PA, NJ, CT, and NY and off trail at DEWA; (some CT examples have *Tsuga canadensis* (eastern hemlock) in subcanopy). ..... **Northeastern Dry Oak - Hickory Forest (CEGL006336)**
[*Quercus (alba, rubra, velutina) - Carya* spp. / *Viburnum acerifolium* Forest]
27b. Rich oak-hickory forest dominated by a mixture of *Carya glabra* (pignut hickory), *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and/or *Quercus prinus* (chestnut oak) often with *Acer saccharum* (sugar maple) and *Fraxinus americana* (white ash) over an *Ostrya virginiana* (hophornbeam) subcanopy and grassy herbaceous layer dominated by *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), and/or *Carex lucorum* (Blue Ridge sedge) with *Solidago caesia* (wreath goldenrod), *Solidago bicolor* (white goldenrod), and/or *Deschampsia flexuosa* (wavy hairgrass); tall shrubs include *Viburnum acerifolium* (mapleleaf viburnum) and *Amelanchier arborea* (common serviceberry); *Vaccinium pallidum* (Blue Ridge blueberry) is common short shrub; occurs on low-elevation ridgetops, upper slopes, south- or west-facing sideslopes from 285-478 m (935-1,561 feet); observed in PA, NJ, NY, and CT. ..... **Oak - Hickory / Hophornbeam / Sedge Forest (CEGL006301)**
[*Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum* Forest]

28a. Northern hardwoods and *Quercus rubra* (northern red oak) prevalent; either mature forests or woodlands of talus slopes. **29**
28b. Early-successional species present in quantity. **31**

29a. *Quercus rubra* (northern red oak) and *Betula lenta* (sweet birch) codominant in canopy; acidic large-boulder talus slope woodland occurs in Lower New England and south to the northern Piedmont; low to mid elevations, from near sea level to about 520 m (1,700 feet); observed in PA and NY. ..... **Oak - Birch Talus Slope Woodland (CEGL006585)**
[*Quercus rubra - Betula lenta / Polypodium virginianum* Woodland]
29b. Closed forest, not on talus. **30**

30a. Transitional upland / wetland forest occurring at the base of slopes on the border of wetlands; including *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Fraxinus* (ash) spp., and/or *Quercus rubra* (northern red oak) in the canopy; *Lindera benzoin* (northern spicebush) dominates shrub layer; *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Osmunda claytoniana* (interrupted fern), *Thelypteris palustris* (eastern marsh fern), *Impatiens capensis* (jewelweed), *Aralia nudicaulis* (wild sarsaparilla), and *Symplocarpus foetidus* (skunk-cabbage) common in the herb layer; ranges from Southern New England north to ME; observed in CT. ..... **Upland/Wetland Transitional Forest (CEGL006000)**
[*Quercus rubra - Betula alleghaniensis / Osmunda cinnamomea* Forest]

30b. Setting not transitional to wetlands; strong component of transitional northern hardwood species accompanies *Quercus rubra* (northern red oak) in the canopy; *Acer saccharum* (sugar maple) and *Quercus rubra* (northern red oak) codominant; *Fraxinus americana* (white ash) and/or *Betula alleghaniensis* (yellow birch) are canopy associates; *Acer pensylvanicum* (striped maple), *Viburnum acerifolium* (mapleleaf viburnum), and *Lindera benzoin* (northern spicebush) common shrubs; *Aralia nudicaulis* (wild sarsaparilla), *Dennstaedtia punctilobula* (eastern hayscented fern), *Athyrium filix-femina* (common ladyfern), and *Polystichum acrostichoides* (Christmas fern) common herbs; occurs on sideslopes at low to mid elevations, usually under 550 m (1,800 feet) but can range up to 655 m (2,148 feet); observed in NJ, NY CT, MA, and VT. ..... **Red Oak - Transitional Northern Hardwood Forest (CEGL006635)**
[*Quercus rubra - Acer saccharum / Viburnum acerifolium - Lindera benzoin* Forest]

31a. *Pinus strobus* (eastern white pine) usually present in quantity; mid-successional forests developing after heavy cutting or other disturbance from Delaware Water Gap north to southern New England; emergent *Pinus strobus* (eastern white pine) may be present over a layer of young, small-diameter hardwoods, such as *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Prunus serotina* (black cherry), and oaks, including *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and *Quercus velutina* (black oak); heath shrubs <25% cover; plots off trail at DEWA..... **Mid-Atlantic Mid-Successional Oak - Pine Forest (CEGL006454)**
[*Quercus (rubra, velutina, alba) - Betula lenta - (Pinus strobus*) Forest]

31b. Not as above. **32**

32a. Obviously disturbed and widely variable woody vegetation with mixtures of young, even-aged native and non-native hardwoods, especially *Robinia pseudoacacia* (black locust), *Sassafras albidum* (sassafras), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Acer saccharum* (sugar maple) on calcareous soils, and *Ailanthus altissima* (tree of heaven), any one of which can dominate over small areas; understory heavily invaded by *Rosa multiflora* (multiflora rose), *Celastrus orbiculatus* (Oriental bittersweet), and *Lonicera japonica* (Japanese honeysuckle); can also occur in wet settings such as floodplains and seasonally or temporarily flooded lowlands; many plots off trail throughout Northeast especially at DEWA; observed in NJ, NY, and CT..... **Northeastern Ruderal Hardwood Forest (CEGL006599)**
[*Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana - (Robinia pseudoacacia)* Ruderal Forest]

32b. Successional native forest, not obviously disturbed; composition variable depending on site history; canopy includes *Quercus rubra* (northern red oak) [<25%], *Acer rubrum* (red maple), and *Fagus grandifolia* (American beech) in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry); *Betula papyrifera* (paper birch) and *Picea rubens* (red spruce) minor associates in northern examples; *Pinus strobus* (eastern white pine) may be common to absent; trees 40-100 years old; ground cover may be diverse range of species based on sites history and disturbance; develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or heavily fragmented residential development; widespread throughout northern and central New England; observed in MA and VT. ..... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra* - *Acer rubrum* - *Betula* spp. - *Pinus strobus* Ruderal Forest]

11. Successional and Ruderal Vegetation (including plantations)

1a. Successional, ruderal, or non-native upland vegetation. **2**
1b. Successional, ruderal or non-native wetland vegetation. **19**

2a. Successional fields/meadows/shrublands/woodlands (<60% trees). **3**
2b. Successional or planted forests (>60% cover of canopy/overstory combined). **5**

3a. Shrubland thicket occurring on old fields, pastures, power lines, or otherwise modified lands dominated by native shrubs or an admixture of non-native and native shrubs; small trees (<25% in cover) may be present; old-field grasses, forbs and ferns are common in more open-canopied variants where tall and short shrubs cover at least 25% of the field; wide-ranging in northeastern states; observed off trail at DEWA and on trail in CT and VT. ..... **Northeastern Ruderal Shrubland (CEGL006451)**
[*Elaeagnus umbellata* - *Cornus racemosa* - *Rosa multiflora* - *Juniperus virginiana* Ruderal Shrubland]
3b. Herbaceous-dominated (greater than 50% herbaceous cover) vegetation that has been anthropogenically altered and/or maintained, especially on old fields and pastures frequently disturbed or managed, created and maintained by yearly mowing or grazing. **4**

4a. Old field with variable composition that can include or be dominated by one or more of the following: *Solidago* (goldenrod) spp., *Dactylis glomerata* (orchardgrass), *Phleum pratense* (timothy), *Anthoxanthum odoratum* (sweet vernalgrass), *Festuca* (fescue) spp., *Dichanthelium clandestinum* (deertongue), *Poa pratensis* (Kentucky bluegrass), *Euthamia graminifolia* (flat-top goldentop), *Dennstaedtia punctilobula* (eastern hayscented fern), and other grass, forb, and/or fern species; scattered trees and shrubs possible; wide-ranging in northeastern states; off trail at DEWA; observed in NJ and VT. ..... **Northeastern Old-field Meadow (CEGL006107)**
[*Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Ruderal Meadow Vegetation]
4b. *Schizachyrium scoparium* (little bluestem) dominated field; wide-ranging in northeastern states; observed off trail at DEWA. ..... **Little Bluestem Old-field Meadow (CEGL006333)**
[*Schizachyrium scoparium* - *(Andropogon virginicus)* - *Solidago* spp. Ruderal Meadow]

5a. Canopy dominated by evergreen trees (at least 50% evergreen trees in canopy; generally >75%). **6**
5b. Canopy dominated by hardwood deciduous trees (at least 50% deciduous canopy; conifers generally <25%). **14**

6a. Evergreen portion of canopy dominated by *Pinus* (pine) species or *Tsuga canadensis* (eastern hemlock). **7**
6b. Conifer portion of canopy not dominated by *Pinus* (pine) species. **12**

7a. Multiple *Pinus* (pine) species in the canopy; in uncommon instances, *Tsuga canadensis* (eastern hemlock) may be sole dominant; other conifers sometimes present in smaller amounts; planted in postagricultural fields and pastures; plantations of mixed pines or pine mixed with other non-native planted conifers; common throughout the Northeast; observed off trail at DEWA. ..... **Mixed Pine Conifer Plantation (CST006313)**
[*Pinus* spp. Forest Plantation]
7b. Canopy dominated by *Pinus strobus* (eastern white pine) or *Pinus resinosa* (red pine); greater than 50% of canopy. **8**

8a. Plantations of *Pinus resinosa* (red pine) occurring in various settings and soil types; in older stands, or in canopy gaps, native regeneration includes hardwoods such as *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), and *Fagus grandifolia* (American beech), as well as the conifers *Pinus strobus* (eastern white pine), *Picea rubens* (red spruce), and/or *Tsuga canadensis* (eastern hemlock); observed in VT. ..... **Red Pine Plantation (CST007177)**
[*Pinus resinosa* Forest Plantation]
8b. Planted and successional stands of *Pinus strobus* (eastern white pine)..... **9**

9a. Multiple *Pinus* (pine) species in the canopy; in uncommon instances, *Tsuga canadensis* (eastern hemlock) may be sole dominant; other conifers sometimes present in smaller amounts; planted in postagricultural fields and pastures; plantations of mixed pines or pine mixed with other non-native planted conifers; common throughout the Northeast; observed off trail at DEWA. .... **Mixed Pine Conifer Plantation (CST006313)**
[*Pinus* spp. Forest Plantation]
9b. Canopy dominated by *Pinus strobus* (eastern white pine); greater than 50% of canopy. **10**

10a. Composition is variable depending on site history; canopy is a mixture of *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and *Fagus grandifolia* (American beech); *Quercus rubra* (northern red oak) is often present, but occurring at <25% relative cover; occurs in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry); *Betula papyrifera* (paper birch) and *Picea rubens* (red spruce) are occasional minor associates in northern examples; trees 40-100 years old; ground cover may be represented by a diverse range of species based on sites history and disturbance pattern; forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development; widespread throughout northern and central New England; observed in MA and VT..... ..... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest]
10b. Planted and successional stands of *Pinus strobus* (eastern white pine) or as in some VT stands, successional *Tsuga canadensis* (eastern hemlock) is replacing eastern white pine in the canopy. **11**

11a. *Pinus strobus* (eastern white pine) plantations; observed in CT..... ..... **Eastern White Pine Plantation (CST007178)**
[*Pinus strobus* Forest Plantation]
11b. Successional stands of *Pinus strobus* (eastern white pine) [or as in some VT sites, successional *Tsuga canadensis* (eastern hemlock) is replacing eastern white pine in the canopy]; *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Fraxinus americana* (white ash), and/or *Prunus serotina* (black cherry) may be common in canopy and/or subcanopy; observed in CT and VT..... ..... **Ruderal Eastern White Pine Forest (CEGL007944)**
[*Pinus strobus* Ruderal Forest]

12a. *Juniperus virginiana* (eastern red-cedar) dominant; can also be a woodland..... ..... **Northeastern Ruderal Red-cedar Forest (CEGL006024)**
[*Juniperus virginiana* Ruderal Forest]
12b. *Picea* (spruce) sp. and/or *Abies balsamea* (balsam fir) dominant. **13**

13a. *Picea* (spruce) sp. plantations dominated by *Picea abies* (Norway spruce) or *Picea glauca* (white spruce), and/or a combination of spruce species. .... **Norway Spruce Plantation (CST007167)**
[*Picea abies* Forest Plantation]

13b. Successional mixed spruce-fir-hardwoods forest made up of *Picea rubens* (red spruce) and *Abies balsamea* (balsam fir) and early-successional trees including *Acer rubrum* (red maple), *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), and *Betula papyrifera* (paper birch), or, less commonly, *Betula populifolia* (gray birch) or *Betula papyrifera* var. *cordifolia* (mountain paper birch) as well as *Fagus grandifolia* (American beech); *Acer pensylvanicum* (striped maple) characteristic shrub; common herbs include *Uvularia sessilifolia* (sessileleaf bellwort), *Maianthemum canadense* (Canada mayflower), and *Trientalis borealis* (starflower) in northern New England and NY; observed in MA and VT..... **Successional Mixed Spruce - Fir - Hardwood Forest (CEGL006505)**
[*Picea rubens - Abies balsamea - Betula* spp. - *Acer rubrum* Forest]

14a. Composition is variable depending on site history; canopy is a mixture of *Quercus rubra* (northern red oak) [<25%], *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), and occasionally *Pinus strobus* (eastern white pine) occurring in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry); *Betula papyrifera* (paper birch) and *Picea rubens* (red spruce) are occasional minor associates in northern examples; trees 40-100 years old; ground cover may be represented by a diverse range of species based on sites history and disturbance pattern; forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development; widespread throughout northern and central New England; observed in MA and VT. ..... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest]

14b. Oak uncommon in canopy; stand with variable mixtures of young even-aged native and/or non-native hardwoods. **15**

15a. Obviously disturbed forests comprised of non-native (*Ailanthus altissima* (tree of heaven), *Robinia pseudoacacia* (black locust)) and/or early-successional native trees (*Acer rubrum* (red maple), *Prunus serotina* (black cherry), *Juglans nigra* (black walnut), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree)); vines often rampant..... **16**

15b. Early-successional forests comprised mainly of native trees; occurring as monotypic stands or mixtures..... **17**

16a. Canopy strongly dominated by either *Ailanthus altissima* (tree of heaven), *Liriodendron tulipifera* (tuliptree), or *Juglans nigra* (black walnut). ..... **Ruderal Tree-of-Heaven Forest (CEGL007191)**
[*Ailanthus altissima* Ruderal Forest]
OR
Ruderal Tuliptree Forest (Rich Type) (CEGL007220)
[*Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Ruderal Forest]
OR
Ruderal Black Walnut Forest (CEGL007879)
[*Juglans nigra / Verbesina alternifolia* Ruderal Forest]

16b. *Ailanthus altissima* (tree of heaven), *Liriodendron tulipifera* (tuliptree), or *Juglans nigra* (black walnut) absent or mixed with other tree species; *Robinia pseudoacacia* (black locust), *Sassafras albidum* (sassafras), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Acer saccharum* (sugar maple) on calcareous soils, *Populus deltoides* (eastern cottonwood), and *Ailanthus altissima* (tree of heaven), any one of which can dominate over small areas; understory heavily invaded by *Rosa multiflora* (multiflora rose), *Celastrus orbiculatus* (Oriental bittersweet), and *Lonicera japonica* (Japanese honeysuckle), *Berberis thunbergii* (Japanese barberry); generally an upland forest, but can occur in wet settings such as floodplains and seasonally or temporarily flooded lowlands; common throughout all northeastern states; many plots off trail throughout the Northeast especially at DEWA; observed on trail in NJ, NY and CT. ..... **Northeastern Ruderal Hardwood Forest (CEGL006599)**
[*Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana - (Robinia pseudoacacia)* Ruderal Forest]

17a. *Betula lenta* (sweet birch) and/or *Acer rubrum* (red maple) abundant; *Betula alleghaniensis* (yellow birch) and *Acer saccharum* (sugar maple) absent or minor; successional even-aged, nearly pure *Betula lenta* (sweet birch) and *Acer rubrum* (red maple) in canopy with dense *Lycopodium* (clubmoss) sp. or *Dennstaedtia punctilobula* (eastern hayscented fern) ground cover; distribution is centered in the Central Appalachians but extends north to NY, NJ and PA; observed off trail at DEWA and observed in NY..... **Central Appalachian Ruderal Sweet Birch - Red Maple Forest (CEGL008503)**
[*Betula lenta - Acer rubrum / Lycopodium annotinum - Dennstaedtia punctilobula* Ruderal Forest]
17b. Northern hardwood (*Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Betula alleghaniensis* (yellow birch)) or northern early-successional [*Populus grandidentata* (bigtooth aspen), *Populus tremuloides* (quaking aspen), *Populus balsamifera* (balsam poplar), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch)] trees abundant..... **18**

18a. Early-successional variant of widespread typic northern hardwood forest occurring on acidic soils in central New England and at lower elevations in northern New England and upstate NY; either monotypic *Acer saccharum* (sugar maple), or dominated by some combination of young, small-diameter *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech) and/or *Betula papyrifera* (paper birch); arises from cutting; disturbed shrub layer with exotics or no shrub layer; herb layer patchy and most often a mix of ferns, clubmosses (Lycopodiaceae), and other herbs. ..... **Ruderal Sugar Maple - Northern Hardwood Forest (CEGL006628)**
[*Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest]
18b. Successional northern hardwoods dominated by some combination of *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Populus alba* (white poplar), *Betula papyrifera* (paper birch), and/or *Betula populifolia* (gray birch); *Populus balsamifera* (balsam poplar), *Acer rubrum* (red maple), *Prunus serotina* (black cherry), and/or *Prunus pensylvanica* (pin cherry) may also be common; shrub layer can be sparse or include *Lonicera morrowii* (Morrow's honeysuckle), *Frangula alnus* (glossy buckthorn), *Rubus* (blackberry) spp., and/or *Viburnum dentatum* (southern arrow-wood); old-field grasses and forbs and/or herbs typical of northern hardwood forests common in herb layer; ranges from closed-canopy forests or open woodlands; observed in MA and VT. ..... **Ruderal Aspen - Birch Woodland (CEGL006303)**
[*Populus (tremuloides, grandidentata) - Betula (populifolia, papyrifera)* Ruderal Woodland]

19a. Wetland shrub-dominated vegetation. **20**
19b. Wetland herbaceous and aquatic vegetation. **22**

20a. Successional wet meadow vegetation dominated by *Spiraea* (spirea) spp. and *Rubus* (blackberry) spp. with variable combinations of wetland old-field species such as *Phalaris arundinacea* (reed canarygrass), *Juncus effusus* (common rush), *Thelypteris palustris* (eastern marsh fern),*Onoclea sensibilis* (sensitive fern), *Solidago* (goldenrod) spp., *Impatiens capensis* (jewelweed), *Lycopus uniflorus* (northern bugleweed), and *Lythrum salicaria* (purple loosestrife); ranges from shrub thicket to herbaceous meadow with scattered shrubs; occurs in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands; known throughout the Northeast; observed off trail at DEWA; observed from NJ north; applied to manmade and beaver meadows. ..... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa - Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]
20b. Tall successional shrub swamps (2-4 m). **21**

21a. Highly variable successional wet shrubland occurring in low-lying areas of old fields or pastures, or the edges of beaver-impacted wetlands or impoundments; vegetation can include *Cornus amomum* (silky dogwood), *Cornus sericea* (red-osier dogwood), *Viburnum dentatum* (southern arrow-wood), *Spiraea alba* var. *latifolia* (white meadowsweet), *Rosa multiflora* (multiflora rose), *Rubus allegheniensis* (Allegheny blackberry), and *Rubus hispidus* (bristly dewberry) typically present and abundant; *Salix* (willow) spp. may also be present but are less common..... **Ruderal Dogwood - Arrow-wood Shrub Swamp (CEGL006576)**
[*Cornus (amomum, sericea) - Viburnum dentatum - Rosa multiflora* Ruderal Shrub Swamp]
21b. Alder swamps of saturated basins, beaver-impacted wetlands and small, low-velocity streams dominated by *Alnus incana* (gray alder); northern species such as *Nemopanthus mucronatus* (catberry) and *Myrica gale* (sweetgale) differentiate this type; other shrubs, such as *Cornus sericea* (red-osier dogwood), *Rubus idaeus* (American red raspberry), *Salix* (willow) spp., *Spiraea alba* (white meadowsweet), *Spiraea tomentosa* (steeplebush), and *Viburnum* (viburnum) spp., are common; if occurring adjacent to a high-velocity stream or river or an active floodplain consider CEGL006062 in the Alluvial Vegetation Key; throughout the northeastern United States; observed in MA and VT on trail..... **Gray Alder Shrub Swamp (CEGL002381)**
[*Alnus incana* Shrub Swamp]

22a. Aquatic vegetation of ponds and lakes; dominants are usually submerged macrophytes or floating-leaved pondweeds; observed in NJ. ..... **Water-lily Aquatic Wetland (CEGL002386)**
[*Nuphar advena - Nymphaea odorata* Aquatic Vegetation]
22b. Herbaceous vegetation. **23**

23a. Vegetation of wet meadows; with variable combinations of wetland old-field species such as *Phalaris arundinacea* (reed canarygrass), *Juncus effusus* (common rush), *Thelypteris palustris* (eastern marsh fern),*Onoclea sensibilis* (sensitive fern), *Solidago* (goldenrod) spp., *Impatiens capensis* (jewelweed), *Lycopus uniflorus* (northern bugleweed), and *Lythrum salicaria* (purple loosestrife); *Spiraea* (spirea) spp. and *Rubus* (blackberry) spp. common; ranges from herbaceous meadow with scattered shrubs to shrub thicket; occurs in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands; known throughout the Northeast; observed off trail at DEWA and from NJ north; applied to manmade and beaver meadows. ..... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa - Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]
23b. Marshes. **24**

24a. *Phalaris arundinacea* (reed canarygrass) marsh found in basin wetlands and along rivershores; other species present may include *Solidago canadensis* (Canada goldenrod), *Impatiens capensis* (jewelweed), *Onoclea sensibilis* (sensitive fern), *Euthamia graminifolia* (flat-top goldentop), and *Eupatorium maculatum* (spotted joe-pye-weed) occurs throughout the northeastern United States; observed in NJ, NY, and MA and at DEWA off trail. ..... **Eastern Ruderal Reed Canarygrass Marsh (CEGL006044)**
[*Phalaris arundinacea* Eastern Ruderal Marsh]

24b. *Phragmites australis* ssp. *australis* (European common reed) marsh. ..... **Eastern Ruderal Common Reed Marsh (CEGL004141)**
[*Phragmites australis* ssp. *australis* Eastern Ruderal Marsh]

Field Key to Vegetation Associations of the Northern Appalachian Project Area

This field key provides classification to USNVC associations that were identified during the APPA vegetation mapping project for the NAP project area (see Figure D–4 in the "Key to Field Keys by Project Area"). The NAP project area includes APPA lands between the Connecticut River (Vermont-New Hampshire State line between Norwich, Vermont, and Hanover, New Hampshire) and the northern terminus of the AT corridor on Baxter Peak of Mount Katahdin in Maine.

Notes about Scale for the Northern Appalachian Project Area

All forest associations were mapped to a 0.5-ha MMU (a circle with a 40-m radius) and all nonforest associations were mapped to a 0.25-ha MMU (a circle with a 28-m radius) with the exception of alpine vegetation. Vegetation associations in the alpine zones (Mount Moosilauke, Mount Lafayette area, Mount Guyot, the Presidential Range, South Peak, East Peak, Saddleback Mountain, the Bigelow Range, and Mount Katahdin) were mapped to a 0.125-ha MMU (a circle with a 20-meter radius).

Key to Keys for the Northern Appalachian Project Area

1a. Wetland vegetation including alluvial vegetation and sparse vegetation alongside rivers **2**
1b. Upland vegetation. **6**

2a. Wetland vegetation dominated by trees, shrubs, forbs, grasses, and/or vines strongly altered by recent human disturbance, dominated by disturbance-oriented (ruderal) native species and/or non-native species, often in monotypic stands. ..... **Successional and Ruderal Vegetation (Key #10, p. D-208)**
2b. Wetland vegetation, dominated by trees, shrubs, forbs, grasses, and/or vines *not* altered by recent human disturbance. **3**

3a. Alluvial forests, woodlands, shrublands and herbaceous communities occurring along banks or channels of rivers and streams and adjacent levees and bottomlands, at least occasionally flooded; also beaver pond areas that are part of larger alluvial systems. ..... **Alluvial Vegetation (Key #1, p. D-167)**
3b. Non-alluvial palustrine vegetation. **4**

4a. Forested and wooded wetlands (canopy cover ≥10%) including seepage-fed beaver pond impoundments, bottomlands, poorly-drained depressions, wooded and forested bogs, fens, and basin swamps; and small-patch herbaceous seeps, sparse vegetation of vernal pools, and nonvascular wetland vegetation dominated by *Sphagnum* (sphagnum moss) occurring under forest canopy; substrate is saturated to the surface by groundwater for extended periods during the growing season or seepage-fed; rarely, if ever, flooded by alluvial waters. ..... **Forested and Wooded Wetlands (Key #2, p. D-170)**
4b. Non-forested wetland communities (tree canopy cover ≤10%), including wooded marshes, shrub swamps, bogs, fens, herbaceous-dominated wetlands, with deep saturated soils or seasonally flooded soils, and aquatic vegetation. **5**

5a. Wetland vegetation dominated by shrubs (≥50% shrub cover) or with scattered tree cover (≤10%). ..... **Shrub Swamps, Bogs, and Fens (Key #3, p. D-175)**
5b. Wetland vegetation dominated by herbaceous species (>50% cover)..... **Herbaceous Wetlands and Aquatic Vegetation (Key #4, p. D-179)**
6a. One or more layers of the vegetation's structure and/or composition determined by regular human activity such as planting, tilling, cropping, mowing, and/or irrigating; vegetation dominated by even-aged trees, shrubs, forbs, grasses, and/or vines strongly altered by recent (often anthropogenic) disturbance; trees typically less than 80 years old; community develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development; dominated by disturbance-oriented (ruderal) native and/or non-native species, often in monotypic stands; includes also evergreen plantations, pine successional forests, light-requiring, wind-dispersed trees common; successional shrublands, and old fields. ..... **Successional and Ruderal Vegetation (Key #10, p. D-208)**
6b. Vegetation structure and/or composition determined by a spontaneously growing set of plant species shaped by ecological processes. **7**

7a. Non-forested or non-wooded vegetation and sparse vegetation (tree canopy cover ≤10%)..... **8**
7b. Forested and woodland vegetation (tree canopy cover ≥10%)..... **9**

8a. Shrublands, grasslands, nonvascular vegetation (such as lichens), or bare rock in alpine and subalpine settings, mid-elevation talus slopes, lower elevation barrens, cliffs, and sparse vegetation. Only alpine vegetation is restricted to the peaks listed in the Notes and Comments section. ..... **Open Alpine and Subalpine Vegetation, Lower Elevation Balds, Barrens, Cliffs, and Sparse Vegetation (Key #5, p. D-183)**
8b. Shrublands or grasslands of lower elevations without substantial areas of exposed rock; successional or altered (ruderal) vegetation resulting from human disturbance..... **Successional and Ruderal Vegetation (Key #10, p. D-208)**

9a. Woodlands (10-60% tree canopy cover)..... **Upland Woodlands (Key #6, p. D-190)**
9b. Forests (>60% tree canopy cover)[35]. **10**

10a. Evergreen or mixed evergreen-deciduous forest canopies (deciduous trees less than 75% cover). **11**
10b. Deciduous and mixed canopies; deciduous trees such as northern hardwoods or early-successional hardwoods dominate canopy; spruces, pines and hemlock generally absent to minor..... **12**

11a. Spruce- and fir-dominated forests and woodlands or mixed stands of softwood and hardwood forests..... **Spruce and/or Fir Upland Woodlands and Forests (Key #7, p. D-193)**
11b. Pine- and/or hemlock-dominated and mixed canopies. ..... **Hemlock, Mixed Hemlock, Pine, and Mixed Pine Upland Forests (Key #8, p. D-197)**

[35]Typically >60% tree cover, except in obvious cases of severe disturbance from gypsy moth, hemlock woolly adelgid, windstorms, etc. Such disturbed stands are quite common. Key users should try to key to the pre-disturbance association if possible or identify the new, postdisturbance association if the pre-disturbance association diagnostic species are absent.

12a. Northern hardwoods such as *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), and/or mesophytic tree species [e.g., *Tilia americana* (American basswood)], *Fraxinus americana* (white ash), may be codominant in canopy; forests with *Quercus rubra* (northern red oak) may also be present. ..... **Northern Hardwood Upland Forests (Key #9, p. D-201)**

12b. Early-successional species such as *Acer rubrum* (red maple), *Betula papyrifera* (paper birch), *Populus* (cottonwood) spp. and/or *Prunus serotina* (black cherry) dominate canopy; canopy dominated by native or non-native deciduous and/or conifer species; includes heavily invaded forests; altered (ruderal) forests and plantations resulting from human disturbance. ..... **Successional and Ruderal Vegetation (Key #10, p. D-208)**

1. Alluvial Vegetation

1a. Forested communities, with greater than 40% tree canopy coverage. **2**
1b. Woodlands, shrublands, and herbaceous communities along narrow river margins; scattered trees (up to 10% cover) possible..... **5**

2a. *Acer saccharinum* (silver maple) strongly dominant, forming a high, arching canopy; shrubs sparse; typically along medium to large rivers. **3**
2b. Floodplain forest canopy within an abundance of *Acer saccharum* (sugar maple) and/or *Fraxinus* (ash) spp. in the canopy; *Acer saccharinum* (silver maple) minor or absent. **4**

3a. *Matteuccia struthiopteris* (ostrich fern) or *Laportea canadensis* (Canadian woodnettle) prominent in the herb layer; *Populus deltoides* (eastern cottonwood) may be present; associated with coarse soils and a relatively short flood duration; along trail in VT near White River; possible in ME. .... **Silver Maple Floodplain Levee Forest (CEGL006147)**
[*Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Floodplain Forest]
3b. *Onoclea sensibilis* (sensitive fern) and/or *Boehmeria cylindrica* (small-spike false nettle) dominant in lush ground layer; low-positioned *Acer saccharinum* (silver maple) floodplain forest with large, widely-spaced canopy trees; few to no shrubs; typical of riverbottoms, lakeplains, and the inner floodplain of medium to large rivers (third- or fourth-order), mostly at less than 245 m (800 feet) elevation; at Katahdin Iron Works and along the Penobscot River in ME..... ..... **Silver Maple Floodplain Bottom Forest (Sensitive Fern Type) (CEGL006176)**
[*Acer saccharinum / Onoclea sensibilis - Boehmeria cylindrica* Floodplain Forest]

4a. Forests on terraces or plains of lower-gradient portions of rivers, often in areas of circumneutral to calcareous bedrock, soils usually silt loams; canopy dominants include *Acer saccharum* (sugar maple) and/or *Fraxinus americana* (white ash) with associates *Acer rubrum* (red maple), *Tilia americana* (American basswood), *Quercus rubra* (northern red oak), *Ulmus americana* (American elm), *Juglans cinerea* (butternut), and *Prunus serotina* (black cherry); *Acer negundo* (box-elder) and *Juglans cinerea* (butternut) often present in younger stands; diverse herb layer with *Matteuccia struthiopteris* (ostrich fern) prominent and usually with richness indicators such as *Ageratina altissima* (white snakeroot), *Solidago flexicaulis* (zigzag goldenrod), *Allium tricoccum* (ramp), *Elymus hystrix* (eastern bottlebrush grass), or *Elymus wiegandii* (Wiegand's wildrye); CT north to ME; observed in ME at 180 m (600 feet). .... **Terrace Hardwood Floodplain Forest (CEGL006114)**
[*Acer saccharum - Fraxinus* spp. - *Tilia americana / Matteuccia struthiopteris - Ageratina altissima* Floodplain Forest]
4b. Floodplains forests of higher-gradient, somewhat flashy reaches; soils are alluvial sands or sandy loams over coarser substrates; *Acer saccharum* (sugar maple) and *Ostrya virginiana* (hophornbeam) characteristic; other northern hardwoods such as *Fagus grandifolia* (American beech) or *Betula alleghaniensis* (yellow birch) may be present; rich-site species are absent or minor; common herbs include *Thelypteris noveboracensis* (New York fern), *Osmunda claytoniana* (interrupted fern), and *Uvularia sessilifolia* (sessileleaf bellwort). *Brachyelytrum erectum* (bearded shorthusk) is a frequently present grass. Observed in ME; plot elevations range from 177 to 483 m (580-1,586 feet).. ..... **High-gradient Hardwood Floodplain Forest (CEGL006504)**
[*Acer saccharum / Ostrya virginiana / Brachyelytrum erectum* Floodplain Forest]

5a. Woodlands and shrublands. **6**
5b. Herbaceous communities. **7**

6a. Riparian shrublands occurring on river-margin alluvial deposits of moderate -to high-energy river reaches, where the flooding regime prevents forests from developing; on mineral soils that are flooded in spring but may be fairly dry by midsummer; *Alnus* (alder) spp. occurring in the greatest abundance; *Clematis virginiana* (devil's darning needles), *Boehmeria cylindrica* (small-spike false nettle), *Matteuccia struthiopteris* (ostrich fern), *Elymus virginicus* (Virginia wildrye), and *Osmunda claytoniana* (interrupted fern) are characteristic; floodplain trees such as *Ulmus americana* (American elm) may be occasional; observed in NH and ME; plot/obs point elevations ranges from 396 to 478 m (1,300-1,568 feet). ..... **Alluvial Alder Thicket (CEGL006062)**
[*Alnus incana - Cornus (amomum, sericea) / Clematis virginiana* Shrub Swamp]
6b. Alder-dominated swamp occurring in saturated basins settings, in association with beaver-impacted wetlands, and/or alongside small, low-velocity streams dominated by *Alnus incana* (gray alder); *Rubus pubescens* (dwarf red blackberry) common; *Carex stricta* (upright sedge) and other wetland *Carex* (sedge) spp. along with a diversity of *Symphyotrichium* (asters), *Osmunda cinnamomea* (cinnamon fern), *Thelypteris palustris* (marsh fern), and *Impatiens capensis* (orange jewelweed); mosses include *Climacium dendroides* (tree climacium moss) and *Sphagnum* (sphagnum moss) spp.; widespread in the northeastern United States; elevations range from 177 to 354 m (580-1,160 feet). ..... **Gray Alder Shrub Swamp (CEGL002381)**
[*Alnus incana* Shrub Swamp]

7a. Sites with medium to high flow gradient, coarse substrate (rocky or gravelly). **8**
7b. Low gradient shores with silt, sand, or muck substrate. **10**

8a. *Carex torta* (twisted sedge) diagnostic, and prairie grasses such as *Sorghastrum nutans* (Indiangrass) and *Andropogon gerardii* (big bluestem) often present; occurring on large coarse substrates deposited along medium- to high-energy river channels and, less frequently, exposed lakeshores with heavy wave action; seasonal flooding and ice-scour maintain the open nature; observed in ME. ..... **Northeastern Temperate Cobble Scour Rivershore (CEGL006536)**
[*Carex torta - Apocynum cannabinum - Cyperus* spp. Riverbed Vegetation]
8b. Vegetation dominated by a combination of species. **9**

9a. Riverside grasslands dominated by tall prairie grasses such as *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass), and *Schizachyrium scoparium* (little bluestem); generally occurs along major rivers in flood-scoured areas; along the Pemigewassett and Connecticut rivers in NH but not within the AT corridor in NH. ..... **Riverside Prairie Grassland (CEGL006518)**
[*Prunus pumila / Andropogon gerardii - Sorghastrum nutans* Wet Meadow]
9b. Herb-dominated, constantly saturated, rivershore seeps that develop on discharge areas of the shores of larger rivers in the glaciated Northeast; **circumneutral groundwater** discharge a fen supports -like aspect, but on mineral rather than peat soils; semi-open conditions maintained by ice-scouring and floodwaters; herbaceous species include *Lobelia kalmii* (Ontario lobelia), *Parnassia glauca* (fen grass of Parnassus), *Platanthera dilatata* (scentbottle), *Packera paupercula* (balsam groundsel), *Triantha glutinosa* (sticky tofieldia), *Equisetum variegatum* (variegated scouringrush), *Spiranthes lucida* (shining ladies'-tresses), *Spiranthes romanzoffiana* (hooded ladies'-tresses), *Carex garberi* (elk sedge), *Carex viridula* (little green sedge), *Carex flava* (yellow sedge), *Rhynchospora capillacea* (needle beaksedge), *Rhynchospora capitellata* (brownish beaksedge), *Mentha arvensis* (wild mint), and others; *Dasiphora fruticosa* ssp. *floribunda* (shrubby-cinquefoil), variegated *Alnus*

(alder) spp., *Cornus sericea* (red-osier dogwood), and *Calamagrostis canadensis* (bluejoint); occurs where White River crosses AT in VT; documented globally in ME, NH, VT, and NY; but does not occur in the AT corridor in NH..... **Boreal Circumneutral Riverside Seep (CEGL006142)**
[*Triantha glutinosa* - *Carex garberi* Riverscour Wet Meadow]

10a. Successional mixed wet meadow - shrubby vegetation of the low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands; *Spiraea* (spirea) spp. and *Rubus* (blackberry) spp. are characteristic shrubs; variable composition can include wetland old-field species such as *Phalaris arundinacea* (reed canarygrass), *Juncus effusus* (common rush), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Solidago* (goldenrod) spp., *Impatiens capensis* (jewelweed), *Lycopus uniflorus* (northern bugleweed), and *Lythrum salicaria* (purple loosestrife); known throughout the Northeast. ..... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]
10b. Graminoids dominant. **11**

11a. Seasonally flooded **grass-**dominated marshes with *Calamagrostis canadensis* (bluejoint) predominant graminoid; *Carex utriculata* (Northwest Territory sedge), *Carex stricta* (upright sedge), and *Glyceria canadensis* (rattlesnake mannagrass) may be codominant to dominant at some sites; total herbaceous cover ranges from 40-80%; shrubs such as *Alnus incana* (gray alder), *Spiraea tomentosa* (steeplebush), and *Chamaedaphne calyculata* (leatherleaf) are common at low cover; 3 plots in the NAP project area. ..... **Mixed Graminoid Wet Meadow (CEGL006519)**
[*Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow]
11b. Seasonally flooded **sedge** dominated marshes; *Carex stricta* (upright sedge) (>15% coverage) dominant; other common herbaceous species include *Carex vesicaria* (blister sedge), *Scirpus* (bulrush) spp., *Carex canescens* (silvery sedge), *Triadenum virginicum* (Virginia marsh St. Johnswort), and *Sparganium americanum* (American bur-reed); scattered, and other wetland shrubs possible; occurs in seasonally flooded basins or on stream or lake margins; substrate is muck or peat of variable depth overlying mineral soil; common throughout the Northeast. ..... **Eastern Upright Sedge Wet Meadow (CEGL006412)**
[*Carex stricta* - *Carex vesicaria* Wet Meadow]

2. Forested and Wooded Wetlands[36]

1a. Forested wetlands dominated by conifers; hardwoods may be present, but generally <50% total cover. **2**
1b. Forested wetlands characterized by hardwoods; conifers may be present, but <50% total cover... **9**

2a. *Thuja occidentalis* (arborvitae) is abundant in wetland forest canopy. **3**
2b. *Picea* (spruce) spp., *Abies* (fir), and/or *Tsuga canadensis* (eastern hemlock) dominant or codominant in canopy. **5**

3a. Canopy more open (usually <50%), partially wooded fens dominated by *Thuja occidentalis* (arborvitae), that are part of a larger peatland vegetation complex; heath shrubs or other dwarf-shrubs usually >15% cover; *Picea mariana* (black spruce), *Larix laricina* (tamarack), *Abies balsamea* (balsam fir), and *Acer rubrum* (red maple) canopy and subcanopy associates; tall-shrub layer characterized by *Alnus incana* (gray alder), *Ilex verticillata* (common winterberry), and *Viburnum nudum* (possumhaw); dwarf-shrubs typically include *Vaccinium angustifolium* (lowbush blueberry), *Kalmia angustifolia* (sheep laurel), and *Gaylussacia baccata* (black huckleberry); herbaceous layer includes *Maianthemum trifolium* (threeleaf false lily of the valley), *Carex trisperma* (three-seeded sedge), *Carex stricta* (upright sedge), *Calamagrostis canadensis* (bluejoint), *Osmunda cinnomomea* (cinnamon fern), *Coptis trifolia* (threeleaf goldthread), *Onoclea sensibilis* (sensitive fern), and *Osmunda regalis* (royal fern); observed in ME; plot elevations are 344 m and 415 m (1,130-1,360 feet). ..... **Northern White-cedar Wooded Fen (CEGL006507)**
[*Thuja occidentalis - Abies balsamea / Ledum groenlandicum / Carex trisperma* Swamp Woodland]
3b. Closed or nearly closed-canopy forests (almost always >60% canopy). **4**

4a. Basin peatland dominated by *Thuja occidentalis* (arborvitae) with canopy associates including *Picea mariana* (black spruce), *Abies balsamea* (balsam fir), and *Larix laricina* (tamarack); shrubs include *Lonicera canadensis* (American fly honeysuckle), *Ilex verticillata* (common winterberry), and *Nemopanthus mucronatus* (catberry) with heaths <15%; herb layer is often diverse with *Gaultheria hispidula* (creeping snowberry), *Carex trisperma* (three-seeded sedge), *Carex disperma* (softleaf sedge), *Linnaea borealis* (twinflower), *Mitella nuda* (naked miterwort), *Mitella diphylla* (twoleaf miterwort), and others; *Sphagnum* (sphagnum moss) abundant; usually in poorly-drained basins where they may occupy most of the basin, rather than occurring as part of a larger peatland vegetation complex; observed in ME..... **Northern White-cedar Peatland Swamp Forest (CEGL006007)**
[*Thuja occidentalis / Sphagnum (girgensohnii, warnstorfii)* Swamp Forest]
4b. *Thuja occidentalis* (arborvitae) seepage forest; *Thuja occidentalis* (arborvitae) either clearly dominant or mixed with *Picea rubens* (red spruce), *Abies balsamea* (balsam fir), and/or *Betula alleghaniensis* (yellow birch) or *Fraxinus* (ash) spp.; *Alnus incana* (gray alder) dominant shrub on wetter sites; characteristic herbs include *Tiarella cordifolia* (heartleaf foamflower), *Ranunculus hispidus* var. *nitidus* (bristly buttercup), *Solidago rugosa* (wrinkleleaf goldenrod), *Doellingeria umbellata* (parasol whitetop), *Chrysosplenium americanum* (American golden saxifrage), and *Symphyotrichum puniceum* (purplestem aster); non-*Sphagnum* (sphagnum moss) mosses abundant;

[36]Includes wooded swamps; wooded fens; forested bogs; vernal pools and Sphagnum-dominated vegetation with tree cover >10%. Herbaceous seeps under forest canopy are covered in Section 4: Non-Alluvial Herbaceous Wetlands and Aquatic Vegetation.

forests on gentle to moderate slopes with groundwater seepage maintaining moist to saturated conditions; mineral soils with little peat accumulation, or rocky/bouldery substrates near lakes and rivers; most often where the substrate is not strongly acidic; observed in ME..... .....**Northern White-cedar - Spruce Seepage Forest (CEGL006175)**
[*Thuja occidentalis - (Picea rubens) / Tiarella cordifolia* Swamp Forest]

5a. Forested wetlands characterized by *Tsuga canadensis* (eastern hemlock); mixed hardwood - hemlock (≤25% of canopy) [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple) - *Tsuga canadensis* (eastern hemlock) - *Abies balsamea* (balsam fir)] wetland forest occurring in seepage-influenced areas, at wetland-upland ecotones, along streamsides, on gentle to moderate slopes with hydric minerals soils and/or shallow muck soils; herbaceous layer indicative of semi-nutrient-enriched conditions seepage, including such species such as *Glyceria* (mannagrass) spp. (*Glyceria melicaria* (melic mannagrass) and *Glyceria striata* (fowl mannagrass), *Rubus pubescens* (dwarf red blackberry), *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians. Balsam fir replaces hemlock as the dominant conifer in these sites moving northward.. .....**Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]
5b. *Picea* (spruce) spp. and/or *Abies balsamea* (balsam fir) dominant or codominant. **6**

6a. *Picea mariana* (black spruce) bog of sub-boreal peatland systems with both wooded and open portions from central NH north through ME; *Picea mariana* (black spruce) is often the sole species in the canopy and may be stunted; *Larix laricina* (tamarack) may be a canopy associate; dwarf-shrub layer includes a mixture of *Myrica gale* (sweetgale), *Ledum groenlandicum* (bog Labrador-tea), *Chamaedaphne calyculata* (leatherleaf), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Vaccinium oxycoccos* (small cranberry), *Kalmia polifolia* (bog laurel), *Kalmia angustifolia* (sheep laurel), *Gaultheria hispidula* (creeping snowberry), and *Andromeda polifolia* (bog rosemary); ground cover includes *Carex trisperma* (three-seeded sedge), *Eriophorum vaginatum* (tussock cottongrass), *Maianthemum trifolium* (threeleaf false lily of the valley), and a *Sphagnum* (sphagnum moss) carpet; observed in NH. .....**Black Spruce Open Bog Woodland (CEGL002485)**
[*Picea mariana / Ledum groenlandicum / Carex trisperma / Sphagnum* spp. Open Bog Woodland]
6b. *Picea rubens* (red spruce) dominant or codominant with or without *Abies balsamea* (balsam fir) **7**

7a. Open to closed mostly evergreen dominated near-boreal acidic basin swamp; *Picea rubens* (red spruce) dominates the canopy with minor amounts of *Acer rubrum* (red maple) (though hardwoods can exceed 25% cover) and *Tsuga canadensis* (eastern hemlock); *Nemopanthus mucronatus* (catberry) dominant shrub; other shrubs present at low cover may include *Alnus incana* ssp. *rugosa* (speckled alder), *Amelanchier canadensis* (Canadian serviceberry), *Ilex verticillata* (common winterberry), and *Viburnum nudum* var. *cassinoides* (withe-rod); herbaceous layer dominated by *Osmunda cinnamomea* (cinnamon fern) in association with other forbs and graminoids; *Sphagnum* (sphagnum moss) are prominent in the ground layer and may exceed 80% cover; observed in NH and ME; plot/obs point elevations range from 511 to 740 m (1,678-2,427 feet). ....**Red Spruce - Red Maple Acidic Swamp Forest (CEGL006198)**
[*Picea rubens - Acer rubrum / Nemopanthus mucronatus* Swamp Forest]
7b. Coniferous dominated spruce-fir swamps and flats with <25% hardwood. **8**

8a. Typic, Northern Appalachians endemic red spruce swamp; usually closed-canopy evergreen forests dominated by *Picea rubens* (red spruce) and/or *Abies balsamea* (balsam fir) with both species always at least present; *Sphagnum* (sphagnum moss) often strongly dominate the ground layer with as much as >90% cover; canopy associates include *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), and *Betula papyrifera* (paper birch); shrubs are not prominent; herbs are highly variable and can include *Carex brunnescens* (brownish sedge), *Carex disperma* (softleaf sedge), *Carex gynandra* (nodding sedge), *Carex trisperma* (three-seeded sedge), *Clintonia borealis* (bluebead), *Coptis trifolia* (threeleaf goldthread), *Cornus canadensis* (bunchberry dogwood), *Dennstaedtia punctilobula* (eastern hayscented fern), *Dryopteris campyloptera* (mountain woodfern), *Dryopteris marginalis* (marginal woodfern), *Gaultheria hispidula* (creeping snowberry), *Maianthemum canadense* (Canada mayflower), *Oclemena acuminata* (whorled wood aster), and *Osmunda cinnamomea* (cinnamon fern); observed in NH and ME. ..... **Northern Appalachian Spruce-Fir Swamp Forest (CEGL006312)**
[*Picea rubens - Abies balsamea / Gaultheria hispidula / Osmunda cinnamomea / Sphagnum* spp. Swamp Forest]

8b. *Picea rubens - Abies balsamea* (red spruce-balsam fir) and/or *Picea mariana - Picea rubens* (black spruce-red spruce) flats with a well-developed bryophyte layer that includes *Pleurozium schreberi* (Schreber's big red stem moss), *Hylocomium splendens* (splendid feathermoss), *Ptilium crista-castrensis* (knights plume moss), *Bazzania trilobata* (three-lobed bazzania), and *Sphagnum* (sphagnum moss); upland and wetland plants in the understory including heath shrubs *Kalmia angustifolia* (sheep laurel), *Vaccinium angustifolium* (lowbush blueberry), and *Vaccinium myrtilloides* (velvetleaf huckleberry) as well as herbs *Osmunda cinnamomea* (cinnamon fern), *Osmunda claytoniana* (interrupted fern), *Gaultheria hispidula* (creeping snowberry), *Maianthemum canadense* (Canada mayflower), and *Cornus canadensis* (bunchberry dogwood); occurs on imperfectly drained flats or stream drainages, where cold air accumulates; may intergrade with Low Elevation Spruce Fir Forest, depending on subtle changes in drainage; observed on trail in NH and ME..... **Northern Spruce - Fir Flats (CEGL006361)**
[*Picea mariana - Picea rubens / Pleurozium schreberi* Swamp Forest]

9a. Hardwood forested wetlands strongly dominated by *Acer rubrum* (red maple); canopy associates may be present but at relatively low cover. **10**
9b. Hardwood forested wetlands codominated by other species [but may be codominated by *Acer rubrum* (red maple)]..... **14**

10a. Lower New England, open-canopied (20-60%) *Acer rubrum* (red maple) wooded marsh characterized by an herbaceous layer strongly dominated by *Carex stricta* (upright sedge); *Carex lacustris* (hairy sedge) and *Calamagrostis canadensis* (bluejoint) may be common; *Vaccinium corymbosum* (highbush blueberry) often present; occurs on muck soils or mineral soils with a surface organic layer, in poorly-drained depressions influenced by groundwater; peripheral in the Northern Appalachian / Acadian ecoregion, observed in southern NH. ..... **Red Maple / Upright Sedge Wet Woodland (CEGL006119)**
[*Acer rubrum / Carex stricta - Onoclea sensibilis* Wet Woodland]
10b. *Acer rubrum* (red maple) open peatlands, seepage swamps, and forested wetlands. **11**

11a. Open *Acer rubrum* (red maple) wooded fen generally lacking *Picea* (spruce) spp.; *Larix laricina* (tamarack) possible to codominant; tall shrubs can include *Viburnum nudum* var. *cassinoides* (withe-rod), *Spiraea alba* (white meadowsweet), *Ilex verticillata* (common winterberry), and *Nemopanthus mucronatus* (catberry); *Osmunda cinnamomea* (cinnamon fern) and *Carex trisperma* (three-seeded sedge) are common, continuous saturated *Sphagnum* (sphagnum moss) layer; occurs in basin

peatlands at elevations below 305 m (1,000 feet), often in a peripheral area of a larger peatland; in central and northern New England; observed in ME. ..... **Red Maple Wooded Fen (CEGL006395)**
[*Acer rubrum / Alnus incana - Ilex verticillata / Osmunda regalis* Woodland]
11b. Seepage swamps and forested wetlands. **12**

12a. *Acer rubrum* (red maple) swamp of stream drainages and wetland borders; many possible canopy associates; shrub layer dominated by *Ilex verticillata* (common winterberry); herb layer dominated by *Osmunda cinnamomea* (cinnamon fern), *Carex stricta* (upright sedge), and *Onoclea sensibilis* (sensitive fern); *Sphagnum* (sphagnum moss) frequent but not necessarily abundant; observed in ME. ..... **Northern Red Maple Swamp Forest (CEGL006220)**
[*Acer rubrum / Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest]
12b. Forested seepage swamps with nutrient enrichment indicators. **13**

13a. Enriched *Acer rubrum - Fraxinus nigra* (red maple-black ash) circumneutral seepage swamp often with *Larix laricina* (tamarack) and *Pinus strobus* (eastern white pine) in canopy and *Alnus incana* (gray alder); *Rhamnus alnifolia* (alderleaf buckthorn) and *Toxicodendron vernix* (poison-sumac) in the shrub layer; calciphiles such as *Saxifraga pensylvanica* (eastern swamp saxifrage), *Carex leptalea* (bristly-stalked sedge), *Carex flava* (yellow sedge), *Solidago patula* (roundleaf goldenrod), and *Ranunculus hispidus* var. *caricetorum* (bristly buttercup) common; typically occurs south of the NAP project area, seen during mapping reconnaissance in southern NH and northern ME..... **Red Maple - Black Ash Rich Seepage Swamp Forest (CEGL006009)**
[*Acer rubrum - Fraxinus nigra - (Larix laricina) / Rhamnus alnifolia* Swamp Forest]
13b. Mixed hardwood - hemlock (≤25% of canopy) [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple) - *Tsuga canadensis* (eastern hemlock), - *Abies balsamea* (balsam fir)]] wetland forest occurring in seepage-influenced areas, at wetland-upland ecotones, along streamsides, on gentle to moderate slopes with minerals soils; herbaceous layer indicative of semi-nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians. Balsam fir replaces hemlock as the dominant conifer in these sites moving northward; observed in ME. ..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]

14a. Conifers such as *Picea rubens* (red spruce) or *Tsuga canadensis* (eastern hemlock) in canopy. **15**
14b. Hardwood swamps dominated by other deciduous species in addition to *Acer rubrum* (red maple). **16**

15a. Mixed coniferous -deciduous [*Picea rubens* (red spruce) - *Acer rubrum* (red maple)] near-boreal acidic basin swamp with a mixed canopy (>25% hardwoods) that includes shrubs include *Nemopanthus mucronatus* (catberry), *Ilex verticillata* (common winterberry), and/or *Viburnum* (viburnum) spp.; herbs include *Carex trisperma* (three-seeded sedge) and *Osmunda cinnamomea* (cinnamon fern); *Sphagnum* (sphagnum moss) common; observed in NH and ME; plot/obs point elevations range from 511 to 740 m (1,678-2,427 feet)..... **Red Spruce - Red Maple Acidic Swamp Forest (CEGL006198)**
[*Picea rubens - Acer rubrum / Nemopanthus mucronatus* Swamp Forest]

15b. Mixed hardwood - hemlock (≤25% of canopy)] [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple) - *Tsuga canadensis* (eastern hemlock) - *Abies balsamea* (balsam fir)] wetland forest occurring in seepage-influenced areas, at wetland-upland ecotones, along streamsides, on gentle to moderate slopes with minerals soils; herbaceous layer indicative of semi-nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern) and *Arisaema triphyllum* (Jack in the pulpit); occurs in New England and the Northern Appalachians; balsam fir replaces hemlock as the dominant conifer in these sites moving northward. ..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]

16a. Mixed hardwood - hemlock (≤25% of canopy) [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple) - *Tsuga canadensis* (eastern hemlock) - *Abies balsamea* (balsam fir)] wetland forest occurring in seepage-influenced areas, at wetland-upland ecotones, along streamsides, on gentle to moderate slopes with minerals soils; herbaceous layer indicative of semi-nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in New England and the Northern Appalachians; balsam fir replaces hemlock as the dominant conifer in these sites moving northward; observed in ME..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]
16b. Hardwood forested swamps and wet forests codominated by *Acer rubrum* (red maple) and *Fraxinus* (ash) spp..... **17**

17a. *Acer rubrum - Fraxinus* spp. (red maple-ash) basin swamps where *Acer rubrum* (red maple) is codominant with many possible associates; shrub layer dominated by *Ilex verticillata* (common winterberry); herb layer dominated by *Osmunda cinnamomea* (cinnamon fern), *Carex stricta* (upright sedge), and *Onoclea sensibilis* (sensitive fern); *Sphagnum* (sphagnum moss) frequent but not necessarily abundant. ..... **Northern Red Maple Swamp Forest (CEGL006220)**
[*Acer rubrum / Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest]
17b. Seepage swamps with *Acer rubrum* (red maple) and *Fraxinus nigra* (black ash)..... **18**

18a. Low elevation *Acer rubrum - Fraxinus nigra* (red maple-black ash) seepage swamp with less enrichment than CEGL006009 below; canopy often mixed with *Tsuga canadensis* (eastern hemlock); includes northern conifers such as *Thuja occidentalis* (arborvitae) and *Abies balsamea* (balsam fir); enrichment indicators such as *Rhamnus alnifolia* (alderleaf buckthorn), *Tiarella cordifolia* (heartleaf foamflower), and *Chrysosplenium americanum* (American golden saxifrage) present but not abundant; calciphiles lacking; observed in southern NH and then again in northern ME. ..... **Northern Hardwood - Hemlock Seepage Swamp Forest (CEGL006502)**
[*Acer rubrum - Fraxinus nigra - (Tsuga canadensis) / Tiarella cordifolia* Swamp Forest]
18b. Enriched *Acer rubrum - Fraxinus nigra* (red maple-black ash) circumneutral seepage swamp often with *Larix laricina* (tamarack) and *Pinus strobus* (eastern white pine) in canopy and *Alnus incana* (gray alder), *Rhamnus alnifolia* (alderleaf buckthorn), and *Toxicodendron vernix* (poison-sumac) in the shrub layer; calciphiles *Saxifraga pensylvanica* (eastern swamp saxifrage), *Carex leptalea* (bristly-stalked sedge), *Carex flava* (yellow sedge), *Solidago patula* (roundleaf goldenrod) and *Ranunculus hispidus* var. *caricetorum* (bristly buttercup) common. ..... **Red Maple - Black Ash Rich Seepage Swamp Forest (CEGL006009)**
[*Acer rubrum - Fraxinus nigra - (Larix laricina) / Rhamnus alnifolia* Swamp Forest]

3. Shrub Swamps, Bogs, and Fens[37]

1a. Peatlands and shrub swamps of high elevations. **2**
1b. Peatlands **and** shrub swamps of lower elevations. **6**

2a. Shrubby to herbaceous seepage swamps or glades known from high elevations (>776 m [2,545 feet]) in the Northern Appalachians; occupying small openings on moderate to somewhat steep slopes within a matrix of *Abies balsamea*- (balsam fir) dominated forest (CEGL006112); soils primarily fertile mineral with deep organic/A horizon and little to no muck/peat accumulation; open to dense shrub layer up to 5 m in height dominated by *Prunus virginiana* (chokecherry), *Acer spicatum* (mountain maple), and *Sambucus racemosa* (red elderberry); *Ribes triste* (red currant) is often present as a short shrub; lush herb layer includes some combination of *Angelica atropurpurea* (purplestem angelica), *Heracleum maximum* (common cowparsnip), *Hydrophyllum virginianum* (eastern waterleaf), *Impatiens capensis* (jewelweed), *Thalictrum pubescens* (king-of-the-meadow), *Tiarella cordifolia* (heartleaf foamflower), *Ageratina altissima* (white snakeroot), *Glyceria striata* (fowl mannagrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Athyrium filix-femina* (common ladyfern), *Chelone glabra* (white turtlehead), *Dryopteris campyloptera* (mountain woodfern), *Ranunculus recurvatus* (blisterwort), *Laportea canadensis* (Canadian woodnettle), and others; observed in southernmost NH and ME. ..... **Northern Appalachian High-Elevation Seepage Shrubland (CEGL006583)**
[*Prunus virginiana - Acer spicatum - Ribes triste / Angelica atropurpurea - Heracleum maximum* Seepage Shrubland]

2b. Bog-like vegetation in subalpine and alpine settings above 610 m (2,000 feet) elevation, on moderate to steep slopes over bedrock or talus; includes alpine and subalpine bogs over sloping rock. **3**

3a. Subalpine peatland near or above treeline [elevations range from 1,036 to 1,599 m (3,400-5,246 feet)], forming in shallow bedrock basins where the peat usually remains saturated through the summer; vegetation dominated by bryoids with a mixture of dwarf-shrubs and graminoids, usually including *Vaccinium* (blueberry) spp., *Rubus chamaemorus* (cloudberry), *Ledum groenlandicum* (bog Labrador-tea), *Empetrum nigrum* (black crowberry), *Kalmia angustifolia* (sheep laurel), *Kalmia polifolia* (bog laurel), *Chamaedaphne calyculata* (leatherleaf), *Trichophorum caespitosum* (tufted bulrush), and *Eriophorum* (cottongrass) spp.; observed in NH. ..... **Black Crowberry Wet Alpine Bog (CEGL006140)**
[*Empetrum nigrum - Vaccinium uliginosum - Vaccinium oxycoccos / Rubus chamaemorus* Dwarf-shrubland]

3b. Dwarf-shrub- (or, rarely graminoid-) dominated vegetation on *Sphagnum* (sphagnum moss) or *Cladina* (reindeer lichen) spp. forming a thin layer over sloping bedrock (sometimes talus); not in basin settings, peat may not remain saturated through the summer..... **4**

[37]Shrub cover (including dwarf-shrubs) exceeds tree and graminoid cover (shrubs ≥50%); shrub swamps, bogs, fens, and shrub-herbaceous vegetation (50/50). For bog-like vegetation in subalpine setting, on moderate to steep slopes over bedrock or talus of mountain slopes go to Open Upland Alpine and Subalpine communities.

4a. Uncommon graminoid-dominated montane sloping fen occurring at or above approximately 800 m (2,625 feet) with abundant *Trichophorum caespitosum* (tufted bulrush) and *Calamagrostis pickeringii* (Pickering's reedgrass) restricted to the brow of certain alpine cliffs; dwarf ericaceous shrubs including *Vaccinium uliginosum* (bog blueberry), *Chamaedaphne calyculata* (leatherleaf), *Kalmia polifolia* (bog laurel), and *Ledum groenlandicum* (bog Labrador-tea) common; may occur as a mosaic of herb-dominated patches, shrub clusters, bryophyte carpets, and exposed bedrock; observed in NH. .....**Northern Appalachian Alpine Bulrush Cliff (CEGL006423)**
[*Trichophorum caespitosum - Calamagrostis pickeringii* Alpine Snowbed]
4b. Dwarf-shrub-dominated vegetation. **5**

5a. Subalpine slope bog occurring on moderate to very steep subalpine slopes among fir-birch forest or krummholz near or above treeline with elevations ranging from 1,085 to 1,420 m (3,560-4,659 feet); peat accumulation is deeper than in other alpine or subalpine heath settings, with depths of 25-80+ cm; dense layer of dwarf ericaceous shrubs dominated by a mixture of *Kalmia angustifolia* (sheep laurel), *Chamaedaphne calyculata* (leatherleaf), *Ledum groenlandicum* (bog Labrador-tea), and *Sphagnum* (sphagnum moss); fruticose lichens including *Cladina rangiferina* (greygreen reindeer lichen) and *Cetraria islandica* (island cetraria lichen) abundant; in ME and NH. ....**Subalpine Slope Bog (CEGL006425)**
[*Kalmia angustifolia - Chamaedaphne calyculata / Rubus chamaemorus / Cladina* spp. Dwarf-shrubland]
5b. Talus heathland usually at lower elevations [plot elevations ~776 m (2,296 feet)] in cool microsites with very patchy vegetation, occurring at the base of much exposed talus slopes; bryoid layer has *Cladina* (reindeer lichen) spp. and *Cladonia* (cup lichen) spp. more extensive than *Sphagnum* (sphagnum moss) cover; may be open or partially wooded, primarily with *Picea mariana* (black spruce); observed in the Presidential Range. .....**Cold Air Talus Heathland (CEGL006268)**
[*Picea mariana / Ledum groenlandicum - Empetrum nigrum / Cladina* spp. Dwarf-shrubland]

6a. Bogs and fens; *Sphagnum* (sphagnum moss) or other mosses (≥20%) dominant in ground layer sometimes floating over water and often forming a mat; substrate is accumulated peat (undecayed to partially decayed), constantly saturated. **7**
6b. Non-peat-forming shrub swamps; *Sphagnum* (sphagnum moss) may be present (<20% cover), but seldom forming continuous carpet or mat; shrub swamps of saturated basins, beaver-impacted wetlands and small, low-velocity streams **and** altered shrubby wet meadow vegetation. **14**

7a. Shrub bogs with a deep peat layer; shrub cover (including dwarf-shrubs) exceeds graminoid cover; acidic vegetation. **8**
7b. Shrub-herbaceous vegetation of nutrient-poor and enriched fens occurring on shallow peat; vegetation in contact with groundwater. **12**

8a. Vegetation dominated by taller shrub species, including *Viburnum nudum* (possumhaw), *Nemopanthus mucronatus* (catberry), *Alnus incana* (gray alder), or *Myrica gale* (sweetgale). **9**
8b. Shrubs mostly shorter species, including abundant ericads such as *Chamaedaphne calyculata* (leatherleaf), *Ledum groenlandicum* (bog Labrador-tea), or *Kalmia angustifolia* (sheep laurel); bogs and fens on well-developed *Sphagnum* (sphagnum moss) carpets. **10**

9a. Northern peatland shrub swamp occurring at the landward edge of acidic peat mats at 717 m (2,352 feet); *Viburnum nudum* var. *cassinoides* (withe-rod), *Nemopanthus mucronatus* (catberry), *Alnus incana* (gray alder), *Eriophorum virginicum* (tawny cottongrass), *Carex trisperma* (three-seeded sedge), *Osmunda cinnamomea* (cinnamon fern), and *Calla palustris* (water arum) characteristic; scattered *Picea mariana* (black spruce), *Larix laricina* (tamarack), and/or *Acer rubrum* (red maple) possible; standing water usually present among hummocks of *Sphagnum* (sphagnum moss); observed in NH..... **Northern Peatland Shrub Swamp (CEGL006158)**
[*Alnus incana* ssp. *rugosa* - *Nemopanthus mucronatus* / *Sphagnum* spp. Acidic Peatland]

9b. Mixed shrub fen with *Myrica gale* (sweetgale), *Spiraea tomentosa* (steeplebush), and/or *Spiraea alba* (white meadowsweet) prominent; *Chamaedaphne calyculata* (leatherleaf) often present but other ericads not abundant; diverse herb layer with *Calamagrostis canadensis* (bluejoint), *Carex stricta* (upright sedge), *Carex utriculata* (Northwest Territory sedge), and others; occurs in shallow standing water without a continuous *Sphagnum* (sphagnum moss) carpet; observed in NH and ME; plot elevations range from 280 to 837 m (920-2,746 feet). ..... **Sweetgale Mixed Shrub Fen (CEGL006512)**
[*Myrica gale* - *Spiraea alba* - *Chamaedaphne calyculata* Fen]

10a. Leatherleaf boggy fen with weakly minerotrophic fen conditions (vegetation in contact with the water table; water supply comes mainly from streams or springs), *Chamaedaphne calyculata* (leatherleaf) dominates the dwarf-shrub layer (>25%); *Andromeda polifolia* (bog rosemary) usually present; *Myrica gale* (sweetgale), *Kalmia angustifolia* (sheep laurel), and *Ledum groenlandicum* (bog Labrador-tea) are frequent; *Eriophorum virginicum* (tawny cottongrass) and *Rhynchospora alba* (white beaksedge) are characteristic herbs; *Sphagnum* (sphagnum moss) mat typical; occurs throughout the glaciated northeast; observed in ME. ..... **Leatherleaf Boggy Fen (CEGL006513)**
[*Chamaedaphne calyculata* / *Eriophorum virginicum* / *Sphagnum rubellum* Acidic Peatland]

10b. Ombrotrophic conditions (vegetation raised above the water table - receives water from precipitation; poor fen conditions where ground is permanently wet with nutrient-poor water which is somewhat acidic), or sometimes weakly minerotrophic conditions grading to ombrotrophic conditions; *Kalmia angustifolia* (sheep laurel), *Rhododendron canadense* (rhodora), *Gaylussacia* (huckleberry) spp., and *Ledum groenlandicum* (bog Labrador-tea) together equal or exceed the cover of *Chamaedaphne calyculata* (leatherleaf); graminoid cover rarely exceeds 15%. **11**

11a. Vegetation occurring on the raised and relatively well-drained portions of raised peatlands bogs *Kalmia angustifolia* (sheep laurel), *Gaylussacia* (huckleberry) spp., and *Ledum groenlandicum* (bog Labrador-tea) together more abundant than *Rhododendron canadense* (rhodora); *Eriophorum vaginatum* var. *spissum* (tussock cottongrass), *Sarracenia purpurea* (purple pitcherplant), *Drosera rotundifolia* (roundleaf sundew), and *Carex trisperma* (three-seeded sedge) are common; observed in ME..... **Raised Dwarf-shrub Bog (CEGL006225)**
[*Kalmia angustifolia* - *Chamaedaphne calyculata* - *(Picea mariana)* / *Cladina* spp. Acidic Peatland]

11b. Vegetation usually slightly downslope of the highest portions of a raised bog; very weakly minerotrophic conditions; *Rhododendron canadense* (rhodora) characteristic and more abundant than *Kalmia angustifolia* (sheep laurel), *Ledum groenlandicum* (bog Labrador-tea), and *Gaylussacia* (huckleberry) spp.; *Eriophorum virginicum* (tawny cottongrass) the most typical cottongrass; possible on trail in ME..... **Near-Boreal Dwarf-shrub Poor Fen (CEGL006514)**
[*Rhododendron canadense* - *Chamaedaphne calyculata* Acidic Peatland]

12a. *Chamaedaphne calyculata* (leatherleaf) dominates the dwarf-shrub layer (>25%); *Andromeda polifolia* (bog rosemary) usually present; *Myrica gale* (sweetgale), *Kalmia angustifolia* (sheep laurel), and *Ledum groenlandicum* (bog Labrador-tea) are frequent; *Eriophorum virginicum* (tawny cottongrass) and *Rhynchospora alba* (white beaksedge) are characteristic herbs; *Sphagnum* (sphagnum moss) mat typical; occurs throughout the glaciated Northeast; observed in ME. ..... **Leatherleaf Boggy Fen (CEGL006513)**
[*Chamaedaphne calyculata / Eriophorum virginicum / Sphagnum rubellum* Acidic Peatland]
12b. *Chamaedaphne calyculata* (leatherleaf) <25% in the dwarf-shrub layer. **13**

13a. Mixed, relatively tall-shrub (often >1 m) fen codominated by *Myrica gale* (sweetgale), *Spiraea tomentosa* (steeplebush), and/or *Spiraea alba* (white meadowsweet); *Chamaedaphne calyculata* (leatherleaf) present but not sole dominant; diverse herb layer with *Calamagrostis canadensis* (bluejoint), *Carex stricta* (upright sedge), *Carex utriculata* (Northwest Territory sedge), and others; occurs in standing shallow water without a continuous *Sphagnum* (sphagnum moss) carpet; observed in NH and ME; plot elevations range from 280 to 837 m (920-2,746 feet). ..... **Sweetgale Mixed Shrub Fen (CEGL006512)**
[*Myrica gale - Spiraea alba - Chamaedaphne calyculata* Fen]
13b. Vegetation codominated by tall sedges: dominant species are *Carex lasiocarpa* (woollyfruit sedge), *Carex utriculata* (Northwest Territory sedge), *Carex lacustris* (hairy sedge), and/or *Carex vesicaria* (blister sedge); sometimes with *Carex stricta* (upright sedge) and *Rhynchospora alba* (white beaksedge); scattered shrubs often shorter than the graminoids include *Spiraea alba* var. *latifolia* (white meadowsweet), *Myrica gale* (sweetgale), and/or *Chamaedaphne calyculata* (leatherleaf); observed in ME; plot elevations range from 400 to 749 m (1,310-2,457 feet). ..... **Medium Fen (CEGL006302)**
[*Myrica gale - Chamaedaphne calyculata / Carex (lasiocarpa, utriculata) - Utricularia* spp. Fen]

14a. Altered, successional mixed wet meadow shrubby vegetation dominated by *Spiraea* (spirea) spp. and *Rubus* (blackberry) spp. with variable combinations of wetland old-field species such as *Phalaris arundinacea* (reed canarygrass), *Juncus effusus* (common rush), *Thelypteris palustris* (eastern marsh fern),*Onoclea sensibilis* (sensitive fern), *Solidago* (goldenrod) spp., *Impatiens capensis* (jewelweed), *Lycopus uniflorus* (northern bugleweed), and *Lythrum salicaria* (purple loosestrife); ranges from shrub thicket to herbaceous meadow with scattered shrubs; occurs in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands; known throughout the Northeast; observed in the NAP project area. ..... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa - Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]
14b. Alder-dominated swamp occurring in saturated basins settings, in association with beaver-impacted wetlands, and/or alongside small, low-velocity streams dominated by *Alnus incana* (gray alder); *Rubus pubescens* (dwarf red blackberry) common; *Carex stricta* (upright sedge) and other wetland *Carex* (sedge) spp. along with a diversity of *Symphyotrichium* (asters), *Osmunda cinnamomea* (cinnamon fern), *Thelypteris palustris* (marsh fern), and *Impatiens capensis* (orange jewelweed); mosses include *Climacium dendroides* (tree climacium moss) and *Sphagnum* (sphagnum moss) spp.; widespread in the northeastern United States; elevations range from 177 to 354 m (580-1,160 feet). ..... **Gray Alder Shrub Swamp (CEGL002381)**
[*Alnus incana* Shrub Swamp]

4. Herbaceous Wetlands and Aquatic Vegetation

1a. Herbaceous seeps and nonvascular wetland vegetation. **2**
1b. Herbaceous wetlands that aren't seeps; herb cover >50% **and** aquatic vegetation **5**

2a. Boreal circumneutral riverside seep that develops on discharge areas of the shores of larger rivers in the northeast; circumneutral groundwater discharge supports a fen-like aspect, but on mineral rather than peat soils; semi-open conditions maintained by ice-scouring and floodwaters; characteristic species include *Lobelia kalmii* (Ontario lobelia), *Parnassia glauca* (fen grass of Parnassus), *Platanthera dilatata* (scentbottle), *Packera paupercula* (balsam groundsel), *Triantha glutinosa* (sticky tofieldia), *Spiranthes lucida* (shining ladies'-tresses), *Spiranthes romanzoffiana* (hooded ladies'-tresses), *Carex garberi* (elk sedge), *Carex viridula* (little green sedge), *Carex flava* (yellow sedge), *Rhynchospora capillacea* (needle beaksedge), *Rhynchospora capitellata* (brownish beaksedge), *Mentha arvensis* (wild mint), and others; probable where White River crosses AT in VT; documented globally in ME, NH, VT, and NY; but not in the NH portion of the AT corridor. .... **Boreal Circumneutral Riverside Seep (CEGL006142)**
[*Triantha glutinosa - Carex garberi* Riverscour Wet Meadow]
2b. Herb-dominated seepage communities not associated with riversides. **3**

3a. Shrubby to herbaceous seepage swamps or glades known from high elevations (>776 m [2,545 feet]) in the Northern Appalachians; occupying small openings on moderate to somewhat steep slopes within a matrix of *Abies balsamea*- (balsam fir) dominated forest (CEGL006112); soils primarily fertile mineral with deep organic/A horizon and little to no muck/peat accumulation; open to dense shrub layer up to 5 m in height dominated by *Prunus virginiana* (chokecherry), *Acer spicatum* (mountain maple), and *Sambucus racemosa* (red elderberry); *Ribes triste* (red currant) is often present as a short shrub; lush herb layer includes some combination of *Angelica atropurpurea* (purplestem angelica), *Heracleum maximum* (common cowparsnip), *Hydrophyllum virginianum* (eastern waterleaf), *Impatiens capensis* (jewelweed), *Thalictrum pubescens* (king-of-the-meadow), *Tiarella cordifolia* (heartleaf foamflower), *Ageratina altissima* (white snakeroot), *Glyceria striata* (fowl mannagrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Athyrium filix-femina* (common ladyfern), *Chelone glabra* (white turtlehead), *Dryopteris campyloptera* (mountain woodfern), *Ranunculus recurvatus* (blisterwort), *Calamagrostis canadensis* (bluejoint), *Veratrum viride* (green false hellebore), and others; observed in NH and ME. May occur in areas with natural disturbance (e.g., blowdown patches) or harvest history. .... **Northern Appalachian High-Elevation Seepage Shrubland (CEGL006583)**
[*Prunus virginiana - Acer spicatum - Ribes triste / Angelica atropurpurea - Heracleum maximum* Seepage Shrubland]
3b. Seeps dominated by forbs and graminoids typically at lower elevations. **4**

4a. Seepy wet cliff community of lower elevations dominated by moisture-loving plants such as *Chrysosplenium americanum* (American golden saxifrage), *Epilobium ciliatum* ssp. *glandulosum* (fringed willowherb), *Cinna latifolia* (drooping woodreed), *Drosera rotundifolia* (roundleaf sundew), and *Trichophorum caespitosum* (tufted bulrush), often with abundant bryophytes; *Oclemena acuminata* (whorled wood aster) and *Viola* (violet) spp. are characteristic; observed in NH. ....**Northern Appalachian Cliff Seep (CEGL006429)**
[*Drosera rotundifolia - Viola* spp. Cliff Sparse Vegetation]

4b. Common seeps not occurring on cliffs; *Carex scabrata* (eastern rough sedge) and/or *Chrysosplenium americanum* (American golden saxifrage) characteristic; small herbaceous seepage areas with shallow muck soils and usually lush cover of forbs, grasses, and sedges under matrix forest canopy; *Circaea alpina* (small enchanter's nightshade), *Viola cucullata* (marsh blue violet), *Chelone glabra* (white turtlehead), and *Glyceria* (mannagrass) spp. common; observed in NH. ..... **Golden-saxifrage Forested Seep (CEGL006193)**
[*Chrysosplenium americanum* Seepage Meadow]

5a. Aquatic vegetation of ponds and slow-moving rivers. **6**
5b. Herbaceous vegetation. **7**

6a. Dominants are usually submerged macrophytes such as *Nuphar advena* (yellow pond-lily), and/or *Nymphaea odorata* (American white waterlily) or floating-leaved pondweeds or bur-reeds; common throughout the Northeast; observed in ME. ... **Water-lily Aquatic Wetland (CEGL002386)**
[*Nuphar advena - Nymphaea odorata* Aquatic Vegetation]
6b. Aquatic vegetation of circumneutral water; *Nymphaea odorata* (American white waterlily) and *Nuphar* (pond-lily) spp. are often present but not abundant; submerged macrophytes or floating-leaved pondweeds dominant, including *Elodea canadensis* (Canadian waterweed), *Potamogeton robbinsii* (Robbins' pondweed), *Potamogeton vaseyi* (Vasey's pondweed), *Stuckenia filiformis* (fineleaf pondweed), *Potamogeton friesii* (Fries' pondweed), and *Potamogeton strictifolius* (narrowleaf pondweed); *Vallisneria americana* (American eel-grass)is often present. ..... **Eastern Waterweed - Pondweed Aquatic Vegetation (CEGL006431)**
[*Elodea canadensis - Potamogeton* spp. Eastern Aquatic Vegetation]

7a. Herbaceous vegetation occurring in riverine settings. **8**
7b. Non-alluvial herbaceous vegetation of bogs, fens, marshes and wet meadows. **11**

8a. Low-gradient shores with silt, sand, or muck substrate; *Calamagrostis canadensis* (bluejoint) predominant graminoid. **9**
8b. Sites with medium to high flow gradient, coarse substrate (rocky or gravelly). **10**

9a. *Calamagrostis canadensis* (bluejoint) monodominant in alluvial setting..... **Laurentian & Northeast Bluejoint Wet Meadow (CEGL005448)**
[*Calamagrostis canadensis - Carex* spp. Laurentian & Northeast Wet Meadow]
9b. Seasonally flooded mixed graminoid meadow with *Carex utriculata* (Northwest Territory sedge), *Carex stricta* (upright sedge), and *Glyceria canadensis* (rattlesnake mannagrass) may be codominant to dominant with *Calamagrostis canadensis* (bluejoint); total herbaceous cover ranges from 40-80%; shrubs such as *Alnus incana* (gray alder), *Spiraea tomentosa* (steeplebush), and *Chamaedaphne calyculata* (leatherleaf) common at low cover..... **Mixed Graminoid Wet Meadow (CEGL006519)**
[*Calamagrostis canadensis - Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow]

10a. *Carex torta* (twisted sedge) diagnostic, and prairie grasses such as *Sorghastrum nutans* (Indiangrass) and *Andropogon gerardii* (big bluestem) often present; occurring on large coarse substrates deposited along medium- to high-energy river channels and, less frequently, exposed lakeshores with heavy wave action; seasonal flooding and ice-scour maintain the open nature; observed in ME. ..... **Northeastern Temperate Cobble Scour Rivershore (CEGL006536)**
[*Carex torta - Apocynum cannabinum - Cyperus* spp. Riverbed Vegetation]
10b. Vegetation dominated by a combination of species. **11**

11a. Riverside grasslands dominated by tall prairie grasses such as *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass), and *Schizachyrium scoparium* (little bluestem); generally occurs along major rivers in flood-scoured areas; along the Pemigewassett and Connecticut rivers in NH but not within the AT corridor in NH. ..... **Riverside Prairie Grassland (CEGL006518)**
[*Prunus pumila / Andropogon gerardii - Sorghastrum nutans* Wet Meadow]

11b. Herb-dominated, constantly saturated, rivershore seeps that develop on discharge areas of the shores of larger rivers in the glaciated Northeast; **circumneutral groundwater** discharge supports a fen-like aspect, but on mineral rather than peat soils; semi-open conditions maintained by ice-scouring and floodwaters; herbaceous species include *Lobelia kalmii* (Ontario lobelia), *Parnassia glauca* (fen grass of Parnassus), *Platanthera dilatata* (scentbottle), *Packera paupercula* (balsam groundsel), *Triantha glutinosa* (sticky tofieldia), *Equisetum variegatum* (variegated scouringrush), *Spiranthes lucida* (shining ladies'-tresses), *Spiranthes romanzoffiana* (hooded ladies'-tresses), *Carex garberi* (elk sedge), *Carex viridula* (little green sedge), *Carex flava* (yellow sedge), *Rhynchospora capillacea* (needle beaksedge), *Rhynchospora capitellata* (brownish beaksedge), *Mentha arvensis* (wild mint), and others; *Dasiphora fruticosa* ssp. *floribunda* (shrubby-cinquefoil), variegated *Alnus* (alder) spp., *Cornus sericea* (red-osier dogwood), and *Calamagrostis canadensis* (bluejoint); occurs where White River crosses AT in VT; not within the AT corridor in NH but documented globally in ME, NH, VT, and NY. ..... **Boreal Circumneutral Riverside Seep (CEGL006142)**
[*Triantha glutinosa - Carex garberi* Riverscour Wet Meadow]

12a. Bog and fen, peatland vegetation including low elevation and alpine settings. **13**
12b. Herbaceous marshes and wet meadows of lower elevations. **15**

13a. Fen community codominated by tall sedges: dominant species are *Carex lasiocarpa* (woollyfruit sedge), *Carex utriculata* (Northwest Territory sedge), *Carex lacustris* (hairy sedge), and/or *Carex vesicaria* (blister sedge); sometimes with *Carex stricta* (upright sedge) and *Rhynchospora alba* (white beaksedge); scattered shrubs often shorter than the graminoids include *Spiraea alba* var. *latifolia* (white meadowsweet), *Myrica gale* (sweetgale), and/or *Chamaedaphne calyculata* (leatherleaf); observed in ME; plot elevations range from 400 to 749 m (1,310-2,457 feet). ..... **Medium Fen (CEGL006302)**
[*Myrica gale - Chamaedaphne calyculata / Carex (lasiocarpa, utriculata) - Utricularia* spp. Fen]

13b. Bog-like vegetation in subalpine setting, on moderate to steep slopes over bedrock or talus of mountain slopes. **14**

14a. Rare graminoid-dominated sloping fen, with abundant *Trichophorum caespitosum* (tufted bulrush) and *Calamagrostis pickeringii* (Pickering's reedgrass) restricted to the brow of certain alpine cliffs; dwarf ericaceous shrubs including *Vaccinium uliginosum* (bog blueberry), *Chamaedaphne calyculata* (leatherleaf), *Kalmia polifolia* (bog laurel), and *Ledum groenlandicum* (bog Labrador-tea) common; may occur as a mosaic of herb-dominated patches, shrub clusters, bryophyte carpets, and exposed bedrock; observed in NH; average plot elevation is 800 m (2,625 feet). ..... **Northern Appalachian Alpine Bulrush Cliff (CEGL006423)**
[*Trichophorum caespitosum - Calamagrostis pickeringii* Alpine Snowbed]

14b. Alpine herbaceous - heath wet meadow dominated by *Trichophorum caespitosum* (tufted bulrush) occurring in moist and somewhat protected spots, or at groundwater seeps above 1,430 m (4,700 feet) elevation; not on cliffs; slopes more gentle with constant moisture provided by nearby streams or late-melting snowbanks; *Carex bigelowii* (Bigelow's sedge), and *Veratrum viride* (green false hellebore) common; lower-elevation species such as *Solidago macrophylla* (largeleaf

goldenrod) and *Deschampsia flexuosa* (wavy hairgrass) often present along with *Vaccinium caespitosum* (dwarf bilberry) and *Vaccinium uliginosum* (bog blueberry); observed in NH. ....**Alpine Herbaceous Wet Meadow (CEGL006424)**
[*Trichophorum caespitosum - Carex scirpoidea - Carex bigelowii* Alpine Snowbed]

15a. Freshwater wetlands dominated by broad-leaved emergent herbs; *Pontederia cordata* (pickerelweed), *Sagittaria* (arrowhead) spp., and/or *Sparganium* (bur-reed) sp. occurs along pondshores, lakeshores, and impoundments; common throughout the Northeast from PA north to ME; observed in ME. .....**Northeastern Leafy Forb Marsh (CEGL006191)**
[*Pontederia cordata - Peltandra virginica - Sagittaria latifolia* Marsh]
15b. Graminoids primarily dominant..... **16**

16a. Seasonally flooded wet meadows characterized by *Phalaris arundinacea* (reed canarygrass), *Spiraea* (spirea) spp., *Rubus* (blackberry) spp., or *Calamagrostis canadensis* (bluejoint) and/or *Dulichium arundinaceum* (threeway sedge). **17**
16b. Seasonally flooded or saturated marshes characterized by *Carex stricta* (upright sedge), *Carex vesicaria* (blister sedge), or *Typha* (cattail) spp. **18**

17a. Successional, mixed wet meadow - shrubby vegetation of the low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands; *Spiraea* (spirea) spp. and *Rubus* (blackberry) spp. are characteristic shrubs; variable composition can include wetland old-field species such as *Phalaris arundinacea* (reed canarygrass), *Juncus effusus* (common rush), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Solidago* (goldenrod) spp., *Impatiens capensis* (jewelweed), *Lycopus uniflorus* (northern bugleweed), and *Lythrum salicaria* (purple loosestrife); known throughout the Northeast; observed in the NAP project area. ....**Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa - Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]
17b. Naturally occurring, seasonally flooded wet meadow with some combination of *Calamagrostis canadensis* (bluejoint), *Scirpus cyperinus* (woolgrass), and/or *Schoenoplectus* (bulrush) spp., as well as *Leersia oryzoides* (rice cutgrass), *Carex stricta* (upright sedge), *Juncus* (rush) spp., *Lysimachia terrestris* (earth loosestrife), *Dulichium arundinaceum* (threeway sedge), *Lycopus uniflorus* (northern bugleweed), *Glyceria canadensis* (rattlesnake mannagrass), and *Carex echinata* (star sedge); shrubs absent to sparse; observed in NAP project area. ....**Mixed Graminoid Wet Meadow (CEGL006519)**
[*Calamagrostis canadensis - Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow]

18a. Seasonally flooded sedge marshes dominated by *Carex stricta* (upright sedge) (>15% coverage); other common herbaceous species include *Carex vesicaria* (blister sedge), *Scirpus* (bulrush) spp., *Carex canescens* (silvery sedge), *Triadenum virginicum* (Virginia marsh St. Johnswort), and *Sparganium americanum* (American bur-reed); scattered, and other wetland shrubs possible; occurs in seasonally flooded basins or on stream or lake margins; substrate is muck or peat of variable depth overlying mineral soil; common throughout the Northeast; 4 plots in the NAP project area..... ..... **Eastern Upright Sedge Wet Meadow (CEGL006412)**
[*Carex stricta - Carex vesicaria* Wet Meadow]
18b. Tall emergent marsh dominated by *Typha* (cattail) spp.; occurs in permanently flooded basins and other disturbed wetlands, often part of a larger wetland mosaic and associated with lakes, ponds, or slow-moving streams; very common throughout the Northeast; observed in NH. ....**Eastern Cattail Marsh (CEGL006153)**
[*Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Eastern Marsh]

5. Open Alpine and Subalpine Vegetation, Lower Elevation Balds, Barrens, Cliffs, and Sparse Vegetation[38]

1a. Alpine areas: rocky summits and slopes near or above treeline, usually >1,000 m (3,300 feet) elevation; if tree species are present, then less than 2 m tall; vegetation patchy to continuous; may be small-patch in nature though key consistently. **2**
1b. Open areas with patchy to sparse vegetation on hills, low mountains, steep slopes, or cliffs; elevation usually below treeline though occasionally above tree line, scattered trees may be present. **19**

2a. Spruce and fir frequent. **3**
2b. Vegetation dominated by shrubs, dwarf-shrubs and/or herbs, or sparse; ericaceous species prominent among the shrubs. **4**

3a. Stunted tree species form the dominant cover; dense masses or patches of krummholz (stunted conifers) ≤2 m tall including *Picea mariana* (black spruce) and *Abies balsamea* (balsam fir) [and on occasion *Larix* (larch)] forming a band between treeline and more open summit areas; *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Nemopanthus mucronatus* (catberry), and *Ledum groenlandicum* (bog Labrador-tea) are common shrubs; elevation of plots range from 1,018 to 1,109 m (3,340-3,669 feet). .... **Black Spruce Krummholz (CEGL006038)**
[*Picea mariana - Abies balsamea / Sibbaldiopsis tridentata* Shrubland]
3b. Shrub species form the dominant cover; vegetation a mixture of dwarf heath shrubs and scattered stunted *Picea mariana* (black spruce), *Picea rubens* (red spruce), and/or *Abies balsamea* (balsam fir) with *Kalmia angustifolia* (sheep laurel) or *Ledum groenlandicum* (bog Labrador-tea) as the most abundant dwarf-shrub; taller shrubs, or tall-shrub-sized spruce often interspersed as islands; subalpine, sometimes extending above treeline; elevation of plots ranges from 950 to 1,460 m (3,117-4,790 feet); global elevations range from 550-1,435 m (1,800-4,700 feet); observed in NH and ME. ... . **Subalpine Summit Heath (CEGL006031)**
[(*Picea mariana, Abies balsamea*) / *Kalmia angustifolia - Ledum groenlandicum* Dwarf-shrubland]

4a. Arctic-alpine vegetation on high summits, with one or more strictly alpine species present (not necessarily dominant): *Diapensia lapponica* (pincushion plant), *Agrostis mertensii* (northern bentgrass), *Carex bigelowii* (Bigelow's sedge), *Arctostaphylos alpina* (alpine bearberry), *Rhododendron lapponicum* (Lapland rosebay), *Salix uva-ursi* (bearberry willow), *Betula glandulosa* (resin birch), *Harrimanella hypnoides* (mossplant), *Phyllodoce caerulea* (blue mountain-heath), *Saxifraga foliolosa* (leafystem saxifrage), or *Polygonum viviparum* (alpine bistort). **5**
4b. Strictly alpine species (see list above) absent; patches of vegetation over bare rock, usually subalpine, below or near treeline, but may extend higher. **12**

[38]Includes alpine herbaceous meadows, heath barrens, krummholz, cliffs, rocky outcrop, boulderfields, talus slopes, cliff and sparse vegetation with <10% tree cover. See Upland Woodlands for vegetation with more tree cover occurring in alpine and subalpine settings.

5a. Expanses of lichen-covered boulders occurring on gentle to steep slopes or tablelands (fell-field); very sparse vascular vegetation confined to pockets among the rocks; Mt. Abram in ME; occurs globally in NH. ..... **Eastern Lichen Fell-field (CEGL006420)**
[*Arctoparmelia centrifuga - Rhizocarpon geographicum* Nonvascular Vegetation]
5b. Vegetation more extensive, although very low, forming patchy carpets over the rock substrate. .. **6**

6a. Herbs, mostly graminoids, more prominent than dwarf-shrubs. **7**
6b. Vegetation primarily dwarf shrubs. **10**

7a. *Carex bigelowii* (Bigelow's sedge) dominates the vegetation; high elevation alpine meadows usually over 1,463 m (4,800 feet), on north and west slopes, where there is both high moisture intercept (from precipitation or fog) and lower snow cover than other alpine habitats; soils are typically thin, acidic and have a low moisture-holding capacity, consisting of organic turf over stone, gravel or coarse sediment; extensive in Presidential Range and very small patch on Katahdin, patches may be too small in ME and could be included in Alpine Heath Meadow (CEGL006298) see below... ..... **Bigelow's Sedge Alpine Meadow (CEGL006081)**
[*Carex bigelowii* Alpine Meadow]
7b. *Carex bigelowii* (Bigelow's sedge) not sole dominant **8**

8a. Matrix, above treeline, alpine meadow of matted shrubs, sedges, and rushes on the highest peaks [above 1,370 m (4,500 feet) (occasionally lower)] of the northern Appalachian Mountains; a variable mixture of dwarf evergreen shrubs primarily *Vaccinium uliginosum* (bog blueberry), with *Vaccinium* (blueberry) spp., *Empetrum* (crowberry) spp., *Rhododendron lapponicum* (Lapland rosebay), *Diapensia lapponica* (pincushion plant), *Salix uva-ursi* (bearberry willow), and *Arctostaphylos uva-ursi* (kinnikinnick) and herbs with locally extensive patches of graminoid cover, dominated by *Juncus trifidus* (highland rush) and/or *Carex bigelowii* (Bigelow's sedge); observed in ME and NH. ... . **Alpine Heath Meadow (CEGL006298)**
[*Vaccinium uliginosum - Rhododendron lapponicum / Juncus trifidus* Dwarf-shrubland]
8b. Less common, small-patch alpine vegetation with moist to wet soils. **9**

9a. Small-patch alpine herbaceous - heath wet meadow dominated by *Trichophorum caespitosum* (tufted bulrush) occurring in moist and somewhat protected spots, or at groundwater seeps above 1,430 m (4,700 feet) elevation; not on cliffs; slopes more gentle with constant moisture provided by nearby streams or late-melting snowbanks; *Carex bigelowii* (Bigelow's sedge), and *Veratrum viride* (green false hellebore) common; lower-elevation species such as *Solidago macrophylla* (largeleaf goldenrod) and *Deschampsia flexuosa* (wavy hairgrass) often present along with *Vaccinium caespitosum* (dwarf bilberry) and *Vaccinium uliginosum* (bog blueberry); observed in NH. .... **Alpine Herbaceous Wet Meadow (CEGL006424)**
[*Trichophorum caespitosum - Carex scirpoidea - Carex bigelowii* Alpine Snowbed]
9b. Rare graminoid-dominated sloping fen, with abundant *Trichophorum caespitosum* (tufted bulrush) and *Calamagrostis pickeringii* (Pickering's reedgrass) restricted to the brow of certain alpine cliffs; dwarf ericaceous shrubs including *Vaccinium uliginosum* (bog blueberry), *Chamaedaphne calyculata* (leatherleaf), *Kalmia polifolia* (bog laurel), and *Ledum groenlandicum* (bog Labrador-tea) common; may occur as a mosaic of herb-dominated patches, shrub clusters, bryophyte carpets, and exposed bedrock; observed in NH; average plot elevation is 800 m (2,625 feet). .... **Northern Appalachian Alpine Bulrush Cliff (CEGL006423)**
[*Trichophorum caespitosum - Calamagrostis pickeringii* Alpine Snowbed]

10a. Matrix, above treeline, alpine meadow of matted shrubs, sedges, and rushes on the highest peaks [above 1,370 m (4,500 feet) (occasionally lower)] of the northern Appalachian Mountains; a variable mixture of dwarf evergreen shrubs (primarily *Vaccinium uliginosum* (bog blueberry)) and herbs with locally extensive patches of graminoid cover, dominated by *Juncus trifidus* (highland rush) and/or *Carex bigelowii* (Bigelow's sedge); observed in NH and ME. ..... **Alpine Heath Meadow (CEGL006298)**
[*Vaccinium uliginosum - Rhododendron lapponicum / Juncus trifidus* Dwarf-shrubland]
10b. Less common, small patch dwarf-shrub dominated vegetation. **11**

11a. Protected areas where snow lingers - at summit edges, upper slopes, or bases of cliffs; *Vaccinium uliginosum* (bog blueberry) typically dominant and *Phyllodoce caerulea* (blue mountain-heath), *Betula glandulosa* (resin birch), or *Harrimanella hypnoides* (mossplant) characteristic; observed in NH. ..... **Alpine Heath Snowbank (CEGL006155)**
[*Vaccinium uliginosum - Harrimanella hypnoides - Loiseleuria procumbens* Dwarf-shrubland]
11b. Exposed areas; cushions of *Diapensia lapponica* (pincushion plant) dominate the vegetation (>30% cover), with *Vaccinium uliginosum* (bog blueberry); *Betula glandulosa* (resin birch), or *Harrimanella hypnoides* (mossplant) absent; herbs <10% cover; observed in NH. ..... **Windswept Alpine Ridge (CEGL006322)**
[*Diapensia lapponica* Dwarf-shrubland]

12a. Bog-like vegetation with peaty soils in subalpine setting above 610 m (2,000 feet) elevation, on moderate to steep slopes over bedrock or talus; bedrock substrate (or sometimes talus). **13**
12b. Upland vegetation in an open or woodland setting. **16**

13a. Subalpine peatlands near or above treeline forming in shallow bedrock basins where the peat usually remains saturated through the summer; vegetation dominated by bryoids with a mixture of dwarf-shrubs and graminoids, usually including *Vaccinium* (blueberry) spp., *Rubus chamaemorus* (cloudberry), *Ledum groenlandicum* (bog Labrador-tea), *Empetrum nigrum* (black crowberry), *Kalmia angustifolia* (sheep laurel), *Kalmia polifolia* (bog laurel), *Chamaedaphne calyculata* (leatherleaf), *Trichophorum caespitosum* (tufted bulrush), and *Eriophorum* (cottongrass) spp.; observed in NH, plot elevations range from 1,036 to 1,599 m (3,400-5,246 feet). ..... **Black Crowberry Wet Alpine Bog (CEGL006140)**
[*Empetrum nigrum - Vaccinium uliginosum - Vaccinium oxycoccos / Rubus chamaemorus* Dwarf-shrubland]
13b. Dwarf-shrub- (or, rarely graminoid-) dominated vegetation on *Sphagnum* (sphagnum moss) or *Cladina* (reindeer lichen) spp., forming a thin layer over sloping bedrock (sometimes talus), not a basin; peat may not remain saturated through the summer. **14**

14a. Rare graminoid-dominated sloping fen, with abundant *Trichophorum caespitosum* (tufted bulrush) and *Calamagrostis pickeringii* (Pickering's reedgrass) restricted to the brow of certain alpine cliffs; dwarf ericaceous shrubs including *Vaccinium uliginosum* (bog blueberry), *Chamaedaphne calyculata* (leatherleaf), *Kalmia polifolia* (bog laurel), and *Ledum groenlandicum* (bog Labrador-tea) common; may occur as a mosaic of herb-dominated patches, shrub clusters, bryophyte carpets, and exposed bedrock; observed in NH; average plot elevation is 800 m (2,625 feet). ..... **Northern Appalachian Alpine Bulrush Cliff (CEGL006423)**
[*Trichophorum caespitosum - Calamagrostis pickeringii* Alpine Snowbed]
14b. Dwarf-shrub-dominated vegetation. **15**

15a. Subalpine slope bog occurring on moderate to very steep subalpine slopes near or above treeline with plot elevations ranging from 1,085 to 1,420 m (3560-4,659 feet); peat accumulation is deeper than in other alpine or subalpine heath settings, with depths of 25-80+ cm; dense layer of dwarf ericaceous shrubs dominated by a mixture of *Kalmia angustifolia* (sheep laurel), *Chamaedaphne calyculata* (leatherleaf), *Ledum groenlandicum* (bog Labrador-tea), and *Sphagnum* (sphagnum moss); fruticose lichens including *Cladina rangiferina* (greygreen reindeer lichen) and *Cetraria islandica* (island cetraria lichen) abundant; observed in NH and ME..... **Subalpine Slope Bog (CEGL006425)**
[*Kalmia angustifolia - Chamaedaphne calyculata / Rubus chamaemorus / Cladina* spp. Dwarf-shrubland]

15b. Talus heathland usually at lower elevations [plot elevations ~700 m (2,296 feet)] in cool microsites with very patchy vegetation, occurring at the base of much exposed talus slopes; bryoid layer has *Cladina* (reindeer lichen) spp. and *Cladonia* (cup lichen) spp. more extensive than *Sphagnum* (sphagnum moss) cover; may be open or partially wooded, primarily with *Picea mariana* (black spruce); observed in the Presidential Range. ..... **Cold Air Talus Heathland (CEGL006268)**
[*Picea mariana / Ledum groenlandicum - Empetrum nigrum / Cladina* spp. Dwarf-shrubland]

16a. 1-2 m tall *Alnus viridis* ssp. *crispa* (mountain alder) and *Betula papyrifera* (paper birch) (possibly including the subalpine var. *cordifolia*) alder-birch shrublands found in subalpine to lower alpine zones in unstable settings such as avalanche paths, old landslides, or cirque walls; herb cover is patchy and best developed in openings among the shrubs; bryophytes are sparse; *Diervilla lonicera* (northern bush honeysuckle) and/or *Corylus cornuta* (beaked hazelnut) may be locally abundant, especially in somewhat drier microsites; stunted *Picea mariana* (black spruce) and *Abies balsamea* (balsam fir) possible; *Viburnum edule* (squashberry) often present with low cover; herbs include *Solidago macrophylla* (largeleaf goldenrod), *Prenanthes trifoliolata* (gall of the earth), *Eurybia radula* (low rough aster), *Sibbaldiopsis tridentata* (shrubby fivefingers) (in drier openings), *Dryopteris campyloptera* (mountain woodfern), *Dryopteris intermedia* (intermediate woodfern), *Athyrium filix-femina* (common ladyfern) and *Calamagrostis canadensis* (bluejoint). .... **Alpine Slope Shrub Thicket (CEGL006064)**
[*Alnus viridis* ssp. *crispa - Spiraea alba / Solidago macrophylla* Shrubland]

16b. *Alnus viridis* ssp. *crispa* (mountain alder) and *Betula papyrifera* (paper birch) not abundant.... **17**

17a. Spruce and/or fir krummholz and tall shrubs absent or very limited; sparse vascular vegetation forming a patchwork of matted shrubs amid expanses of rock; *Vaccinium uliginosum* (bog blueberry), *Vaccinium vitis-idaea* (lingonberry), and/or *Empetrum* (crowberry) spp. the most abundant dwarf-shrubs; sometimes extending above treeline; observed in ME and NH. .... **Subalpine Rock Bald (CEGL006533)**
[*Vaccinium uliginosum / Sibbaldiopsis tridentata* Sparse Vegetation]

17b. Spruce and/or fir abundant..... **18**

18a. Shrub species form the dominant cover; vegetation a mixture of dwarf heath shrubs and scattered stunted *Picea* spp. (black spruce and/or red spruce), and/or *Abies balsamea* (balsam fir) with *Kalmia angustifolia* (sheep laurel) or *Ledum groenlandicum* (bog Labrador-tea) as the most abundant dwarf-shrub; taller shrubs, or tall-shrub-sized spruce often interspersed as islands; subalpine, sometimes extending above treeline; elevation of plots ranges from 950 to 1,460 m (3,117-4,790 feet); global elevations range from 550-1,435 m (1,800-4,700 feet); observed in ME and NH.... ..... **Subalpine Summit Heath (CEGL006031)**
[(*Picea mariana, Abies balsamea*) / *Kalmia angustifolia - Ledum groenlandicum* Dwarf-shrubland]

18b. Talus heathland usually at lower elevations [plot elevations ~700 m (2,296 feet)] in cool microsites with very patchy vegetation, occurring at the base of much exposed talus slopes; bryoid layer has *Cladina* (reindeer lichen) spp. and *Cladonia* (cup lichen) spp. more extensive than *Sphagnum* (sphagnum moss) cover; may be open or partially wooded, primarily with *Picea mariana* (black spruce); observed in the Presidential Range. .....**Cold Air Talus Heathland (CEGL006268)**
[*Picea mariana / Ledum groenlandicum - Empetrum nigrum / Cladina* spp. Dwarf-shrubland]

19a. Vegetation of low- to mid-elevation open summits, with patchy vegetation including dwarf-shrubs, herbs, and, in more protected spots, taller shrubs or stunted trees; vegetation is not sparse (≥10% cover). **20**
19b. Sparse vegetation of mid-elevation steep talus slopes, boulderfields, and cliffs (including the cliff brow) with sparse and patchy vegetation (<10% cover). **24**

20a. Trees and/or tall shrubs (1-2 m) present. **21**
20b. Dwarf ericads (1 m) form the dominant cover. **23**

21a. 1-2 m tall *Alnus viridis* ssp. *crispa* (mountain alder) and *Betula papyrifera* (paper birch) (possibly including the subalpine var. *cordifolia*) alder-birch shrublands found in subalpine to lower alpine zones in unstable settings such as avalanche paths, old landslides, or cirque walls; herb cover is patchy and best developed in openings among the shrubs; bryophytes are sparse; *Diervilla lonicera* (northern bush honeysuckle) and/or *Corylus cornuta* (beaked hazelnut) may be locally abundant, especially in somewhat drier microsites; stunted *Picea mariana* (black spruce) and *Abies balsamea* (balsam fir) may be present; *Viburnum edule* (squashberry) is often present, although in very low numbers; herbs include Solidago macrophylla (largeleaf goldenrod), *Prenanthes trifoliolata* (gall of the earth), *Eurybia radula* (low rough aster), *Sibbaldiopsis tridentata* (shrubby fivefingers) (in drier openings), *Dryopteris campyloptera* (mountain woodfern), *Dryopteris intermedia* (intermediate woodfern), *Athyrium filix-femina* (common ladyfern), and *Calamagrostis canadensis* (bluejoint). .....**Alpine Slope Shrub Thicket (CEGL006064)**
[*Alnus viridis* ssp. *crispa - Spiraea alba / Solidago macrophylla* Shrubland]
21b. *Picea rubens* (red spruce) -dominated woodlands. **22**

22a. Patchy and open *Picea rubens* (red spruce) woodland with *Abies balsamea* (balsam fir) or *Pinus strobus* (eastern white pine) occasionally codominant, occurring on exposed acidic bedrock outcrops, rocky ridges or summits often with high lichen cover; talus substrate sparse to absent; *Betula papyrifera* var. *cordifolia* (mountain paper birch) may be common over a heath-forb understory with *Vaccinium angustifolium* (lowbush blueberry) and *Kalmia angustifolia* (sheep laurel); elevations range from 305-880 m (1,000-2,887 feet)..... .....**Northern Appalachian Red Spruce Rocky Ridge (CEGL006053)**
[*Picea rubens / Vaccinium angustifolium / Sibbaldiopsis tridentata* Woodland]
22b. *Picea rubens* (red spruce) woodland of acidic talus steep slopes typically occurring within the spruce-fir forest zone at moderate to high elevations with variable canopy closure and coverage; *Abies balsamea* (balsam fir), *Betula papyrifera* var. *papyrifera* (paper birch), *Betula papyrifera* var. *cordifolia* (mountain paper birch), and *Betula alleghaniensis* (yellow birch) are canopy associates; tall-shrub cover is comprised of *Acer spicatum* (mountain maple), *Acer pensylvanicum* (striped maple), *Sorbus americana* (American mountain-ash), and *Sorbus decora* (northern mountain-ash); *Ribes glandulosum* (skunk currant) is a typical and diagnostic smaller shrub; heaths may be present, but not abundant.....**Red Spruce Talus Slope Woodland (CEGL006250)**
[*Picea rubens / Ribes glandulosum* Woodland]

23a. Acidic rock heath barren occurring on rocky ridges, outcrops and summits dominated by *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium myrtilloides* (velvetleaf huckleberry), and/or *Vaccinium pallidum* (Blue Ridge blueberry); more temperate species such as *Quercus rubra* (northern red oak), *Arctostaphylos uva-ursi* (kinnikinnick), *Solidago simplex* var. *randii* (Rand's goldenrod), and/or *Minuartia glabra* (Appalachian stitchwort) often present; more boreal species such as *Ledum groenlandicum* (bog Labrador-tea) and *Empetrum* (crowberry) spp. absent; observed in NH; below 825 m (2,700 feet). ..... **Blueberry Granite Barrens (CEGL005094)**
[*Vaccinium angustifolium - Sorbus americana / Sibbaldiopsis tridentata* Dwarf-shrubland]

23b. Vegetation a mixture of dwarf heath shrubs and scattered stunted *Picea mariana* (black spruce), *Picea rubens* (red spruce), and/or *Abies balsamea* (balsam fir) with *Kalmia angustifolia* (sheep laurel) or *Ledum groenlandicum* (bog Labrador-tea) as the most abundant dwarf-shrub; taller shrubs, or tall-shrub-sized spruce often interspersed as islands; subalpine, sometimes extending above treeline; elevation of APPA plots ranges from 950 to 1,460 m (3,117-4,790 feet); global elevations range from 550-1,435 m (1,800-4,700 feet)..... **Subalpine Summit Heath (CEGL006031)**
[(*Picea mariana, Abies balsamea*) / *Kalmia angustifolia - Ledum groenlandicum* Dwarf-shrubland]

24a**.** Very steep, lichen-covered talus slopes and boulderfields occurring at mid elevations from 300-900 m (984-2,953 feet) with little-to-no soil accumulation; *Cladina* (reindeer lichen) spp. and *Cladonia* (cup lichen) spp. characteristic; scattered and isolated patches of stunted vegetation including but not limited to *Picea rubens* (red spruce), *Betula papyrifera* var. *cordifolia* (mountain paper birch), dwarf ericads such as *Vaccinium* spp. (blueberries), and *Polypodium* (polypody) spp. possible at low cover (≤10% cover)..... **Northern Lichen Talus Barrens (CEGL006534)**
Polypodium (*virginianum, appalachianum*) / Lichens Nonvascular Vegetation

24b. Sparse and patchy vegetation of cliffs, including the cliff brow above. **25**

25a. Seepy wet cliff community dominated by moisture-loving plants such as *Chrysosplenium americanum* (American golden saxifrage), *Epilobium ciliatum* ssp. *glandulosum* (fringed willowherb), *Cinna latifolia* (drooping woodreed), *Drosera rotundifolia* (roundleaf sundew), and *Trichophorum caespitosum* (tufted bulrush), often with abundant bryophytes; *Oclemena acuminata* (whorled wood aster) and *Viola* (violet) spp. are characteristic; observed in NH. .... **Northern Appalachian Cliff Seep (CEGL006429)**
[*Drosera rotundifolia - Viola* spp. Cliff Sparse Vegetation]

25b. Cliff-face dry, at most with small linear seepage areas included. **26**

26a. Sub-boreal cliffs or outcrops of circumneutral to calcareous rocks where woody plants such as *Thuja occidentalis* (arborvitae), *Sorbus decora* (northern mountain-ash) and/or *Sorbus americana* (American mountain-ash) are common; enriched conditions present, as evidenced by calciphilic vascular plants or bryophytes, including *Dryopteris fragrans* (fragrant woodfern), *Dasiphora fruticosa* ssp. *floribunda* (shrubby-cinquefoil), *Carex scirpoidea* (northern singlespike sedge), *Pinguicula vulgaris* (common butterwort), *Asplenium trichomanes-ramosum* (bright-green spleenwort), *Asplenium trichomanes* (maidenhair spleenwort), and/or *Carex eburnea* (bristleleaf sedge); possible on trail in NH and observed in ME at 847 m (2,278 feet). .... **Near-Boreal Alkaline Cliff (CEGL006526)**
[*Carex scirpoidea* Alkaline Cliff Sparse Vegetation]

26b. Cliffs or outcrops of acidic rock; vegetation patchy and in many places sparse; herbaceous flora varies, but lacks calciphiles, with typical species including *Polypodium* (polypody) spp., *Sibbaldiopsis tridentata* (shrubby fivefingers), *Deschampsia flexuosa* (wavy hairgrass), *Streptopus lanceolatus* (twisted-stalk), and *Solidago simplex* var. *randii* (Rand's goldenrod); woody plants typically include *Picea rubens* (red spruce), *Betula papyrifera* (paper birch), or *Acer spicatum* (mountain maple); observed in NH and possible on trail ME; plot elevations range from 678 to 1,155 m (2,224-3,789 feet). .....**Northern Appalachian Acidic Cliff (CEGL006528)**
[*Polypodium (virginianum, appalachianum)* Cliff Sparse Vegetation]

6. Upland Woodlands[39]

1a. Open woodlands on exposed talus or cliffs with trees very patchy and open areas interspersed; trees generally short; talus may be covered by a thin layer of leaf litter. **2**
1b. Woodlands not occurring on exposed talus. **4**

2a. Northern hardwood - (oak) talus slope woodland of low to mid elevations up to about 518 m (1,700 feet) with some combination of *Betula alleghaniensis* (yellow birch) and/or *Betula papyrifera* (paper birch); oak may drop out entirely in the northern portion of range; enriched-site herbs absent; *Acer spicatum* (mountain maple), *Acer pensylvanicum* (striped maple), *Rubus* (blackberry) spp., *Viburnum acerifolium* (mapleleaf viburnum), and *Ribes* (currant) spp. also common; vines are characteristic including *Parthenocissus quinquefolia* (Virginia creeper), *Parthenocissus vitacea* (woodbine), *Toxicodendron radicans* (eastern poison-ivy), and others; *Dryopteris marginalis* (marginal woodfern), *Dryopteris campyloptera* (mountain woodfern), *Polypodium virginianum* (rock polypody), and *Maianthemum canadense* (Canada mayflower) are common herbs; observed in NH; global range extends into ME. ..... **Northern Hardwood - Oak Talus Slope Woodland (CEGL006584)**
[*Betula alleghaniensis - Quercus rubra / Polypodium virginianum* Woodland]
2b. *Picea rubens* (red spruce) and/or *Picea mariana* (black spruce) present. **3**

3a. *Picea rubens* (red spruce) woodland of acidic talus steep slopes typically occurring within the spruce-fir forest zone at moderate to high elevations with variable canopy coverage; *Abies balsamea* (balsam fir), *Betula papyrifera* var. *papyrifera* (paper birch), *Betula papyrifera* var. *cordifolia* (mountain paper birch), and *Betula alleghaniensis* (yellow birch) are canopy associates; tall-shrub cover is comprised of *Acer spicatum* (mountain maple), *Acer pensylvanicum* (striped maple), *Sorbus americana* (American mountain-ash) and *Sorbus decora* (northern mountain-ash); *Ribes glandulosum* (skunk currant) is a diagnostic smaller shrub; heaths may be present, but not abundant; vegetation may be sparse in areas with massive talus blocks. ..... **Red Spruce Talus Slope Woodland (CEGL006250)**
[*Picea rubens / Ribes glandulosum* Woodland]
3b. Partially wooded to open talus heathland occurring at the base of much exposed talus slopes; bryoid layer has *Cladina* (reindeer lichen) spp. and *Cladonia* (cup lichen) spp.; may be open or partially wooded, primarily with *Picea mariana* (black spruce); observed in the Presidential Range at 776 m (2,296 feet) in cool microsites. ..... **Cold Air Talus Heathland (CEGL006268)**
[*Picea mariana / Ledum groenlandicum - Empetrum nigrum / Cladina* spp. Dwarf-shrubland]

4a. Evergreen or mixed evergreen and deciduous trees codominant in canopy. **5**
4b. Deciduous trees dominant in canopy. **8**

[39]Open stands of trees generally forming 10-60% cover. See Open Alpine and Subapline Vegetation for alpine herbaceous meadows, heath barrens, krummholz, cliffs, rocky outcrop, steep lichen covered talus slopes and sparse vegetation with <10% tree cover.

5a. *Quercus rubra* (northern red oak) and occasionally *Pinus strobus* (eastern white pine) codominate the patchy rocky summit and upper slope woodland, occurring low- to mid-elevation summits from 375 to 567 m (1,235-1,860 feet); *Betula populifolia* (gray birch), *Betula papyrifera* (paper birch), and/or *Acer rubrum* (red maple) are canopy associates; *Castanea dentata* (American chestnut) and *Amelanchier laevis* (Allegheny serviceberry), characteristic; *Vaccinium angustifolium* (lowbush blueberry) and/or *Gaylussacia baccata* (black huckleberry) dominate the shrub layer; *Deschampsia flexuosa* (wavy hairgrass), *Danthonia spicata* (poverty oatgrass), *Cypripedium acaule* (moccasin flower), *Aralia nudicaulis* (wild sarsaparilla), and *Pteridium aquilinum* (western brackenfern) characteristic herbs; observed in Hanover and Shelburne NH and in ME. ..... **Red Oak / Heath Woodland Rocky Summit (CEGL006134)**
[*Quercus rubra - (Quercus prinus) / Vaccinium* spp. / *Deschampsia flexuosa* Woodland]
5b. Evergreen trees dominant or codominant in canopy. **6**

6a. *Pinus banksiana* (Jack pine) dominant on mid to high elevation 550 to 1,190 m (1,800-3,900 feet) mountain ridges in the White Mountains in NH; observed at Crawford Notch, NH. ..... **Jack Pine Heath Barrens (CEGL006041)**
[*Pinus banksiana / Kalmia angustifolia - Vaccinium* spp. Woodland]
6b. Other conifers dominant. **7**

7a. Patchy and open *Picea rubens* (red spruce) woodland with *Abies balsamea* (balsam fir) or *Pinus strobus* (eastern white pine) occasionally codominant, occurring on acidic bedrock outcrops and exposed bedrock often with high lichen cover also on rocky ridges or summits; talus substrate sparse to absent; *Betula papyrifera* var. *cordifolia* (mountain paper birch) may be common; over a heath-forb understory with *Vaccinium angustifolium* (lowbush blueberry) and *Kalmia angustifolia* (sheep laurel) common; elevations range from 305-880 m (1,000-2,887 feet). ..... **Northern Appalachian Red Spruce Rocky Ridge (CEGL006053)**
[*Picea rubens / Vaccinium angustifolium / Sibbaldiopsis tridentata* Woodland]
7b. Stunted tree species form the dominant cover; dense masses or patches of krummholz (stunted conifers) ≤2 m tall including *Picea mariana* (black spruce) and *Abies balsamea* (balsam fir) [and on occasion *Larix* (larch)] forming a band between treeline and more open summit areas; *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Nemopanthus mucronatus* (catberry), and *Ledum groenlandicum* (bog Labrador-tea) are common shrubs; elevation of plots range from 1,018 to 1,109 m (3,340-3,669 feet). ..... **Black Spruce Krummholz (CEGL006038)**
[*Picea mariana - Abies balsamea / Sibbaldiopsis tridentata* Shrubland]

8a. *Quercus rubra* (northern red oak) and occasionally *Pinus strobus* (eastern white pine) codominate the patchy woodland, occurring on rocky upper slopes and low- to mid-elevation summits from 375 to 567 m (1,235-1,860 feet); *Betula populifolia* (gray birch), *Betula papyrifera* (paper birch), and/or *Acer rubrum* (red maple) are canopy associates; *Amelanchier laevis* (Allegheny serviceberry), characteristic; *Vaccinium angustifolium* (lowbush blueberry) and/or *Gaylussacia baccata* (black huckleberry) dominate the shrub layer; *Deschampsia flexuosa* (wavy hairgrass), *Danthonia spicata* (poverty oatgrass), *Cypripedium acaule* (moccasin flower), *Aralia nudicaulis* (wild sarsaparilla), and *Pteridium aquilinum* (western brackenfern) characteristic herbs; observed in Hanover and Shelburne, NH and in ME. ..... **Red Oak / Heath Woodland Rocky Summit (CEGL006134)**
[*Quercus rubra - (Quercus prinus) / Vaccinium* spp. / *Deschampsia flexuosa* Woodland]

8b. Early-successional northern hardwoods dominated by a combination of *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), and/or *Betula populifolia* (gray birch); *Betula papyrifera* (paper birch), old-field grasses and herbs in herb layer; understory may contain *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Abies balsamea* (balsam fir), or *Picea rubens* (red spruce), *Pinus strobus* (eastern white pine), and/or *Tsuga canadensis* (eastern hemlock) in canopy and understory; ranges from closed-canopy forests to open woodlands; observed in NH and common in ME.....**Ruderal Aspen - Birch Woodland (CEGL006303)**

[*Populus (tremuloides, grandidentata) - Betula (populifolia, papyrifera)* Ruderal Woodland]

7. Spruce and/or Fir Upland Woodlands and Forests

1a. Open woodlands and spruce-fir krummholz. **2**
1b. Closed-canopy forests and plantations; canopy coverage >70%. **4**

2a. Stunted tree species form the dominant cover; dense masses or patches of krummholz (stunted conifers) ≤2 m tall including *Picea mariana* (black spruce) and *Abies balsamea* (balsam fir) [and on occasion *Larix* (larch)] forming a band between treeline and more open summit areas; *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Nemopanthus mucronatus* (catberry), and *Ledum groenlandicum* (bog Labrador-tea) are common shrubs; elevation of plots range from 1,018 to 1,109 m (3,340-3,669 feet). ..... **Black Spruce Krummholz (CEGL006038)**
[*Picea mariana - Abies balsamea / Sibbaldiopsis tridentata* Shrubland]
2b. Woodlands. **3**

3a. *Picea rubens* (red spruce) woodland of acidic talus steep slopes typically occurring within the spruce-fir forest zone at moderate to high elevations [plot elevations are 664 and 890 m (2,178-2,920 feet)]; *Abies balsamea* (balsam fir), *Betula papyrifera* var. *papyrifera* (paper birch), *Betula papyrifera* var. *cordifolia* (mountain paper birch), and *Betula alleghaniensis* (yellow birch) are canopy associates; tall-shrub cover is comprised of *Acer spicatum* (mountain maple), *Acer pensylvanicum* (striped maple), *Sorbus americana* (American mountain-ash), and *Sorbus decora* (northern mountain-ash); *Ribes glandulosum* (skunk currant) is a typical and diagnostic smaller shrub; heaths may be present, but not abundant; vegetation may be sparse at some sites with massive talus boulders; observed in NH and ME. ..... **Red Spruce Talus Slope Woodland (CEGL006250)**
[*Picea rubens / Ribes glandulosum* Woodland]
3b. Patchy and open to ocassionally closed (70% cover) *Picea rubens* (red spruce) woodland with *Abies balsamea* (balsam fir) and/or *Pinus strobus* (eastern white pine) occasionally codominant, occurring on acidic bedrock outcrops, rocky ridges or summits; talus substrate sparse to absent; *Betula papyrifera* var. *cordifolia* (mountain paper birch) may be common; over a heath-forb understory with *Vaccinium angustifolium* (lowbush blueberry) and *Kalmia angustifolia* (sheep laurel) common; high lichen and moss cover and exposed bedrock; elevations range from 305-880 m (1,000-2,887 feet). ..... **Northern Appalachian Red Spruce Rocky Ridge (CEGL006053)**
[*Picea rubens / Vaccinium angustifolium / Sibbaldiopsis tridentata* Woodland]

4a. *Picea* (spruce) spp. plantations dominated by *Picea abies* (Norway spruce) **or** *Picea glauca* (white spruce), and/or any combination of spruce species; successional understory may be present with *Prunus serotina* (black cherry), *Acer rubrum* (red maple), *Rubus* (blackberry) spp., *Dennstaedtia punctilobula* (eastern hayscented fern), and others; observed in NH. ..... **Norway Spruce Plantation (CST007167)**
[*Picea abies* Forest Plantation]
4b. Naturally regenerated forests. **5**

5a. *Thuja occidentalis* (arborvitae) seepage forest; *Thuja occidentalis* (arborvitae) either clearly dominant or mixed with *Picea rubens* (red spruce), *Abies balsamea* (balsam fir), and/or *Betula alleghaniensis* (yellow birch) or *Fraxinus* (ash) spp.; *Alnus incana* (gray alder) dominant shrub on wetter sites; characteristic herbs include *Tiarella cordifolia* (heartleaf foamflower), *Ranunculus hispidus* var. *nitidus* (bristly buttercup), *Solidago rugosa* (wrinkleleaf goldenrod), *Doellingeria umbellata* (parasol whitetop), *Chrysosplenium americanum* (American golden saxifrage), and *Symphyotrichum puniceum* (purplestem aster); non-*Sphagnum* (sphagnum moss) mosses abundant; forests on gentle to moderate slopes with groundwater seepage maintaining moist to saturated conditions; mineral soils with little peat accumulation, or rocky/bouldery substrates near lakes and rivers; most often where the substrate is not strongly acidic; observed in ME..... **Northern White-cedar - Spruce Seepage Forest (CEGL006175)**
[*Thuja occidentalis - (Picea rubens) / Tiarella cordifolia* Swamp Forest]
5b. Upland forests lacking seepage indicators..... **6**

6a. Subalpine coniferous forest dominated by *Abies balsamea* (balsam fir) near treeline on upper mountain slopes and ridgetops above 732 m (2,400 feet) elevation and approaching a matrix forest above 1,219 m (4,000 feet); open to closed subalpine evergreen or mixed evergreen - deciduous canopies ranging from 40-90% total cover; *Abies balsamea* (balsam fir) is always present and is the sole dominant or may be codominated by *Betula papyrifera* var. *cordifolia* (mountain paper birch); *Picea rubens* (red spruce) is frequently present at low cover (<10% in canopy); a dense subcanopy may be present and composed of the canopy species in addition to *Acer pensylvanicum* (striped maple), *Sorbus americana* (American mountain-ash), and *Sorbus decora* (northern mountain-ash); consistent herbs include *Clintonia borealis* (bluebead), *Dryopteris campyloptera* (mountain woodfern), *Huperzia lucidula* (shining clubmoss), and *Oxalis montana* (mountain woodsorrel); fir waves are repeating patterns of growth, senescence, and regeneration that are controlled by the prevailing wind and are a physiognomically unusual expression of this community; common in the NAP project area..... **Montane Balsam Fir - Birch Forest (CEGL006112)**
[*Abies balsamea - (Betula papyrifera* var. *cordifolia*) Forest]
6b. Strong presence (>25%) of *Picea rubens* (red spruce) in the canopy or in the understory; *Betula papyrifera* var. *cordifolia* (mountain paper birch) absent to minor or non-diagnostic (i.e., growing outside of its appropriate range)..... **7**

7a. Mixed deciduous - spruce forests, *Picea rubens* (red spruce) comprises at least 25% total canopy cover, with *Abies balsamea* (balsam fir) more common in logged stands; *Tsuga canadensis* (eastern hemlock) minor to absent; deciduous hardwood species form at least 25% canopy cover..... **8**
7b. Evergreen canopy, with deciduous trees typically forming <25% of the canopy cover..... **9**

8a. Closed-canopy mixed deciduous - evergreen forests occurring at middle elevations, between 305 and 762 m (1,000-2,500 feet) on moderate to steep low to high slopes with cooler north, northwest, east and northeast aspects; *Betula alleghaniensis* (yellow birch) and *Picea rubens* (red spruce) are codominant or present; canopy associates present at low cover may include *Acer rubrum* (red maple), *Acer spicatum* (mountain maple), *Abies balsamea* (balsam fir), *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), and *Betula papyrifera* (paper birch); *Viburnum lantanoides* (hobblebush) most frequent shrub; dense herbaceous layer dominated by the ferns *Dryopteris campyloptera* (mountain woodfern), *Dryopteris intermedia* (intermediate woodfern), and *Dennstaedtia punctilobula* (eastern hayscented fern); nonvascular moss and lichen species may have as much as 60% cover; observed in NH and ME..... **Transitional Northern Hardwood - Red Spruce Forest (CEGL006267)**
[*Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest]

8b. Highly variable mixed evergreen-deciduous successional forest occurring on sites that have burned or been heavily harvested and are characterized by canopies dominated by combinations of *Picea rubens* (red spruce), *Abies balsamea* (balsam fir), *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), and *Betula papyrifera* (paper birch); *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Pinus strobus* (eastern white pine), and *Tsuga canadensis* (eastern hemlock) often occur at low cover; shrub layer mainly consists of species from the canopy and may be very dense on some sites; *Viburnum lantanoides* (hobblebush) and *Acer pensylvanicum* (striped maple) may be common; locally dominant herbs can include *Aralia nudicaulis* (wild sarsaparilla), *Carex gynandra* (nodding sedge), *Clintonia borealis* (bluebead), *Coptis trifolia* (threeleaf goldthread), *Cornus canadensis* (bunchberry dogwood), *Dennstaedtia punctilobula* (eastern hayscented fern), *Dryopteris campyloptera* (mountain woodfern), *Dryopteris intermedia* (intermediate woodfern), *Huperzia lucidula* (shining clubmoss), *Maianthemum canadense* (Canada mayflower), *Oxalis montana* (mountain woodsorrel), *Pteridium aquilinum* (western brackenfern), *Thelypteris noveboracensis* (New York fern), and *Uvularia sessilifolia* (sessileleaf bellwort); includes young stands dominated by softwoods; observed in NH and ME. ..... **Successional Mixed Spruce - Fir - Hardwood Forest (CEGL006505)**
[*Picea rubens - Abies balsamea - Betula* spp. - *Acer rubrum* Forest]

9a. Mixed evergreen - deciduous forest characterized by a canopy cover of variable mixtures of *Tsuga canadensis* (eastern hemlock), *Picea rubens* (red spruce) (10-45% cover) and *Betula alleghaniensis* (yellow birch); canopy associates may include *Acer rubrum* (red maple), *Betula papyrifera* (paper birch) and *Pinus strobus* (eastern white pine); canopy species dominate the shrub layer with *Acer pensylvanicum* (striped maple); low herb cover with most abundant species *Aralia nudicaulis* (wild sarsaparilla) and *Dryopteris intermedia* (intermediate woodfern); boreal species such as *Dryopteris campyloptera* (mountain woodfern), *Huperzia lucidula* (shining clubmoss), *Oxalis montana* (mountain woodsorrel), and *Trillium undulatum* (painted trillium) possible; plots occur on sheltered slopes at moderate elevations from 200 to 480 m (670-1,580 feet); observed in NH and ME. ..... **Hemlock - Spruce - Hardwood Forest (CEGL006129)**
[*Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest]
9b. Spruce-fir and/or spruce-dominated canopy; deciduous hardwoods <25%; *Tsuga canadensis* (eastern hemlock) sparse to absent **10**

10a. *Picea rubens - Abies balsamea* (red spruce-balsam fir) and/or *Picea mariana - Picea rubens* (black spruce-red spruce) flats with a well-developed bryophyte layer that includes *Pleurozium schreberi* (Schreber's big red stem moss), *Hylocomium splendens* (splendid feathermoss), *Ptilium crista-castrensis* (knights plume moss), *Bazzania trilobata* (three-lobed bazzania), and *Sphagnum* (sphagnum moss); upland and wetland plants in the understory include heath shrubs *Kalmia angustifolia* (sheep laurel), *Vaccinium angustifolium* (lowbush blueberry), and *Vaccinium myrtilloides* (velvetleaf huckleberry) and herbs *Osmunda cinnamomea* (cinnamon fern), *Osmunda claytoniana* (interrupted fern), *Gaultheria hispidula* (creeping snowberry), *Maianthemum canadense* (Canada mayflower), and *Cornus canadensis* (bunchberry dogwood); occurs on imperfectly drained flats or stream drainages, where cold air accumulates; shrubs sparse; may intergrade with Low Elevation Spruce Fir Forest, depending on subtle changes in drainage; observed on trail in NH and ME. ..... **Northern Spruce - Fir Flats (CEGL006361)**
[*Picea mariana - Picea rubens / Pleurozium schreberi* Swamp Forest]
10b. Upland *Picea rubens* (red spruce) and *Abies balsamea* (balsam fir) forests **11**

11a. Widespread on lower-elevation slopes between 244 and 640 m (800-2,100 feet); canopy dominated by variable amounts of *Picea rubens* (red spruce) and *Abies balsamea* (balsam fir); on occasion just spruce; *Acer rubrum* (red maple) is the most common hardwood; high-elevation species such as *Dryopteris campyloptera* (mountain woodfern) and *Sorbus americana* (American mountain-ash) are less abundant or absent here, while other lower-elevation species such as *Aralia nudicaulis* (wild sarsaparilla) *Trientalis borealis* (starflower), and *Trillium undulatum* (painted trillium) may be more abundant; observed in NH and ME..... **Low-Elevation Spruce-Fir Forest (CEGL006273)**
[*Picea rubens - Abies balsamea - Betula papyrifera* Forest]

11b. Spruce-fir forests of high elevations, generally a matrix forest between 634 and 1,067 m (2,000-3,500 feet); *Picea rubens* (red spruce) and *Abies balsamea* (balsam fir) dominant (usually 70-80% of the canopy); *Betula alleghaniensis* (yellow birch) is the most common hardwood; other canopy associates include *Sorbus americana* (American mountain-ash) and *Betula papyrifera* var. *cordifolia* (mountain paper birch); herb layer patchy with *Oxalis montana* (mountain woodsorrel), *Clintonia borealis* (bluebead), *Streptopus lanceolatus* (twisted-stalk), and/or *Dryopteris campyloptera* (mountain woodfern); lush carpet of mosses and liverworts characteristic; common in the NAP project area..... **Montane Spruce-Fir Forest (CEGL006128)**
[*Picea rubens - Abies balsamea / Sorbus americana* Forest]

8. Hemlock, Mixed Hemlock, Pine, and Mixed Pine Upland Forests[40]

1a. *Tsuga canadensis* (eastern hemlock) forming at least 25% of the total canopy. **2**
1b. *Pinus* (pine) spp. dominant in canopy; *Tsuga canadensis* (eastern hemlock) sparse to absent. **9**

2a. *Tsuga canadensis* (eastern hemlock) - mixed evergreen canopy; conifer trees >75% of canopy cover. **3**
2b. Mixed canopy hemlock-hardwood forest; northern hardwoods ≥25% canopy cover. **5**

3a. Mixed evergreen - deciduous forest characterized by a canopy cover of variable mixtures of *Tsuga canadensis* (eastern hemlock), *Picea rubens* (red spruce) (10-45% cover) and *Betula alleghaniensis* (yellow birch); canopy associates may include *Acer rubrum* (red maple), *Betula papyrifera* (paper birch) and *Pinus strobus* (eastern white pine); canopy species dominate the shrub layer with *Acer pensylvanicum* (striped maple); low herb cover with most abundant species *Aralia nudicaulis* (wild sarsaparilla) and *Dryopteris intermedia* (intermediate woodfern); boreal species such as *Dryopteris campyloptera* (mountain woodfern), *Huperzia lucidula* (shining clubmoss), *Oxalis montana* (mountain woodsorrel), and *Trillium undulatum* (painted trillium) possible; plots occur on sheltered slopes at moderate elevations from 200 to 480 m (670-1,580 feet);observed in NH and ME. ..... **Hemlock - Spruce - Hardwood Forest (CEGL006129)**
[*Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest]
3b. *Pinus strobus* (eastern white pine) important in canopy. **4**

4a. Closed-canopy evergreen forests dominated by variable mixtures of *Pinus strobus* (eastern white pine), *Picea rubens* (red spruce) and *Tsuga canadensis* (eastern hemlock), any of which can be dominant, codominant or a canopy associate; heavily shaded forests with understories with low cover and low diversity; northern hardwoods be present but at low cover; occurs on lower-elevation slopes and flats from MA to ME on sheltered slopes with sandy or stony, acidic, moderately well-drained loamy soils; observed in ME; in north, often hemlock-red spruce with little white pine. ..... **White Pine - Hemlock - Red Spruce Forest (CEGL006324)**
[*Pinus strobus - Tsuga canadensis - Picea rubens* Forest]
4b. *Picea rubens* (red spruce) absent to minor; *Tsuga canadensis* (eastern hemlock) forests with abundant or codominated by *Pinus strobus* (eastern white pine); *Acer rubrum* (red maple) and *Quercus rubra* (northern red oak) common associates; *Acer pensylvanicum* (striped maple) is a common; occurs on sloping sites and in sheltered ravines; from PA and NJ north to ME; observed in NH. ..... **Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest (CEGL006328)**
[*Pinus strobus - Tsuga canadensis* Lower New England / Northern Piedmont Forest]

[40] *Tsuga canadensis* (eastern hemlock) may be codominant in canopy (usually >25% of canopy). For all *Tsuga canadensis* associations that have been impacted by the hemlock woolly adelgid, treat standing and fallen dead trees as part of *Tsuga canadensis* canopy cover.

5a. Mixed *Tsuga canadensis* (eastern hemlock) - hardwood forest with a strong component of *Fagus grandifolia* (American beech), *Quercus rubra* (northern red oak); *Acer saccharum* (sugar maple) and/or *Betula alleghaniensis* (yellow birch) sparse to absent; subcanopy includes, *Pinus strobus* (eastern white pine), *Prunus serotina* (black cherry), and/or *Acer rubrum* (red maple); *Hamamelis virginiana* (American witch-hazel), *Acer pensylvanicum* (striped maple), and *Viburnum acerifolium* (mapleleaf viburnum) are common shrubs; herbs sparse; soils nutrient-poor, well-drained, often stony sandy loams or loamy sands; widespread in southern New England; observed in NH. .... **Hemlock - Beech - Red Oak Forest (CEGL006088)**
[*Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest]

5b. Forest with a strong component of *Picea rubens* (red spruce) **and/or** northern hardwood species, especially *Acer saccharum* (sugar maple) **and/or** *Betula* (birch) spp. **6**

6a. Seepage forests..... **7**
6b. Upland forests lacking seepage indicators..... **8**

7a. Mixed hardwood - hemlock (≤25% of canopy) [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple) - *Tsuga canadensis* (eastern hemlock) - *Abies balsamea* (balsam fir)] wetland forest occurring in seepage-influenced areas, at wetland-upland ecotones, along streamsides, on gentle to moderate slopes with minerals soils; herbaceous layer indicative of semi-nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians; balsam fir replaces hemlock as the dominant conifer in these sites moving northward. ..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]

7b. Low elevation *Acer rubrum - Fraxinus nigra* (red maple-black ash) seepage swamp; canopy often mixed with *Tsuga canadensis* (eastern hemlock); includes northern conifers such as *Thuja occidentalis* (arborvitae) and *Abies balsamea* (balsam fir); enrichment indicators such as *Rhamnus alnifolia* (alderleaf buckthorn), *Tiarella cordifolia* (heartleaf foamflower), and *Chrysosplenium americanum* (American golden saxifrage) present but not necessarily abundant; calciphiles lacking; observed in southern NH and northern ME. .... **Northern Hardwood - Hemlock Seepage Swamp Forest (CEGL006502)**
[*Acer rubrum - Fraxinus nigra - (Tsuga canadensis) / Tiarella cordifolia* Swamp Forest]

8a. *Tsuga canadensis* (eastern hemlock) - northern hardwood forest that lacks a significant presence of *Quercus* (oak) spp., *Pinus strobus* (eastern white pine) and *Picea rubens* (red spruce); hemlock 25-75% canopy cover; *Acer rubrum* (red maple), *Betula papyrifera* (paper birch), *Fagus grandifolia* (American beech), and *Fraxinus americana* (white ash) common; *Acer pensylvanicum* (striped maple) characteristic tall shrub; sparse herb layer but *Dryopteris intermedia* (intermediate woodfern), *Mitchella repens* (partridgeberry), *Clintonia borealis* (bluebead) and *Trientalis borealis* (starflower) are common; occurs on acidic soils, often on rocky, lower elevation slopes (below 300 m in ME and NH; higher up farther south); distributed in large patches from ME south through PA; observed on the West branch of the Pleasant River at about 250 m elevation in ME..... ..... **Hemlock - Northern Hardwood Forest (CEGL006638)**
[*Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest]

8b. Mixed evergreen - deciduous forest characterized by a canopy cover of variable mixtures of *Tsuga canadensis* (eastern hemlock), *Picea rubens* (red spruce) (10-45% cover) and *Betula alleghaniensis* (yellow birch); canopy associates may include *Acer rubrum* (red maple), *Betula papyrifera* (paper birch) and *Pinus strobus* (eastern white pine); canopy species dominate the shrub layer with *Acer pensylvanicum* (striped maple); low herb cover with most abundant species *Aralia nudicaulis* (wild sarsaparilla) and *Dryopteris intermedia* (intermediate woodfern); boreal species such as *Dryopteris campyloptera* (mountain woodfern), *Huperzia lucidula* (shining clubmoss), *Oxalis montana* (mountain woodsorrel), and *Trillium undulatum* (painted trillium) possible; plots occur on sheltered slopes at moderate elevations from 200 to 480 m (670-1,580 feet); observed in NH and ME. ..... **Hemlock - Spruce - Hardwood Forest (CEGL006129)**
[*Tsuga canadensis - (Betula alleghaniensis) - Picea rubens / Cornus canadensis* Forest]

9a. *Pinus resinosa* (red pine) dominant; *Picea rubens* (red spruce) and/or *Pinus strobus* (eastern white pine) may be nearly codominant; herb layer sparse; observed in southern NH and northern ME. ..... **White Pine - Red Pine Forest (CEGL006253)**
[*Pinus strobus - Pinus resinosa / Cornus canadensis* Forest]
9b. *Pinus strobus* (eastern white pine) or *Pinus banksiana* (Jack pine) dominant. **10**

10a. *Pinus banksiana* (Jack pine) dominant on mid to high elevation 550 to 1,190 m (1,800-3,900 feet) mountain ridges in the White Mountains in NH; observed only at Crawford Notch, NH. .... **Jack Pine Heath Barrens (CEGL006041)**
[*Pinus banksiana / Kalmia angustifolia - Vaccinium* spp. Woodland]
10b. *Pinus strobus* (eastern white pine) dominant. **11**

11a. Early- and mid-successional, ruderal or planted *Pinus strobus* (eastern white pine) and mixed pine forests. **12**
11b. Later-successional *Pinus strobus* (eastern white pine) and mixed canopy *Pinus strobus* (eastern white pine) forests. **15**

12a. Mixed evergreen-deciduous canopy with *Pinus strobus* (eastern white pine) and *Quercus* (oak) spp.; composition is variable depending on site history; canopy is a mixture of *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and *Fagus grandifolia* (American beech) occurring in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry); trees 40-100 years old; forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development; widespread throughout northern and central New England. .... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest]
12b. Evergreen-dominated canopy. **13**

13a. Multiple *Pinus* (pine) species in canopy; other conifers sometimes present in smaller amounts; planted in postagricultural fields and pastures; plantations of mixed pines or pine mixed with other non-native planted conifers; common throughout the Northeast. .... **Mixed Pine Conifer Plantation (CST006313)**
[*Pinus* spp. Forest Plantation]
13b. Planted and successional stands of even-aged *Pinus strobus* (eastern white pine). **14**

14a. *Pinus strobus* (eastern white pine) plantations. ....**Eastern White Pine Plantation (CST007178)**
[*Pinus strobus* Forest Plantation]

14b. Successional stands of *Pinus strobus* (eastern white pine); *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Fraxinus americana* (white ash), and/or *Prunus serotina* (black cherry) may be common in canopy and/or subcanopy. ....**Ruderal Eastern White Pine Forest (CEGL007944)**
[*Pinus strobus* Ruderal Forest]

15a. Closed-canopy evergreen forests dominated by variable mixtures of *Pinus strobus* (eastern white pine), *Picea rubens* (red spruce) and *Tsuga canadensis* (eastern hemlock), any of which can be dominant, codominant or a canopy associate; heavily shaded forests have understories with low cover and diversity; northern hardwoods present but at low cover; occurs on lower-elevation slopes and flats and on sheltered slopes with sandy or stony, acidic, moderately well-drained loamy soils from MA to ME; in north, often hemlock-red spruce with little white pine..... ..... **White Pine - Hemlock - Red Spruce Forest (CEGL006324)**
[*Pinus strobus* - *Tsuga canadensis* - *Picea rubens* Forest]

15b. *Picea rubens* (red spruce) absent to minor; *Tsuga canadensis* (eastern hemlock) forests codominated by *Pinus strobus* (eastern white pine); *Acer rubrum* (red maple) and *Quercus rubra* (northern red oak) common associates; *Acer pensylvanicum* (striped maple) is common, though rarely abundant; occurs on sloping sites and in sheltered ravines; from PA and NJ north to ME..... .....**Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest (CEGL006328)**
[*Pinus strobus* - *Tsuga canadensis* Lower New England / Northern Piedmont Forest]

9. Northern Hardwood Upland Forests[41]

1a. Forests with enrichment indicators in the canopy [i.e., *Acer saccharum* (sugar maple) (often abundant), *Tilia americana* (American basswood), *Fraxinus americana* (white ash), and *Ostrya virginiana* (hophornbeam) spp.]; shrubs include *Cornus alternifolia* (alternateleaf dogwood) and herbs may be *Actaea* (baneberry) spp., *Adiantum pedatum* (northern maidenhair), *Polystichum acrostichoides* (Christmas fern), *Polystichum braunii* (Braun's hollyfern), *Caulophyllum thalictroides* (blue cohosh), *Viola rotundifolia* (roundleaf yellow violet), *Hepatica nobilis* (hepatica), wide-leaved sedges (*Carex* spp.), *Geranium robertianum* (Robert's geranium), among many others. **2**
1b. Forests not as above; northern hardwoods dominant; enrichment indicators lacking. **5**

2a. Enriched northern hardwood forests of seepage areas. **3**
2b. Enriched and semi-enriched upland northern hardwood forests; seepage indicators absent. **4**

3a. Mixed hardwood-hemlock (≤25% of canopy) [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple) - *Tsuga canadensis* (eastern hemlock) - *Abies balsamea* (balsam fir)] wetland forest occurring in seepage-influenced areas, at wetland-upland ecotones, along streamsides, on gentle to moderate slopes with minerals soils; herbaceous layer indicative of moist conditions includes *Onoclea sensibilis* (sensitive fern), *Carex scabrata* (eastern rough sedge), and *Tiarella cordifolia* (heartleaf foamflower), or semi-nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians; balsam fir replaces hemlock as the dominant conifer in these sites moving northward..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]

3b. Shrubby to herbaceous seepage swamps or glades known from high elevations (>776 m [2,545 feet]) in the Northern Appalachians; occupying small openings on moderate to somewhat steep slopes within a matrix of *Abies balsamea*- (balsam fir) dominated forest (CEGL006112); soils primarily fertile mineral with deep organic/A horizon and little to no muck/peat accumulation; open to dense shrub layer up to 5 m in height dominated by *Prunus virginiana* (chokecherry), *Acer spicatum* (mountain maple), and *Sambucus racemosa* (red elderberry); *Ribes triste* (red currant) is often present as a short shrub; lush herb layer includes some combination *Angelica atropurpurea* (purplestem angelica), *Heracleum maximum* (common cowparsnip), *Hydrophyllum virginianum* (eastern waterleaf), *Impatiens capensis* (jewelweed), *Thalictrum pubescens* (king-of-the-meadow), *Tiarella cordifolia* (heartleaf foamflower), *Ageratina altissima* (white snakeroot), *Glyceria striata* (fowl mannagrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Athyrium filix-femina* (common ladyfern), *Chelone glabra* (white turtlehead), *Dryopteris campyloptera* (mountain woodfern), *Ranunculus recurvatus* (blisterwort), and others; observed in NH and ME. ..... **Northern Appalachian High-Elevation Seepage Shrubland (CEGL006583)**
[*Prunus virginiana - Acer spicatum - Ribes triste / Angelica atropurpurea - Heracleum maximum* Seepage Shrubland]

[41]Deciduous northern hardwood forests; *Tsuga canadensis* (eastern hemlock) low in cover to absent (<25%).

4a. Enriched northern hardwood forest dominated by *Acer saccharum* (sugar maple) and *Fraxinus americana* (white ash); *Ostrya virginiana* (hophornbeam) can be common as a small tree; *Acer spicatum* (mountain maple) is a characteristic shrub; strong enrichment-indicator herbs include *Caulophyllum thalictroides* (blue cohosh), *Adiantum pedatum* (northern maidenhair), *Asarum canadense* (Canadian wildginger), *Claytonia caroliniana* (Carolina springbeauty), *Deparia acrostichoides* (silver false spleenwort), and *Panax quinquefolius* (American ginseng), often with abundant spring ephemerals; from northern New England; observed in NH. ..... **Northern Sugar Maple - Ash Rich Mesic Forest (CEGL006636)**
[*Acer saccharum - Fraxinus americana / Acer spicatum / Caulophyllum thalictroides* Forest]

4b. Semi-rich northern hardwood forest dominated by a combination of *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), *Fraxinus americana* (white ash), and/or less commonly *Fagus grandifolia* (American beech); lacks the strong-enrichment indicator species mentioned above; *Acer pensylvanicum* (striped maple) common in understory; herbs are semi-rich including *Viola rotundifolia* (roundleaf yellow violet), *Athyrium filix-femina* (common ladyfern), *Arisaema triphyllum* (Jack in the pulpit), *Maianthemum racemosum* (feathery false lily of the valley), *Tiarella cordifolia* (heartleaf foamflower), *Actaea pachypoda* (white baneberry), *Polystichum acrostichoides* (Christmas fern), *Medeola virginiana* (Indian cucumber), wide-leaved sedges such as *Carex leptonervia* (nerveless woodland sedge) and *Carex laxiflora* (broad looseflower sedge) in addition to *Botrychium* (grapefern) spp., *Solidago flexicaulis* (zigzag goldenrod), *Osmunda claytoniana* (interrupted fern), and *Osmunda cinnamomea* (cinnamon fern); plots occur at moderate elevations from 204 to 610 m (670-1,830 feet) on slightly enriched soils often in cove and toeslope settings; observed in NH and ME. ..... **Semi-rich Northern Hardwood Forest (CEGL006211)**
[*Acer saccharum - (Fraxinus americana) / Arisaema triphyllum* Forest]

5a. Northern hardwood forests with 25-50% conifer cover in the canopy. **6**
5b. Northern hardwood forests with deciduous associates in the canopy; conifers ≤25% of canopy . **11**

6a. Mixed hardwood - hemlock (≤25% of canopy)] [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple) - *Tsuga canadensis* (eastern hemlock)] wetland forest occurring in seepage-influenced areas, at wetland-upland ecotones, along streamsides, on gentle to moderate slopes with minerals soils; herbaceous layer indicative of moist conditions includes *Onoclea sensibilis* (sensitive fern), *Carex scabrata* (eastern rough sedge), and *Impatiens capensis* (jewelweed), or semi-nutrient-enriched conditions with species such as *Geum rivale* (purple avens) and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]

6b. Seepage indicators lacking; upland forests. **7**

7a. Early- to- mid-successional forests. **8**
7b. Later-successional forests. **9**

8a. *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and *Fagus grandifolia* (American beech) occur in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry); *Betula papyrifera* (paper birch) and *Picea rubens* (red spruce) an occasional minor associate in northern examples; trees 40-100 years old; forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development; widespread throughout northern and central New England; observed in NH. ..... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest]

8b. Highly variable mixed evergreen-deciduous successional forest occurring on sites that have burned or been heavily harvested and are characterized by canopies dominated by combinations of *Picea rubens* (red spruce), *Abies balsamea* (balsam fir), *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), and *Betula papyrifera* (paper birch); *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Pinus strobus* (eastern white pine), and *Tsuga canadensis* (eastern hemlock) often occur at low cover; shrub layer mainly consists of species from the canopy and may be very dense on some sites; *Viburnum lantanoides* (hobblebush) and *Acer pensylvanicum* (striped maple) may be common; locally dominant herbs can include *Aralia nudicaulis* (wild sarsaparilla), *Carex gynandra* (nodding sedge), *Clintonia borealis* (bluebead), *Coptis trifolia* (threeleaf goldthread), *Cornus canadensis* (bunchberry dogwood), *Dennstaedtia punctilobula* (eastern hayscented fern), *Dryopteris campyloptera* (mountain woodfern), *Dryopteris intermedia* (intermediate woodfern), *Huperzia lucidula* (shining clubmoss), *Maianthemum canadense* (Canada mayflower), *Oxalis montana* (mountain woodsorrel), *Pteridium aquilinum* (western brackenfern), *Thelypteris noveboracensis* (New York fern), and *Uvularia sessilifolia* (sessileleaf bellwort); includes young stands dominated by softwoods; observed in NH and ME..... **Successional Mixed Spruce - Fir - Hardwood Forest (CEGL006505)**
[*Picea rubens - Abies balsamea - Betula* spp. - *Acer rubrum* Forest]

9a. Transitional northern hardwoods - spruce forest with a closed canopy occurring at middle elevations, between 305 and 762 m (1,000-2,500 feet) on moderate to steep low to high slopes with cooler north, northwest, east and northeast aspects; *Betula alleghaniensis* (yellow birch) and *Picea rubens* (red spruce) are codominant or present; *Abies balsamea* (balsam fir) more common in logged stands; canopy associates present at low cover may include *Acer rubrum* (red maple), *Acer spicatum* (mountain maple), *Abies balsamea* (balsam fir), *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), and *Betula papyrifera* (paper birch); *Viburnum lantanoides* (hobblebush) most frequent shrub; dense herbaceous layer dominated by the ferns *Dryopteris campyloptera* (mountain woodfern), *Dryopteris intermedia* (intermediate woodfern), and *Dennstaedtia punctilobula* (eastern hayscented fern); nonvascular moss and lichen species may have as much as 60% cover; observed in NH and ME. ..... **Transitional Northern Hardwood - Red Spruce Forest (CEGL006267)**
[*Betula alleghaniensis - Picea rubens / Dryopteris campyloptera* Forest]

9b. *Tsuga canadensis* (eastern hemlock) most abundant conifer. **10**

10a. *Tsuga canadensis* (eastern hemlock) - northern hardwood forest that lacks a significant presence of *Quercus* (oak) spp., *Pinus strobus* (eastern white pine), and *Picea rubens* (red spruce); hemlock 25-75% canopy cover; *Acer rubrum* (red maple), *Betula papyrifera* (paper birch), *Fagus grandifolia* (American beech), and *Fraxinus americana* (white ash) common; *Acer pensylvanicum* (striped maple) characteristic tall shrub; sparse herb layer but *Dryopteris intermedia* (intermediate woodfern), *Mitchella repens* (partridgeberry), *Clintonia borealis* (bluebead) and *Trientalis borealis* (starflower) are common; occurs on acidic soils, often on rocky, lower elevation slopes (below 300 m in ME and NH; higher up farther south); distributed in large patches in the NAP project area; observed on the West branch of the Pleasant River at about 250 m elevation in ME..... **Hemlock - Northern Hardwood Forest (CEGL006638)**
[*Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest]

10b. Hemlock - Beech - Oak forest; canopy associates and subcanopy include *Quercus rubra* (northern red oak), *Fagus grandifolia* (American beech), *Pinus strobus* (eastern white pine), *Prunus serotina* (black cherry), and/or *Acer rubrum* (red maple); *Hamamelis virginiana* (American witch-hazel), *Acer pensylvanicum* (striped maple), *Viburnum acerifolium* (mapleleaf viburnum), are common shrubs; herbs sparse; soils nutrient-poor, well-drained, often stony sandy loams or loamy sands; observed in NH. ..... **Hemlock - Beech - Red Oak Forest (CEGL006088)**
[*Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest]

11a. Mixed hardwood - hemlock (≤25% of canopy) [*Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Acer saccharum* (sugar maple) - *Tsuga canadensis* (eastern hemlock) - *Abies balsamea* (balsam fir)] wetland forest occurring in seepage-influenced areas, at wetland-upland ecotones, along streamsides, on gentle to moderate slopes with minerals soils; herbaceous layer indicative of semi-nutrient-enriched conditions with species such as *Geum rivale* (purple avens), *Impatiens capensis* (jewelweed), *Thelypteris palustris* (eastern marsh fern), and *Arisaema triphyllum* (Jack in the pulpit); occurs in moist ecotonal areas between uplands and wetlands in New England and the Northern Appalachians; balsam fir replaces hemlock as the dominant conifer in these sites moving northward. ..... **Hardwood - Conifer Seepage Forest (CEGL006380)**
[*Betula alleghaniensis - Acer rubrum - (Tsuga canadensis, Abies balsamea) / Osmunda cinnamomea* Swamp Forest]

11b. Upland forests; seepage indicators lacking. **12**

12a. Acidic, large-boulder talus slope northern hardwood woodland of low to mid elevations up to about 518 m (1,700 feet) with some combination of *Quercus rubra* (northern red oak), *Betula alleghaniensis* (yellow birch), and/or *Betula papyrifera* (paper birch); *Acer spicatum* (mountain maple), *Acer pensylvanicum* (striped maple), *Rubus* (blackberry) spp., *Viburnum acerifolium* (mapleleaf viburnum), and *Ribes* (currant) spp. also common; vines are characteristic including *Parthenocissus quinquefolia* (Virginia creeper), *Parthenocissus vitacea* (woodbine), *Toxicodendron radicans* (eastern poison-ivy), and others; *Dryopteris marginalis* (marginal woodfern), *Dryopteris campyloptera* (mountain woodfern), *Polypodium virginianum* (rock polypody), and *Maianthemum canadense* (Canada mayflower) common herbs; observed in NH..... **Northern Hardwood - Oak Talus Slope Woodland (CEGL006584)**
[*Betula alleghaniensis - Quercus rubra / Polypodium virginianum* Woodland]

12b. Northern hardwood forest not on talus. **13**

13a. Early-successional northern hardwood forests and woodlands, stands with variable mixtures of light-requiring, wind-dispersed trees such as *Populus* (cottonwood) or *Betula* (birch) spp. and even-aged native hardwoods; oaks uncommon in canopy. **14**
13b. Later-successional or older northern hardwood forests. **16**

14a. Highly variable mixed evergreen-deciduous successional forest occurring on sites that have burned or been heavily harvested and are characterized by canopies dominated by combinations of *Picea rubens* (red spruce), *Abies balsamea* (balsam fir), *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), and *Betula papyrifera* (paper birch); *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Pinus strobus* (eastern white pine), and *Tsuga canadensis* (eastern hemlock) often occur at low cover; shrub layer mainly consists of species from the canopy and may be very dense on some sites; *Viburnum lantanoides* (hobblebush) and *Acer pensylvanicum* (striped maple) may be common; locally dominant herbs can include *Aralia nudicaulis* (wild sarsaparilla), *Carex gynandra* (nodding sedge), *Clintonia borealis* (bluebead), *Coptis trifolia* (threeleaf goldthread), *Cornus canadensis* (bunchberry dogwood), *Dennstaedtia punctilobula* (eastern hayscented fern), *Dryopteris campyloptera* (mountain woodfern), *Dryopteris intermedia* (intermediate woodfern), *Huperzia lucidula* (shining clubmoss), *Maianthemum canadense* (Canada mayflower), *Oxalis montana* (mountain woodsorrel), *Pteridium aquilinum* (western brackenfern), *Thelypteris noveboracensis* (New York fern), and *Uvularia sessilifolia* (sessileleaf bellwort); includes young stands dominated by softwoods; observed in NH and ME. ..... **Successional Mixed Spruce - Fir - Hardwood Forest (CEGL006505)**
[*Picea rubens - Abies balsamea - Betula* spp. - *Acer rubrum* Forest]
14b. Evergreen trees not dominant or codominant in canopy. **15**

15a. Canopy is dominated by some combination of *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Populus alba* (white poplar), and/or *Betula populifolia* (gray birch) and/or *Betula papyrifera* (paper birch); *Populus balsamifera* (balsam poplar), *Acer rubrum* (red maple), *Prunus serotina* (black cherry), and/or *Prunus pensylvanica* (pin cherry) may also be common; disturbance-adapted grasses and herbs common in herb layer; ranges from closed-canopy forests to open woodlands; can on occasion have conifers, white pine, red spruce, or hemlock in canopy and understory; observed in NH; common in ME. ..... **Ruderal Aspen - Birch Woodland (CEGL006303)**
[*Populus (tremuloides, grandidentata) - Betula (populifolia, papyrifera)* Ruderal Woodland]
15b. Successional variant, young or even-aged, widespread, typic northern hardwood forest; dominated by some combination of *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Betula alleghaniensis* (yellow birch), and/or *Betula papyrifera* (paper birch); oaks, pines, and aspens sparse to absent; arises from cutting; disturbed shrub layer with exotics or no shrub layer; herb layer patchy and most often a mix of ferns such as *Dennstaedtia punctilobula* (eastern hayscented fern), clubmosses (Lycopodiaceae), and other herbs; occurring on acidic soils in NH and ME. ..... **Ruderal Sugar Maple - Northern Hardwood Forest (CEGL006628)**
[*Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest]

16a. Northern hardwood forest lacking a significant component of *Quercus rubra* (northern red oak) **or** *Prunus serotina* (black cherry). **17**
16b. Northern hardwood forest with *Quercus rubra* (northern red oak) **or** *Prunus serotina* (black cherry). **19**

17a. Semi-rich northern hardwood forest dominated by a combination of *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), *Fraxinus americana* (white ash), and/or less commonly *Fagus grandifolia* (American beech); lacks strong-enrichment indicators; *Acer pensylvanicum* (striped maple) and *Acer spicatum* (mountain maple) common in understory; herbs are semi-rich including *Viola rotundifolia* (roundleaf yellow violet), *Athyrium filix-femina* (common ladyfern), *Arisaema triphyllum* (Jack in the pulpit), *Maianthemum racemosum* (feathery false lily of the valley), *Tiarella cordifolia* (heartleaf foamflower), *Actaea pachypoda* (white baneberry), *Medeola virginiana* (Indian cucumber), *Botrychium* (grapefern) spp., and *Solidago flexicaulis* (zigzag goldenrod); occurs at moderate elevations from 204 to 610 m (670-1,830 feet) on slightly enriched soils often in cove and toeslope settings, from PA north to ME; observed in NH and ME. ..... **Semi-rich Northern Hardwood Forest (CEGL006211)**
[*Acer saccharum - (Fraxinus americana) / Arisaema triphyllum* Forest]
17b. Typic/matrix and successional northern hardwood forests. **18**

18a. Matrix "Northern Hardwood Forest" characterized by mixed age native *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), and/or *Betula alleghaniensis* (yellow birch); *Pinus strobus* (eastern white pine) and *Tsuga canadensis* (eastern hemlock), and in the northern portion of the range, *Picea rubens* (red spruce) may be present but not abundant; *Fraxinus americana* (white ash) and *Tilia americana* (American basswood) absent or minor; *Viburnum lantanoides* (hobblebush) is the most consistent dominant shrub but many sites have a tall shrub layer heavily dominated by saplings of canopy species; herb layer rarely >30% cover except for tree seedlings; herb flora depauperate, without rich-site herbs; environmental settings various but occurring on acidic soils and may cover large areas; the most extensive northern hardwood forest type in the region; common in NH and ME. ..... **Northern Hardwood Forest (CEGL006631)**
[*Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest]
18b. Early-successional variant of widespread typic northern hardwood forest, either monotypic canopy of *Acer saccharum* (sugar maple), or canopy dominated by some combination of young, small-diameter, even-aged *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), *Populus* (cottonwood) spp., and/or *Betula papyrifera* (paper birch); arises from cutting; oaks, pines, and aspens sparse to absent; disturbed shrub layer with exotics or no shrub layer; herb layer patchy and most often a mix of ferns, clubmosses (Lycopodiaceae), and other herbs; occurring on acidic soils in central New England, NH and ME. ..... **Ruderal Sugar Maple - Northern Hardwood Forest (CEGL006628)**
[*Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest]

19a. Northern hardwood forest with significant component of *Prunus serotina* (black cherry); successional variant of widespread typic northern hardwood forest; oaks, pines, and aspens sparse to absent; dominated by some combination of even-aged *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Betula alleghaniensis* (yellow birch), *Populus* (cottonwood) spp., and *Betula papyrifera* (paper birch); arises from cutting; disturbed shrub layer with exotics or no shrub layer; herb layer patchy and most often a mix of ferns such as *Dennstaedtia punctilobula* (eastern hayscented fern), clubmosses (Lycopodiaceae), and other herbs; occurring on acidic soils in NH and ME. ..... **Ruderal Sugar Maple - Northern Hardwood Forest (CEGL006628)**
[*Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest]
19b. Significant component (≥20%) of *Quercus rubra* (northern red oak) in mixed canopy **20**

20a. Variable mixture of *Quercus rubra* (northern red oak) (usually at least 20% of the canopy) and *Acer saccharum* (sugar maple) in association with *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), *Betula papyrifera* (paper birch), and *Ostrya virginiana* (hophornbeam) occurring at lower cover; shrub cover is low and variable and may include *Acer pensylvanicum* (striped maple), *Cornus alternifolia* (alternateleaf dogwood), *Corylus cornuta* (beaked hazelnut), and *Viburnum acerifolium* (mapleleaf viburnum); depauperate herbaceous layer with low cover from *Arisaema triphyllum* (Jack in the pulpit), *Athyrium filix-femina* (common ladyfern), *Dennstaedtia punctilobula* (eastern hayscented fern), *Dryopteris intermedia* (intermediate woodfern), and *Polystichum acrostichoides* (Christmas fern); known from two locations in the NAP project area at 320 to 360 m (1,050-1,180 feet) in elevation on moderate to steep low to mid slopes on south east and northwest aspects; observed in NH. ..... **Red Oak - Northern Hardwood Forest (CEGL006633)**
[*Quercus rubra - Acer saccharum - Fagus grandifolia / Viburnum acerifolium* Forest]

20b. Early- to- mid successional forest with variable canopy composition depending on site history; *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and *Fagus grandifolia* (American beech) occur in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry); *Betula papyrifera* (paper birch) and *Picea rubens* (red spruce) are occasional minor associates in northern examples; trees 40-100 years old; forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development; widespread throughout northern and central New England; observed in NH. ..... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest]

10. Successional and Ruderal Vegetation

1a. Successional, ruderal wetland vegetation with variable combinations of wetland old-field species such as *Phalaris arundinacea* (reed canarygrass), *Juncus effusus* (common rush), *Thelypteris palustris* (eastern marsh fern),*Onoclea sensibilis* (sensitive fern), *Solidago* (goldenrod) spp., *Impatiens capensis* (jewelweed), *Lycopus uniflorus* (northern bugleweed), and *Lythrum salicaria* (purple loosestrife); *Spiraea* (spirea) spp. and *Rubus* (blackberry) spp. common; ranges from herbaceous meadow with scattered shrubs to shrub thicket; occurs in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands; known throughout the Northeast. ..... **Ruderal Steeplebush / Reed Canarygrass Wet Shrubland (CEGL006571)**
[*Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland]
1b. Upland vegetation. **2**

2a. Successional fields/meadows/shrublands/woodlands (<60% trees). **3**
2b. Successional or planted forests (>60% cover of canopy/overstory combined). **5**

3a. Herbaceous-dominated (greater than 50% herbaceous cover) vegetation that has been anthropogenically altered and/or maintained, especially on old fields and pastures frequently disturbed/managed, created and maintained by yearly mowing or grazing; mixtures of *Solidago* (goldenrod) spp., *Dactylis glomerata* (orchardgrass), *Phleum pratense* (timothy), *Anthoxanthum odoratum* (sweet vernalgrass), *Festuca* (fescue) spp., *Poa pratensis* (Kentucky bluegrass), *Euthamia graminifolia* (flat-top goldentop), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Pteridium aquilinum* (western brackenfern), and other grass, forb, and/or fern species; scattered trees and shrubs possible; wide-ranging in northeastern states; observed at low elevation in NH and along the Kennebec River in ME. ..... **Northeastern Old-field Meadow (CEGL006107)**
[*Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Ruderal Meadow]
3b. Shrubland vegetation. **4**

4a. Shrubland thicket found in the NAP project area only in NH south of Hwy 25A/Orford Rd (connecting Wentworth and Fairlee); occurring on old fields, pastures, or modified lands dominated by an admixture of non-native and native shrubs such as *Elaeagnus umbellata* (Autumn olive), *Rubus allegheniensis* (Allegheny blackberry), *Rubus idaeus* (American red raspberry), *Rosa multiflora* (multiflora rose), *Lonicera morrowii* (Morrow's honeysuckle), *Celastrus orbiculatus* (Oriental bittersweet), *Lonicera japonica* (Japanese honeysuckle), *Ligustrum vulgare* (European privet), *Juniperus virginiana* (eastern red-cedar), *Prunus pensylvanica* (pin cherry), *Prunus serotina* (black cherry), *Rhus typhina* (staghorn sumac), and other small trees (<25% in cover); old-field grasses, forbs, and ferns such as *Pteridium aquilinum* (western brackenfern) and *Dennstaedtia punctilobula* (eastern hayscented fern) are common in more open-canopied variants where tall and short shrubs cover at least 25% of the field; wide-ranging in northeastern states. ..... **Northeastern Ruderal Shrubland (CEGL006451)**
[*Elaeagnus umbellata* - *Cornus racemosa* - *Rosa multiflora* - *Juniperus virginiana* Ruderal Shrubland]
4b. Native shrubland vegetation of power lines, landslides, and avalanche scrapes. **5**

5a. Native ericaceous shrubs (huckleberries and blueberries or viburnums) generally dominant, usually occurring on acidic soils that have been cleared or burned, such as forest openings or power lines; dominant shrubs typically include *Gaylussacia baccata* (black huckleberry), *Nemopanthus mucronatus* (catberry), and *Alnus incana* (gray alder); *Calamagrostis canadensis* (bluejoint) is a common herb. ..... **Successional Heath Shrubland (CEGL006622)**
[*Gaylussacia baccata - Vaccinium pallidum - Vaccinium corymbosum* Shrubland]
5b. 1-2 m tall *Alnus viridis* ssp. *crispa* (mountain alder) and *Betula papyrifera* (paper birch) (possibly including the subalpine var. *cordifolia*) alder-birch shrublands found in subalpine to lower alpine zones in unstable settings such as avalanche paths, old landslides, or cirque walls; herb cover is patchy and best developed in openings among the shrubs; bryophytes are sparse; *Diervilla lonicera* (northern bush honeysuckle) and/or *Corylus cornuta* (beaked hazelnut) may be locally abundant, especially in somewhat drier microsites; stunted *Picea mariana* (black spruce) and *Abies balsamea* (balsam fir) may be present; *Viburnum edule* (squashberry) is often present, although in very low numbers; herbs include Solidago macrophylla (largeleaf goldenrod), *Prenanthes trifoliolata* (gall of the earth), *Eurybia radula* (low rough aster), *Sibbaldiopsis tridentata* (shrubby fivefingers) (in drier openings), *Dryopteris campyloptera* (mountain woodfern), *Dryopteris intermedia* (intermediate woodfern), *Athyrium filix-femina* (common ladyfern), and *Calamagrostis canadensis* (bluejoint); 2 plots in the NAP project area. ..... **Alpine Slope Shrub Thicket (CEGL006064)**
[*Alnus viridis* ssp. *crispa - Spiraea alba / Solidago macrophylla* Shrubland]

6a. Canopy or regeneration dominated by evergreen trees (at least 50% evergreen trees in canopy or understory). **7**
6b. Canopy and regeneration dominated by hardwood deciduous trees (≥50% deciduous canopy)... **12**

7a. Evergreen portion of canopy dominated by pines. **8**
7b. Conifer portion of canopy or regeneration not dominated by *Pinus* (pine) species. **11**

8a. Multiple *Pinus* (pine) species in the canopy; other conifers sometimes present in smaller amounts; planted in postagricultural fields and pastures; plantations of mixed pines or pine mixed with other non-native planted conifers; common throughout the Northeast; observed in southern most NH only. ..... **Mixed Pine Conifer Plantation (CST006313)**
[*Pinus* spp. Forest Plantation]
8b. Evergreen portion of canopy dominated by *Pinus strobus* (eastern white pine). **9**

9a. Composition is variable depending on site history; canopy is a mixture of *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and *Fagus grandifolia* (American beech), occurring in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry); *Betula papyrifera* (paper birch) and *Picea rubens* (red spruce) are occasional minor associates in northern examples; trees 40-100 years old; forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development; widespread throughout northern and central New England; observed in NH. ..... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest]
9b. Planted and successional stands dominated by *Pinus strobus* (eastern white pine) **10**

10a. *Pinus strobus* (eastern white pine) plantations; observed in NH. ..... **Eastern White Pine Plantation (CST007178)**
[*Pinus strobus* Forest Plantation]

10b. Successional stands of *Pinus strobus* (eastern white pine); *Acer rubrum* (red maple), *Betula papyrifera* (paper birch), *Fraxinus americana* (white ash), and/or *Prunus serotina* (black cherry) may be common in canopy and/or subcanopy; observed at lower elevations throughout the NAP project area. ..... **Ruderal Eastern White Pine Forest (CEGL007944)**
[*Pinus strobus* Ruderal Forest]

11a. *Picea* (spruce) sp. plantations dominated by *Picea abies* (Norway spruce) or *Picea glauca* (white spruce), and/or a combination of spruce species; observed southernmost NH..... **Norway Spruce Plantation (CST007167)**
[*Picea abies* Forest Plantation]

11b. *Picea* (spruce) sp. and/or *Abies balsamea* (balsam fir) dominant (>50% cover) in either the canopy or regeneration strata; highly variable mixed evergreen-deciduous successional forest occurring on sites that have burned or been heavily harvested and are characterized by canopies dominated by combinations of *Picea rubens* (red spruce), *Abies balsamea* (balsam fir), *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), and *Betula papyrifera* (paper birch); *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Pinus strobus* (eastern white pine), and *Tsuga canadensis* (eastern hemlock) often occur at low cover; shrub layer mainly consists of species from the canopy and may be very dense on some sites; *Viburnum lantanoides* (hobblebush) and *Acer pensylvanicum* (striped maple) may be common; locally dominant herbs can include *Aralia nudicaulis* (wild sarsaparilla), *Carex gynandra* (nodding sedge), *Clintonia borealis* (bluebead), *Coptis trifolia* (threeleaf goldthread), *Cornus canadensis* (bunchberry dogwood), *Dennstaedtia punctilobula* (eastern hayscented fern), *Dryopteris campyloptera* (mountain woodfern), *Dryopteris intermedia* (intermediate woodfern), *Huperzia lucidula* (shining clubmoss), *Maianthemum canadense* (Canada mayflower), *Oxalis montana* (mountain woodsorrel), *Pteridium aquilinum* (western brackenfern), *Thelypteris noveboracensis* (New York fern), and *Uvularia sessilifolia* (sessileleaf bellwort); includes young stands dominated by softwoods; common in the NAP project area. ..... **Successional Mixed Spruce - Fir - Hardwood Forest (CEGL006505)**
[*Picea rubens* - *Abies balsamea* - *Betula* spp. - *Acer rubrum* Forest]

12a. Composition is variable depending on site history but almost always has oaks; canopy a mixture of *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), and occasionally *Pinus strobus* (eastern white pine), occurring in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry); *Betula papyrifera* (paper birch) and *Picea rubens* (red spruce) are occasional minor associates in northern examples; trees 40-100 years old; forest develops after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development; widespread throughout northern and central New England; observed in NH. ..... **Northeastern Ruderal Oak - Red Maple Forest (CEGL006506)**
[*Quercus rubra* - *Acer rubrum* - *Betula* spp. - *Pinus strobus* Ruderal Forest]

12b. Stand with variable mixtures of light-requiring, wind-dispersed trees and even-aged native hardwoods; oaks uncommon in canopy **13**

13a. Early-successional variant of widespread typic northern hardwood forest, either monotypic canopy of *Acer saccharum* (sugar maple), or canopy dominated by some combination of young, small-diameter, even-aged *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), *Pinus strobus* (eastern white pine) and/or *Betula papyrifera* (paper birch); arises from cutting; disturbed shrub layer with exotics or no shrub layer; herb layer patchy and most often a mix of ferns, clubmosses (Lycopodiaceae), and other herbs; occurring on acidic soils in central New England and at lower elevations in northern New England, NH, and ME. ....**Ruderal Sugar Maple - Northern Hardwood Forest (CEGL006628)**
[*Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest]

13b. Early-successional northern hardwoods dominated by some combination of *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Populus alba* (white poplar), and/or *Betula populifolia* (gray birch); *Betula papyrifera* (paper birch), *Populus balsamifera* (balsam poplar), *Acer rubrum* (red maple), *Prunus serotina* (black cherry), and/or *Prunus pensylvanica* (pin cherry) may also be common; understory may contain *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Abies balsamea* (balsam fir), *Picea rubens* (red spruce), *Pinus strobus* (eastern white pine), and/or *Tsuga canadensis* (eastern hemlock); ranges from closed-canopy forests to open woodlands; observed in NH and common in ME. ....**Ruderal Aspen - Birch Woodland (CEGL006303)**
[*Populus (tremuloides, grandidentata) - Betula (populifolia, papyrifera)* Ruderal Woodland]

Appendix E: List of Plant Species

Explanation of Species List

Plant taxa were identified and documented from vegetation plots in which the plots were used to characterize vegetation associations in the U.S. National Vegetation Classification of the Appalachian National Scenic Trail. Plant taxa also were identified and documented from validation and accuracy assessment sites in which the sites were used to assess the vegetation map layer produced for the Appalachian National Scenic Trail vegetation mapping project. Plant taxa from vegetation plots, along with other plot sample data, were entered into the National Park Service PLOTS Database Version 2.0 (NatureServe 2005) and later converted into the PLOTS version 4.0 (National Park Service 2015) database. Plant taxa from validation and accuracy assessment sites, along with other site and environmental data, were entered into the PLOTS version 4.0 (National Park Service 2015) database according to National Park Service specifications.

Table E–1 is an export of plant taxa generated from the PLOTS database for the APPA vegetation mapping project. This list includes taxa identified to the genus, species, and subspecies level. This list is not intended to be a comprehensive list of every taxon of the Appalachian National Scenic Trail. The plant taxa list is organized alphabetically by scientific name, and taxa names were standardized to the PLANTS Database (U.S. Department of Agriculture, Natural Resource Conservation Service 2016), which is in accordance with the NatureServe Ecology vascular plant taxonomic standard (Kartesz 1999).

Table E–1. Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Abies balsamea	balsam fir	Pinaceae
Abies fraseri	Fraser fir	Pinaceae
Abutilon theophrasti	velvetleaf	Malvaceae
Acalypha rhomboidea	common threeseed mercury	Euphorbiaceae
Acalypha virginica	Virginia threeseed mercury	Euphorbiaceae
Acer negundo	boxelder	Aceraceae
Acer nigrum	black maple	Aceraceae
Acer pensylvanicum	striped maple	Aceraceae
Acer platanoides	Norway maple	Aceraceae
Acer rubrum	red maple	Aceraceae
Acer rubrum var. *rubrum*	red maple	Aceraceae
Acer rubrum var. *trilobum*	red maple	Aceraceae
Acer saccharinum	silver maple	Aceraceae
Acer saccharum	sugar maple	Aceraceae
Acer saccharum var. *saccharum*	sugar maple	Aceraceae
Acer spicatum	mountain maple	Aceraceae
Acer ×freemanii	freeman maple	Aceraceae
Achillea millefolium	common yarrow	Asteraceae
Aconitum reclinatum	trailing white monkshood	Ranunculaceae
Aconitum uncinatum	southern blue monkshood	Ranunculaceae
Aconitum uncinatum ssp. *muticum*	southern blue monkshood	Ranunculaceae
Acorus	sweetflag	Acoraceae
Acorus americanus	sweetflag	Acoraceae
Acorus calamus	calamus	Acoraceae
Actaea	baneberry	Ranunculaceae
Actaea pachypoda	white baneberry	Ranunculaceae
Actaea podocarpa	mountain bugbane	Ranunculaceae
Actaea racemosa	black baneberry	Ranunculaceae
Actaea rubra	red baneberry	Ranunculaceae
Adiantum pedatum	northern maidenhair	Pteridaceae
Adlumia fungosa	allegheny vine	Fumariaceae
Aegopodium podagraria	bishop's goutweed	Apiaceae
Aesculus	buckeye	Hippocastanaceae
Aesculus flava	yellow buckeye	Hippocastanaceae
Aesculus sylvatica	painted buckeye	Hippocastanaceae
Agalinis tenuifolia	slenderleaf false foxglove	Scrophulariaceae
Agalinis tenuifolia var. *tenuifolia*	slenderleaf false foxglove	Scrophulariaceae
Agastache scrophulariifolia	purple giant hyssop	Lamiaceae
Ageratina altissima	white snakeroot	Asteraceae
Ageratina altissima var. *altissima*	white snakeroot	Asteraceae
Ageratina altissima var. *roanensis*	white snakeroot	Asteraceae
Ageratina aromatica	lesser snakeroot	Asteraceae
Agrimonia	agrimony	Rosaceae
Agrimonia gryposepala	tall hairy agrimony	Rosaceae
Agrimonia parviflora	harvestlice	Rosaceae
Agrimonia pubescens	soft agrimony	Rosaceae
Agrimonia rostellata	beaked agrimony	Rosaceae
Agrostis	bentgrass	Poaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Agrostis canina	velvet bentgrass	Poaceae
Agrostis gigantea	redtop	Poaceae
Agrostis hyemalis	winter bentgrass	Poaceae
Agrostis mertensii	northern bentgrass	Poaceae
Agrostis perennans	upland bentgrass	Poaceae
Agrostis scabra	rough bentgrass	Poaceae
Agrostis stolonifera	creeping bentgrass	Poaceae
Ailanthus altissima	tree of heaven	Simaroubaceae
Albizia julibrissin	silktree	Fabaceae
Aletris farinosa	white colicroot	Liliaceae
Alga, Freshwater	Alga, Freshwater	
Alisma	water plantain	Alismataceae
Alisma subcordatum	American water plantain	Alismataceae
Alliaria petiolata	garlic mustard	Brassicaceae
Allium	onion	Liliaceae
Allium burdickii	narrowleaf wild leek	Liliaceae
Allium canadense	meadow garlic	Liliaceae
Allium cernuum	nodding onion	Liliaceae
Allium tricoccum	ramp	Liliaceae
Allium vineale	wild garlic	Liliaceae
Alnus	alder	Betulaceae
Alnus incana	gray alder	Betulaceae
Alnus incana ssp. *rugosa*	speckled alder	Betulaceae
Alnus serrulata	hazel alder	Betulaceae
Alnus viridis	green alder	Betulaceae
Alnus viridis ssp. *crispa*	mountain alder	Betulaceae
Amaranthus spinosus	spiny amaranth	Amaranthaceae
Ambrosia artemisiifolia	annual ragweed	Asteraceae
Ambrosia trifida	great ragweed	Asteraceae
Ambrosia trifida var. *trifida*	great ragweed	Asteraceae
Amelanchier	serviceberry	Rosaceae
Amelanchier arborea	common serviceberry	Rosaceae
Amelanchier arborea var. *arborea*	common serviceberry	Rosaceae
Amelanchier bartramiana	oblongfruit serviceberry	Rosaceae
Amelanchier canadensis	Canadian serviceberry	Rosaceae
Amelanchier humilis	low serviceberry	Rosaceae
Amelanchier laevis	Allegheny serviceberry	Rosaceae
Amelanchier sanguinea var. *sanguinea*	roundleaf serviceberry	Rosaceae
Amelanchier stolonifera	running serviceberry	Rosaceae
Amianthium muscitoxicum	flypoison	Liliaceae
Amorpha	false indigo	Fabaceae
Amphicarpaea bracteata	American hogpeanut	Fabaceae
Anaphalis	pearly everlasting	Asteraceae
Anaphalis margaritacea	western pearly everlasting	Asteraceae
Andreaea rothii	Roth's andreaea moss	Andreaeaceae
Andromeda polifolia	bog rosemary	Ericaceae
Andropogon gerardii	big bluestem	Poaceae
Andropogon gyrans var. *gyrans*	Elliott's bluestem	Poaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Andropogon ternarius	splitbeard bluestem	Poaceae
Andropogon virginicus	broomsedge bluestem	Poaceae
Anemone canadensis	Canadian anemone	Ranunculaceae
Anemone lancifolia	mountain thimbleweed	Ranunculaceae
Anemone quinquefolia	wood anemone	Ranunculaceae
Anemone quinquefolia var. *quinquefolia*	nightcaps	Ranunculaceae
Anemone virginiana	tall thimbleweed	Ranunculaceae
Anemone virginiana var. *alba*	tall thimbleweed	Ranunculaceae
Anemone virginiana var. *virginiana*	tall thimbleweed	Ranunculaceae
Angelica	angelica	Apiaceae
Angelica atropurpurea	purplestem angelica	Apiaceae
Angelica triquinata	filmy angelica	Apiaceae
Angelica venenosa	hairy angelica	Apiaceae
Anomodon	anomodon moss	Anomodontaceae
Anomodon attenuatus	anomodon moss	Anomodontaceae
Antennaria	pussytoes	Asteraceae
Antennaria plantaginifolia	woman's tobacco	Asteraceae
Antennaria virginica	shale barren pussytoes	Asteraceae
Anthoxanthum	hornwort	Poaceae
Anthoxanthum monticola ssp. *alpinum*	alpine sweetgrass	Poaceae
Anthoxanthum odoratum	sweet vernalgrass	Poaceae
Apios americana	groundnut	Fabaceae
Apocynum	dogbane	Apocynaceae
Apocynum androsaemifolium	spreading dogbane	Apocynaceae
Apocynum cannabinum	Indianhemp	Apocynaceae
Aquatic species, unknown	unknown aquatic species	
Aquilegia canadensis	red columbine	Ranunculaceae
Arabis	rockcress	Brassicaceae
Arabis canadensis	sicklepod	Brassicaceae
Arabis glabra	tower rockcress	Brassicaceae
Arabis hirsuta	hairy rockcress	Brassicaceae
Arabis laevigata	smooth rockcress	Brassicaceae
Arabis laevigata var. *laevigata*	smooth rockcress	Brassicaceae
Arabis lyrata	lyrate rockcress	Brassicaceae
Aralia hispida	bristly sarsaparilla	Araliaceae
Aralia nudicaulis	wild sarsaparilla	Araliaceae
Aralia racemosa	American spikenard	Araliaceae
Aralia spinosa	devil's walkingstick	Araliaceae
Arctium minus	lesser burdock	Asteraceae
Arctostaphylos alpina	alpine bearberry	Ericaceae
Arisaema	Jack in the pulpit	Araceae
Arisaema dracontium	green dragon	Araceae
Arisaema triphyllum	Jack in the pulpit	Araceae
Arisaema triphyllum ssp. *triphyllum*	Jack in the pulpit	Araceae
Aristida dichotoma var. *dichotoma*	churchmouse threeawn	Poaceae
Aristolochia	dutchman's pipe	Aristolochiaceae
Aristolochia macrophylla	pipevine	Aristolochiaceae
Aristolochia serpentaria	Virginia snakeroot	Aristolochiaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Arnica lanceolata	lanceleaf arnica	Asteraceae
Arnoglossum atriplicifolium	pale Indian plantain	Asteraceae
Arnoglossum muehlenbergii	great Indian plantain	Asteraceae
Aronia arbutifolia	red chokeberry	Rosaceae
Aronia melanocarpa	black chokeberry	Rosaceae
Arrhenatherum elatius	tall oatgrass	Poaceae
Artemisia annua	sweet sagewort	Asteraceae
Artemisia vulgaris	common wormwood	Asteraceae
Arthraxon hispidus	small carpetgrass	Poaceae
Aruncus	aruncus	Rosaceae
Aruncus dioicus	bride's feathers	Rosaceae
Arundinaria appalachiana	hill cane	Poaceae
Arundinaria gigantea	giant cane	Poaceae
Asarum canadense	Canadian wildginger	Aristolochiaceae
Asclepias	milkweed	Asclepiadaceae
Asclepias exaltata	poke milkweed	Asclepiadaceae
Asclepias incarnata	swamp milkweed	Asclepiadaceae
Asclepias incarnata ssp. *incarnata*	swamp milkweed	Asclepiadaceae
Asclepias purpurascens	purple milkweed	Asclepiadaceae
Asclepias quadrifolia	fourleaf milkweed	Asclepiadaceae
Asclepias syriaca	common milkweed	Asclepiadaceae
Asclepias tuberosa	butterfly milkweed	Asclepiadaceae
Asclepias verticillata	whorled milkweed	Asclepiadaceae
Asimina	pawpaw	Annonaceae
Asimina triloba	pawpaw	Annonaceae
Asparagus officinalis	garden asparagus	Liliaceae
Asplenium	spleenwort	Aspleniaceae
Asplenium montanum	mountain spleenwort	Aspleniaceae
Asplenium pinnatifidum	lobed spleenwort	Aspleniaceae
Asplenium platyneuron	ebony spleenwort	Aspleniaceae
Asplenium platyneuron var. *platyneuron*	ebony spleenwort	Aspleniaceae
Asplenium rhizophyllum	walking fern	Aspleniaceae
Asplenium ruta-muraria	wallrue	Aspleniaceae
Asplenium trichomanes	maidenhair spleenwort	Aspleniaceae
Asplenium trichomanes ssp. *trichomanes*	maidenhair spleenwort	Aspleniaceae
Aster	aster	Asteraceae
Asteraceae	Aster family	Asteraceae
Astilbe biternata	Appalachian false goat's beard	Saxifragaceae
Athyrium	ladyfern	Dryopteridaceae
Athyrium filix-femina	common ladyfern	Dryopteridaceae
Athyrium filix-femina ssp. *angustum*	subarctic ladyfern	Dryopteridaceae
Athyrium filix-femina ssp. *asplenioides*	asplenium ladyfern	Dryopteridaceae
Atrichum	atrichum moss	Polytrichaceae
Atrichum angustatum	atrichum moss	Polytrichaceae
Aulacomnium	aulacomnium moss	Aulacomniaceae
Aulacomnium palustre	aulacomnium moss	Aulacomniaceae
Aureolaria	false foxglove	Scrophulariaceae
Aureolaria laevigata	entireleaf yellow false foxglove	Scrophulariaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Aureolaria pectinata	combleaf yellow false foxglove	Scrophulariaceae
Aureolaria virginica	downy yellow false foxglove	Scrophulariaceae
Baptisia tinctoria	horseflyweed	Fabaceae
Barbarea vulgaris	garden yellowrocket	Brassicaceae
Bartonia paniculata	twining screwstem	Gentianaceae
Bazzania		Lepidoziaceae
Bazzania trilobata		Lepidoziaceae
Berberis	bareberry	Berberidaceae
Berberis canadensis	American barberry	Berberidaceae
Berberis thunbergii	Japanese barberry	Berberidaceae
Berberis vulgaris	common barberry	Berberidaceae
Betula	birch	Betulaceae
Betula alleghaniensis	yellow birch	Betulaceae
Betula glandulosa	resin birch	Betulaceae
Betula lenta	sweet birch	Betulaceae
Betula minor	dwarf white birch	Betulaceae
Betula nana	dwarf birch	Betulaceae
Betula nigra	river birch	Betulaceae
Betula papyrifera	paper birch	Betulaceae
Betula papyrifera var. *cordifolia*	mountain paper birch	Betulaceae
Betula papyrifera var. *papyrifera*	paper birch	Betulaceae
Betula populifolia	gray birch	Betulaceae
Bidens	beggarticks	Asteraceae
Bidens bipinnata	Spanish needles	Asteraceae
Bidens cernua	nodding beggartick	Asteraceae
Bidens connata	purplestem beggarticks	Asteraceae
Bidens frondosa	devil's beggartick	Asteraceae
Bidens tripartita	threelobe beggarticks	Asteraceae
Blephilia hirsuta	hairy pagoda-plant	Lamiaceae
Boehmeria cylindrica	smallspike false nettle	Urticaceae
Botrychium	grapefern	Ophioglossaceae
Botrychium biternatum	sparselobe grapefern	Ophioglossaceae
Botrychium dissectum	cutleaf grapefern	Ophioglossaceae
Botrychium lanceolatum var. *angustisegmentum*	lanceleaf grapefern	Ophioglossaceae
Botrychium matricariifolium	matricary grapefern	Ophioglossaceae
Botrychium virginianum	rattlesnake fern	Ophioglossaceae
Brachyelytrum	shorthusk	Poaceae
Brachyelytrum aristosum	northern shorthusk	Poaceae
Brachyelytrum erectum	bearded shorthusk	Poaceae
Brachyelytrum septentrionale	northern shorthusk	Poaceae
Brachythecium frigidum	cold brachythecium moss	Brachytheciaceae
Brasenia schreberi	watershield	Cabombaceae
Bromus	brome	Poaceae
Bromus ciliatus	fringed brome	Poaceae
Bromus inermis	smooth brome	Poaceae
Bromus pubescens	hairy woodland brome	Poaceae
Bromus sterilis	poverty brome	Poaceae
Bryophyte	bryophyte	

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Bryum pseudotriquetrum	common green bryum moss	Bryaceae
Buckleya distichophylla	piratebush	Santalaceae
Bulbostylis capillaris	densetuft hairsedge	Cyperaceae
Calamagrostis canadensis	bluejoint	Poaceae
Calamagrostis canadensis var. *canadensis*	bluejoint	Poaceae
Calamagrostis coarctata	Nuttall's reedgrass	Poaceae
Calamagrostis pickeringii	Pickering's reedgrass	Poaceae
Calamagrostis porteri	Porter's reedgrass	Poaceae
Calamagrostis porteri ssp. *porteri*	Porter's reedgrass	Poaceae
Calla palustris	water arum	Araceae
Calliergon	calliergon moss	Amblystegiaceae
Callitriche	water-starwort	Callitrichaecea
Caltha palustris	yellow marsh marigold	Ranunculaceae
Calycanthus floridus	eastern sweetshrub	Calycanthaceae
Calystegia	false bindweed	Convolvulaceae
Calystegia sepium	hedge false bindweed	Convolvulaceae
Calystegia spithamaea ssp. *spithamaea*	low false bindweed	Convolvulaceae
Campanula aparinoides	marsh bellflower	Campanulaceae
Campanula divaricata	small bonny bellflower	Campanulaceae
Campanula rotundifolia	bluebell bellflower	Campanulaceae
Campanulastrum americanum	American bellflower	Campanulaceae
Capsella bursa-pastoris	shepherd's purse	Brassicaceae
Cardamine	bittercress	Brassicaceae
Cardamine clematitis	small mountain bittercress	Brassicaceae
Cardamine concatenata	cutleaf toothwort	Brassicaceae
Cardamine diphylla	crinkleroot	Brassicaceae
Cardamine flagellifera	Blue Ridge bittercress	Brassicaceae
Cardamine hirsuta	hairy bittercress	Brassicaceae
Cardamine parviflora var. *arenicola*	sand bittercress	Brassicaceae
Cardamine pensylvanica	Pennsylvania bittercress	Brassicaceae
Cardamine pratensis var. *pratensis*	cuckoo flower	Brassicaceae
Carex	sedge	Cyperaceae
Carex aestivalis	summer sedge	Cyperaceae
Carex albicans	whitetinge sedge	Cyperaceae
Carex albicans var. *albicans*	whitetinge sedge	Cyperaceae
Carex albicans var. *australis*	stellate sedge	Cyperaceae
Carex albicans var. *emmonsii*	Emmons' sedge	Cyperaceae
Carex albursina	white bear sedge	Cyperaceae
Carex amphibola	eastern narrowleaf sedge	Cyperaceae
Carex annectens	yellowfruit sedge	Cyperaceae
Carex appalachica	Appalachian sedge	Cyperaceae
Carex aquatilis	water sedge	Cyperaceae
Carex arctata	drooping woodland sedge	Cyperaceae
Carex argyrantha	hay sedge	Cyperaceae
Carex atlantica	prickly bog sedge	Cyperaceae
Carex atlantica ssp. *atlantica*	prickly bog sedge	Cyperaceae
Carex atlantica ssp. *capillacea*	prickly bog sedge	Cyperaceae
Carex backii	Back's sedge	Cyperaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Carex baileyi	Bailey's sedge	Cyperaceae
Carex bigelowii	Bigelow's sedge	Cyperaceae
Carex billingsii	Billings' Sedge	Cyperaceae
Carex blanda	eastern woodland sedge	Cyperaceae
Carex brevior	shortbeak sedge	Cyperaceae
Carex bromoides	brome-like sedge	Cyperaceae
Carex brunnescens	brownish sedge	Cyperaceae
Carex brunnescens ssp. *sphaerostachya*	brownish sedge	Cyperaceae
Carex bullata	button sedge	Cyperaceae
Carex canescens	silvery sedge	Cyperaceae
Carex castanea	chestnut sedge	Cyperaceae
Carex cephaloidea	thinleaf sedge	Cyperaceae
Carex cephalophora	oval-leaf sedge	Cyperaceae
Carex communis	fibrousroot sedge	Cyperaceae
Carex comosa	longhair sedge	Cyperaceae
Carex conoidea	openfield sedge	Cyperaceae
Carex crinita	fringed sedge	Cyperaceae
Carex crinita var. *crinita*	fringed sedge	Cyperaceae
Carex davisii	Davis' sedge	Cyperaceae
Carex debilis	white edge sedge	Cyperaceae
Carex debilis var. *pubera*	white edge sedge	Cyperaceae
Carex debilis var. *rudgei*	white edge sedge	Cyperaceae
Carex deflexa	northern sedge	Cyperaceae
Carex deweyana	Dewey sedge	Cyperaceae
Carex diandra	lesser panicled sedge	Cyperaceae
Carex digitalis	slender woodland sedge	Cyperaceae
Carex disperma	softleaf sedge	Cyperaceae
Carex ebenea	ebony sedge	Cyperaceae
Carex eburnea	bristleleaf sedge	Cyperaceae
Carex echinata	star sedge	Cyperaceae
Carex echinata ssp. *echinata*	star sedge	Cyperaceae
Carex flava	yellow sedge	Cyperaceae
Carex folliculata	northern long sedge	Cyperaceae
Carex frankii	Frank's sedge	Cyperaceae
Carex garberi	elk sedge	Cyperaceae
Carex glaucodea	blue sedge	Cyperaceae
Carex gracillima	graceful sedge	Cyperaceae
Carex granularis	limestone meadow sedge	Cyperaceae
Carex grayi	Gray's sedge	Cyperaceae
Carex gynandra	nodding sedge	Cyperaceae
Carex hirsutella	fuzzy wuzzy sedge	Cyperaceae
Carex hirtifolia	pubescent sedge	Cyperaceae
Carex hystericina	bottlebrush sedge	Cyperaceae
Carex interior	inland sedge	Cyperaceae
Carex intumescens	greater bladder sedge	Cyperaceae
Carex jamesii	James' sedge	Cyperaceae
Carex kraliana	Kral's sedge	Cyperaceae
Carex lacustris	hairy sedge	Cyperaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Carex laevivaginata	smoothsheath sedge	Cyperaceae
Carex lasiocarpa	woollyfruit sedge	Cyperaceae
Carex laxiculmis	spreading sedge	Cyperaceae
Carex laxiculmis var. *laxiculmis*	spreading sedge	Cyperaceae
Carex laxiflora	broad looseflower sedge	Cyperaceae
Carex laxiflora var. *laxiflora*	broad looseflower sedge	Cyperaceae
Carex leptalea	bristlystalked sedge	Cyperaceae
Carex leptalea ssp. *leptalea*	bristlystalked sedge	Cyperaceae
Carex leptonervia	nerveless woodland sedge	Cyperaceae
Carex lucorum	Blue Ridge sedge	Cyperaceae
Carex lucorum var. *austrolucorum*	Blue Ridge sedge	Cyperaceae
Carex lupuliformis	false hop sedge	Cyperaceae
Carex lupulina	hop sedge	Cyperaceae
Carex lurida	shallow sedge	Cyperaceae
Carex magellanica	boreal bog sedge	Cyperaceae
Carex manhartii	Manhart's sedge	Cyperaceae
Carex misera	wretched sedge	Cyperaceae
Carex muehlenbergii	Muhlenberg's sedge	Cyperaceae
Carex nigromarginata	black edge sedge	Cyperaceae
Carex normalis	greater straw sedge	Cyperaceae
Carex novae-angliae	New England sedge	Cyperaceae
Carex oligosperma	fewseed sedge	Cyperaceae
Carex pallescens	pale sedge	Cyperaceae
Carex pauciflora	fewflower sedge	Cyperaceae
Carex peckii	Peck's sedge	Cyperaceae
Carex pedunculata	longstalk sedge	Cyperaceae
Carex pellita	woolly sedge	Cyperaceae
Carex pensylvanica	Pennsylvania sedge	Cyperaceae
Carex plantaginea	plantainleaf sedge	Cyperaceae
Carex platyphylla	broadleaf sedge	Cyperaceae
Carex prasina	drooping sedge	Cyperaceae
Carex projecta	necklace sedge	Cyperaceae
Carex radiata	eastern star sedge	Cyperaceae
Carex retroflexa	reflexed sedge	Cyperaceae
Carex rosea	rosy sedge	Cyperaceae
Carex ruthii	Ruth's sedge	Cyperaceae
Carex scabrata	eastern rough sedge	Cyperaceae
Carex scoparia	broom sedge	Cyperaceae
Carex seorsa	weak stellate sedge	Cyperaceae
Carex shortiana	Short's sedge	Cyperaceae
Carex sparganioides	bur-reed sedge	Cyperaceae
Carex sprengelii	Sprengel's sedge	Cyperaceae
Carex squarrosa	squarrose sedge	Cyperaceae
Carex stipata	awlfruit sedge	Cyperaceae
Carex stipata var. *stipata*	owlfruit sedge	Cyperaceae
Carex striatula	lined sedge	Cyperaceae
Carex stricta	upright sedge	Cyperaceae
Carex styloflexa	bent sedge	Cyperaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Carex swanii	Swan's sedge	Cyperaceae
Carex tenera	quill sedge	Cyperaceae
Carex tincta	tinged sedge	Cyperaceae
Carex tonsa	shaved sedge	Cyperaceae
Carex tonsa var. *tonsa*	shaved sedge	Cyperaceae
Carex torta	twisted sedge	Cyperaceae
Carex tribuloides	blunt broom sedge	Cyperaceae
Carex tribuloides var. *tribuloides*	blunt broom sedge	Cyperaceae
Carex trisperma	threeseeded sedge	Cyperaceae
Carex trisperma var. *trisperma*	threeseeded sedge	Cyperaceae
Carex tuckermanii	Tuckerman's sedge	Cyperaceae
Carex typhina	cattail sedge	Cyperaceae
Carex umbellata	parasol sedge	Cyperaceae
Carex utriculata	Northwest Territory sedge	Cyperaceae
Carex vesicaria	blister sedge	Cyperaceae
Carex virescens	ribbed sedge	Cyperaceae
Carex vulpinoidea	fox sedge	Cyperaceae
Carex wiegandii	Wiegand's sedge	Cyperaceae
Carex willdenowii	Willdenow's sedge	Cyperaceae
Carex woodii	pretty sedge	Cyperaceae
Carpinus caroliniana	American hornbeam	Betulaceae
Carya	hybrid hickory	Juglandaceae
Carya alba	mockernut hickory	Juglandaceae
Carya cordiformis	bitternut hickory	Juglandaceae
Carya glabra	pignut hickory	Juglandaceae
Carya ovalis	red hickory	Juglandaceae
Carya ovata	shagbark hickory	Juglandaceae
Carya pallida	sand hickory	Juglandaceae
Carya tomentosa	mockernut hickory	Juglandaceae
Castanea	chestnut	Fagaceae
Castanea dentata	American chestnut	Fagaceae
Castanea pumila	chinquapin	Fagaceae
Castanea pumila var. *pumila*	chinquapin	Fagaceae
Castilleja septentrionalis	Labrador Indian paintbrush	Scrophulariaceae
Catalpa	catalpa	Bignoniaceae
Catalpa bignonioides	southern catalpa	Bignoniaceae
Catalpa speciosa	northern catalpa	Bignoniaceae
Caulophyllum thalictroides	blue cohosh	Berberidaceae
Ceanothus americanus	New Jersey tea	Rhamnaceae
Celastrus	bittersweet	Celastraceae
Celastrus orbiculatus	Oriental bittersweet	Celastraceae
Celastrus scandens	American bittersweet	Celastraceae
Celtis occidentalis	common hackberry	Ulmaceae
Celtis tenuifolia	dwarf hackberry	Ulmaceae
Centaurea	knapweed	Asteraceae
Centaurea biebersteinii	spotted knapweed	Asteraceae
Cephalanthus occidentalis	common buttonbush	Rubiaceae
Cercis canadensis	eastern redbud	Fabaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Cercis canadensis var. *canadensis*	eastern redbud	Fabaceae
Cetraria islandica	island cetraria lichen	Parmeliaceae
Chaerophyllum procumbens	spreading chervil	Apiaceae
Chaerophyllum procumbens var. *shortii*	Short's spreading chervil	Apiaceae
Chaiturus marrubiastrum	lion's tail	Lamiaceae
Chamaecrista fasciculata	partridge pea	Fabaceae
Chamaecyparis thyoides	Atlantic white cedar	Cupressaceae
Chamaedaphne calyculata	leatherleaf	Ericaceae
Chamaelirium luteum	fairywand	Liliaceae
Chamaesyce humistrata	spreading sandmat	Euphorbiaceae
Chamaesyce maculata	spotted sandmat	Euphorbiaceae
Chamaesyce nutans	eyebane	Euphorbiaceae
Chamerion angustifolium	fireweed	Onagraceae
Chamerion angustifolium ssp. *angustifolium*	fireweed	Onagraceae
Chasmanthium latifolium	Indian woodoats	Poaceae
Cheilanthes lanosa	hairy lipfern	Pteridaceae
Chelone	turtlehead	Scrophulariaceae
Chelone glabra	white turtlehead	Scrophulariaceae
Chelone lyonii	pink turtlehead	Scrophulariaceae
Chelone obliqua	red turtlehead	Scrophulariaceae
Chenopodium	goosefoot	Chenopodiaceae
Chenopodium album	lambsquarters	Chenopodiaceae
Chenopodium ambrosioides var. *ambrosioides*	Mexican tea	Chenopodiaceae
Chenopodium botrys	Jerusalem oak goosefoot	Chenopodiaceae
Chenopodium standleyanum	Standley's goosefoot	Chenopodiaceae
Chimaphila maculata	striped prince's pine	Pyrolaceae
Chimaphila umbellata	pipsissewa	Pyrolaceae
Chionanthus virginicus	white fringetree	Oleaceae
Chrysanthemum	daisy	Asteraceae
Chrysogonum virginianum var. *virginianum*	green and gold	Asteraceae
Chrysosplenium americanum	American golden saxifrage	Saxifragaceae
Cichorium intybus	chicory	Asteraceae
Cicuta bulbifera	bulblet-bearing water hemlock	Apiaceae
Cicuta maculata	spotted water hemlock	Apiaceae
Cicuta maculata var. *maculata*	spotted water hemlock	Apiaceae
Cimicifuga	tall bugbane	Ranunculaceae
Cinna	woodreed	Poaceae
Cinna arundinacea	sweet woodreed	Poaceae
Cinna latifolia	drooping woodreed	Poaceae
Circaea	enchanter's nightshade	Onagraceae
Circaea alpina	small enchanter's nightshade	Onagraceae
Circaea alpina ssp. *alpina*	small enchanter's nightshade	Onagraceae
Circaea lutetiana	broadleaf enchanter's nightshade	Onagraceae
Circaea lutetiana ssp. *canadensis*	broadleaf enchanter's nightshade	Onagraceae
Cirsium	thistle	Asteraceae
Cirsium arvense	Canada thistle	Asteraceae
Cirsium muticum	swamp thistle	Asteraceae
Cirsium pumilum	pasture thistle	Asteraceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Cirsium vulgare	bull thistle	Asteraceae
Citrullus lanatus var. *lanatus*	watermelon	Cucurbitaceae
Cladina	reindeer lichen	Cladoniaceae
Cladina mitis	reindeer lichen	Cladoniaceae
Cladina rangiferina	greygreen reindeer lichen	Cladoniaceae
Cladina stellaris	star reindeer lichen	Cladoniaceae
Cladina subtenuis	reindeer lichen	Cladoniaceae
Cladium mariscoides	smooth sawgrass	Cyperaceae
Cladonia	cup lichen	Cladoniaceae
Cladonia amaurocraea	cup lichen	Cladoniaceae
Cladonia chlorophaea	cup lichen	Cladoniaceae
Cladonia coniocraea	cup lichen	Cladoniaceae
Cladonia cristatella	British soldier lichen	Cladoniaceae
Cladonia squamosa	cup lichen	Cladoniaceae
Cladonia uncialis	cup lichen	Cladoniaceae
Cladrastis kentukea	Kentucky yellowwood	Fabaceae
Claytonia	springbeauty	Portulacaceae
Claytonia caroliniana	Carolina springbeauty	Portulacaceae
Claytonia virginica	Virginia springbeauty	Portulacaceae
Cleistes bifaria	small spreading pogonia	Orchidaceae
Clematis	leather flower	Ranunculaceae
Clematis coactilis	Virginia whitehair leather flower	Ranunculaceae
Clematis viorna	vasevine	Ranunculaceae
Clematis virginiana	devil's darning needles	Ranunculaceae
Clethra acuminata	mountain sweetpepperbush	Clethraceae
Clethra alnifolia	coastal sweetpepperbush	Clethraceae
Climacium americanum	American climacium moss	Climaciaceae
Climacium dendroides	tree climacium moss	Climaciaceae
Clinopodium vulgare	wild basil	Lamiaceae
Clintonia	bluebead	Liliaceae
Clintonia borealis	bluebead	Liliaceae
Clintonia umbellulata	white clintonia	Liliaceae
Clitoria mariana	Atlantic pigeonwings	Fabaceae
Collinsia verna	spring blue eyed Mary	Scrophulariaceae
Collinsonia	horsebalm	Lamiaceae
Collinsonia canadensis	richweed	Lamiaceae
Comandra umbellata	bastard toadflax	Santalaceae
Comarum palustre	purple marshlocks	Rosaceae
Commelina communis	Asiatic dayflower	Commelinaceae
Commelina erecta	whitemouth dayflower	Commelinaceae
Commelina erecta var. *erecta*	whitemouth dayflower	Commelinaceae
Comptonia	sweet fern	Myricaceae
Comptonia peregrina	sweet fern	Myricaceae
Conium maculatum	poison hemlock	Apiaceae
Conoclinium coelestinum	blue mistflower	Asteraceae
Conopholis americana	American cancer-root	Orobanchaceae
Conostomum	conostomum moss	Bartramiaceae
Convallaria majalis	European lily of the valley	Liliaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Convallaria majuscula	American lily-of-the-valley	Liliaceae
Convolvulus	bindweed	Convolvulaceae
Convolvulus arvensis	field bindweed	Convolvulaceae
Conyza canadensis	Canadian horseweed	Asteraceae
Coptis trifolia	threeleaf goldthread	Ranunculaceae
Coreopsis auriculata	lobed tickseed	Asteraceae
Coreopsis latifolia	broadleaf tickseed	Asteraceae
Coreopsis major	greater tickseed	Asteraceae
Coreopsis pubescens	star tickseed	Asteraceae
Coreopsis pubescens var. *robusta*	star tickseed	Asteraceae
Coreopsis verticillata	whorled tickseed	Asteraceae
Cornus	dogwood	Cornaceae
Cornus alternifolia	alternateleaf dogwood	Cornaceae
Cornus amomum	silky dogwood	Cornaceae
Cornus canadensis	bunchberry dogwood	Cornaceae
Cornus florida	flowering dogwood	Cornaceae
Cornus racemosa	gray dogwood	Cornaceae
Cornus rugosa	roundleaf dogwood	Cornaceae
Cornus sericea	redosier dogwood	Cornaceae
Corydalis	fumewort	Fumariaceae
Corydalis flavula	yellow fumewort	Fumariaceae
Corydalis sempervirens	rock harlequin	Fumariaceae
Corylus	hazelnut	Betulaceae
Corylus americana	American hazelnut	Betulaceae
Corylus cornuta	beaked hazelnut	Betulaceae
Corylus cornuta var. *cornuta*	beaked hazelnut	Betulaceae
Crataegus	hawthorn	Rosaceae
Crataegus flabellata	fanleaf hawthorn	Rosaceae
Crataegus intricata	Copenhagen hawthorn	Rosaceae
Crataegus macrosperma	bigfruit hawthorn	Rosaceae
Crataegus pedicellata	scarlet hawthorn	Rosaceae
Crataegus pruinosa	waxyfruit hawthorn	Rosaceae
Crataegus punctata	dotted hawthorn	Rosaceae
Crataegus schuettei	Schuette's hawthorn	Rosaceae
Crataegus uniflora	dwarf hawthorn	Rosaceae
Croton elliottii	Elliott's croton	Euphorbiaceae
Crustose lichen	crustose lichen	
Cryptotaenia canadensis	Canadian honewort	Apiaceae
Cucurbita pepo var. *pepo*	field pumpkin	Cucurbitaceae
Cunila origanoides	common dittany	Lamiaceae
Cuphea viscosissima	blue waxweed	Lythraceae
Cuscuta	dodder	Cuscutaceae
Cuscuta gronovii	scaldweed	Cuscutaceae
Cuscuta gronovii var. *gronovii*	scaldweed	Cuscutaceae
Cuscuta rostrata	beaked dodder	Cuscutaceae
Cymophyllus fraserianus	Fraser's cymophyllus	Cyperaceae
Cynanchum louiseae	Louise's swallow-wort	Asclepiadaceae
Cynanchum louiseae	Louise's swallow-wort	Asclepiadaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Cynoglossum	hound's tongue	Boraginaceae
Cynoglossum officinale	gypsyflower	Boraginaceae
Cynoglossum virginianum	wild comfrey	Boraginaceae
Cynoglossum virginianum var. *virginianum*	wild comfrey	Boraginaceae
Cyperaceae	cyperaceae family	Cyperaceae
Cyperus	flatsedge	Cyperaceae
Cyperus bipartitus	slender flatsedge	Cyperaceae
Cyperus lupulinus	Great Plains flatsedge	Cyperaceae
Cyperus odoratus	fragrant flatsedge	Cyperaceae
Cyperus squarrosus	bearded flatsedge	Cyperaceae
Cyperus strigosus	strawcolored flatsedge	Cyperaceae
Cypripedium	lady's slipper	Orchidaceae
Cypripedium acaule	moccasin flower	Orchidaceae
Cypripedium parviflorum	lesser yellow lady's slipper	Orchidaceae
Cypripedium parviflorum var. *pubescens*	greater yellow lady's slipper	Orchidaceae
Cystopteris	bladderfern	Dryopteridaceae
Cystopteris bulbifera	bulblet bladderfern	Dryopteridaceae
Cystopteris fragilis	brittle bladderfern	Dryopteridaceae
Cystopteris protrusa	lowland bladderfern	Dryopteridaceae
Cystopteris tenuis	upland brittle bladderfern	Dryopteridaceae
Dactylis glomerata	orchardgrass	Poaceae
Dalibarda	dalibarda	Rosaceae
Dalibarda repens	robin runaway	Rosaceae
Danthonia	oatgrass	Poaceae
Danthonia compressa	flattened oatgrass	Poaceae
Danthonia sericea	downy danthonia	Poaceae
Danthonia spicata	poverty oatgrass	Poaceae
Dasiphora fruticosa ssp. *floribunda*	shrubby cinquefoil	Rosaceae
Datura stramonium	jimsonweed	Solanaceae
Daucus carota	Queen Anne's lace	Apiaceae
Decodon verticillatus	swamp loosestrife	Lythraceae
Delphinium tricorne	dwarf larkspur	Ranunculaceae
Dennstaedtia	hayscented fern	Dennstaedtiaceae
Dennstaedtia punctilobula	eastern hayscented fern	Dennstaedtiaceae
Deparia	false spleenwort	Dryopteridaceae
Deparia acrostichoides	silver false spleenwort	Dryopteridaceae
Deschampsia	hairgrass	Poaceae
Deschampsia cespitosa	tufted hairgrass	Poaceae
Deschampsia flexuosa	wavy hairgrass	Poaceae
Deschampsia flexuosa var. *flexuosa*	wavy hairgrass	Poaceae
Desmodium	ticktrefoil	Fabaceae
Desmodium canadense	showy ticktrefoil	Fabaceae
Desmodium canescens	hoary ticktrefoil	Fabaceae
Desmodium ciliare	hairy small-leaf ticktrefoil	Fabaceae
Desmodium glabellum	Dillenius' ticktrefoil	Fabaceae
Desmodium glutinosum	pointedleaf ticktrefoil	Fabaceae
Desmodium laevigatum	smooth ticktrefoil	Fabaceae
Desmodium marilandicum	smooth small-leaf ticktrefoil	Fabaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Desmodium nudiflorum	nakedflower ticktrefoil	Fabaceae
Desmodium paniculatum	panicledleaf ticktrefoil	Fabaceae
Desmodium paniculatum var. *paniculatum*	panicledleaf ticktrefoil	Fabaceae
Desmodium perplexum	perplexed ticktrefoil	Fabaceae
Desmodium rotundifolium	prostrate ticktrefoil	Fabaceae
Dianthus armeria	Deptford pink	Caryophyllaceae
Diapensia lapponica	pincushion plant	Diapensiaceae
Dicentra canadensis	squirrel corn	Fumariaceae
Dicentra cucullaria	dutchman's breeches	Fumariaceae
Dicentra eximia	turkey corn	Fumariaceae
Dichanthelium	rosette grass	Poaceae
Dichanthelium acuminatum	tapered rosette grass	Poaceae
Dichanthelium acuminatum var. *acuminatum*	tapered rosette grass	Poaceae
Dichanthelium acuminatum var. *fasciculatum*	western panicgrass	Poaceae
Dichanthelium acuminatum var. *lindheimeri*	Lindheimer panicgrass	Poaceae
Dichanthelium boreale	northern panicgrass	Poaceae
Dichanthelium boscii	Bosc's panicgrass	Poaceae
Dichanthelium clandestinum	deertongue	Poaceae
Dichanthelium commutatum	variable panicgrass	Poaceae
Dichanthelium depauperatum	starved panicgrass	Poaceae
Dichanthelium dichotomum	cypress panicgrass	Poaceae
Dichanthelium dichotomum var. *dichotomum*	cypress panicgrass	Poaceae
Dichanthelium latifolium	broadleaf rosette grass	Poaceae
Dichanthelium laxiflorum	openflower rosette grass	Poaceae
Dichanthelium linearifolium	slimleaf panicgrass	Poaceae
Dichanthelium oligosanthes var. *scribnerianum*	Scribner's rosette grass	Poaceae
Dichanthelium scoparium	velvet panicum	Poaceae
Dichanthelium sphaerocarpon var. *isophyllum*	roundseed panicgrass	Poaceae
Dichanthelium sphaerocarpon var. *sphaerocarpon*	roundseed panicgrass	Poaceae
Dichanthelium villosissimum	whitehair rosette grass	Poaceae
Dichanthelium villosissimum var. *villosissimum*	whitehair rosette grass	Poaceae
Dicranodontium asperulum	dicranodontium moss	Dicranaceae
Dicranum	dicranum moss	Dicranaceae
Dicranum fulvum	dicranum moss	Dicranaceae
Dicranum montanum	montane dicranum moss	Dicranaceae
Dicranum scoparium	dicranum moss	Dicranaceae
Diervilla	bush honeysuckle	Caprifoliaceae
Diervilla lonicera	northern bush honeysuckle	Caprifoliaceae
Diervilla sessilifolia	southern bush honeysuckle	Caprifoliaceae
Digitaria ischaemum	smooth crabgrass	Poaceae
Digitaria sanguinalis	hairy crabgrass	Poaceae
Dimelaena oreina	mountain lichen	Physciaceae
Diodia teres	poorjoe	Rubiaceae
Diodia virginiana	Virginia buttonweed	Rubiaceae
Dioscorea	yam	Dioscoreaceae
Dioscorea oppositifolia	Chinese yam	Dioscoreaceae
Dioscorea quaternata	fourleaf yam	Dioscoreaceae
Dioscorea villosa	wild yam	Dioscoreaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Diospyros virginiana	common persimmon	Ebenaceae
Diphylleia cymosa	American umbrellaleaf	Berberidaceae
Diplazium pycnocarpon	glade fern	Dryopteridaceae
Dipsacus fullonum	Fuller's teasel	Dipsacaceae
Dirca palustris	eastern leatherwood	Thymelaeaceae
Dodecatheon meadia ssp. *meadia*	pride of Ohio	Primulaceae
Doellingeria infirma	cornel-leaf whitetop	Asteraceae
Doellingeria umbellata	parasol whitetop	Asteraceae
Draba ramosissima	branched draba	Brassicaceae
Drosera intermedia	spoonleaf sundew	Droseraceae
Drosera rotundifolia	roundleaf sundew	Droseraceae
Dryopteris	woodfern	Dryopteridaceae
Dryopteris ×boottii	woodfern	Dryopteridaceae
Dryopteris campyloptera	mountain woodfern	Dryopteridaceae
Dryopteris carthusiana	spinulose woodfern	Dryopteridaceae
Dryopteris cristata	crested woodfern	Dryopteridaceae
Dryopteris fragrans	fragrant woodfern	Dryopteridaceae
Dryopteris goldiana	Goldie's woodfern	Dryopteridaceae
Dryopteris intermedia	intermediate woodfern	Dryopteridaceae
Dryopteris marginalis	marginal woodfern	Dryopteridaceae
Duchesnea indica	Indian strawberry	Rosaceae
Dulichium arundinaceum	three-way sedge	Cyperaceae
Echinochloa	cockspur grass	Poaceae
Echinochloa crus-galli	barnyardgrass	Poaceae
Echinocystis lobata	wild cucumber	Cucurbitaceae
Eclipta prostrata	false daisy	Asteraceae
Elaeagnus	oleaster	Elaeagnaceae
Elaeagnus umbellata	autumn olive	Elaeagnaceae
Elaeagnus umbellata var. *parvifolia*	autumn olive	Elaeagnaceae
Eleocharis	spikerush	Cyperaceae
Eleocharis obtusa	blunt spikerush	Cyperaceae
Eleocharis palustris	common spikerush	Cyperaceae
Eleocharis tenuis	slender spikerush	Cyperaceae
Eleusine indica	Indian goosegrass	Poaceae
Elodea	waterweed	Hydrocharitaceae
Elodea canadensis	Canadian waterweed	Hydrocharitaceae
Elymus	wildrye	Poaceae
Elymus canadensis	Canada wildrye	Poaceae
Elymus hystrix	eastern bottlebrush grass	Poaceae
Elymus hystrix var. *hystrix*	eastern bottlebrush grass	Poaceae
Elymus repens	quackgrass	Poaceae
Elymus riparius	riverbank wildrye	Poaceae
Elymus villosus	hairy wildrye	Poaceae
Elymus virginicus	Virginia wildrye	Poaceae
Elymus virginicus var. *virginicus*	Virginia wildrye	Poaceae
Empetrum eamesii ssp. *atropurpureum*	purple crowberry	Empetraceae
Empetrum nigrum	black crowberry	Empetraceae
Empetrum nigrum ssp. *hermaphroditum*	black crowberry	Empetraceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Entodon cladorrhizans	entodon moss	Entodontaceae
Epifagus virginiana	beechdrops	Orobanchaceae
Epigaea repens	trailing arbutus	Ericaceae
Epilobium	willowherb	Onagraceae
Epilobium ciliatum	fringed willowherb	Onagraceae
Epilobium ciliatum ssp. *ciliatum*	fringed willowherb	Onagraceae
Epilobium coloratum	purpleleaf willowherb	Onagraceae
Epilobium hornemannii	Hornemann's willowherb	Onagraceae
Epilobium leptophyllum	bog willowherb	Onagraceae
Epipactis helleborine	broadleaf helleborine	Orchidaceae
Equisetum	horsetail	Equisetaceae
Equisetum arvense	field horsetail	Equisetaceae
Equisetum fluviatile	water horsetail	Equisetaceae
Equisetum hyemale	scouringrush horsetail	Equisetaceae
Equisetum hyemale var. *affine*	scouringrush horsetail	Equisetaceae
Equisetum palustre	marsh horsetail	Equisetaceae
Equisetum pratense	meadow horsetail	Equisetaceae
Equisetum scirpoides	dwarf scouringrush	Equisetaceae
Equisetum sylvaticum	woodland horsetail	Equisetaceae
Equisetum variegatum	variegated scouringrush	Equisetaceae
Eragrostis	lovegrass	Poaceae
Eragrostis capillaris	lace grass	Poaceae
Eragrostis frankii	sandbar lovegrass	Poaceae
Eragrostis hypnoides	teal lovegrass	Poaceae
Eragrostis pectinacea	tufted lovegrass	Poaceae
Erechtites hieraciifolia	American burnweed	Asteraceae
Erechtites hieraciifolia var. *hieraciifolia*	Americna burnweed	Asteraceae
Erigenia bulbosa	harbinger of spring	Apiaceae
Erigeron	fleabane	Asteraceae
Erigeron annuus	eastern daisy fleabane	Asteraceae
Erigeron philadelphicus	Philadelphia fleabane	Asteraceae
Erigeron philadelphicus var. *philadelphicus*	Philadelphia fleabane	Asteraceae
Erigeron pulchellus	robin's plantain	Asteraceae
Erigeron pulchellus var. *pulchellus*	robin's plantain	Asteraceae
Erigeron strigosus	prairie fleabane	Asteraceae
Eriocaulon aquaticum	sevenangle pipewort	Eriocaulaceae
Eriophorum angustifolium	tall cottongrass	Cyperaceae
Eriophorum tenellum	fewnerved cottongrass	Cyperaceae
Eriophorum vaginatum	tussock cottongrass	Cyperaceae
Eriophorum virginicum	tawny cottongrass	Cyperaceae
Eriophorum viridicarinatum	thinleaf cottonsedge	Cyperaceae
Erythronium americanum	dogtooth violet	Liliaceae
Erythronium umbilicatum	dimpled troutlily	Liliaceae
Euonymus	spindletree	Celastraceae
Euonymus alatus	burningbush	Celastraceae
Euonymus americanus	bursting-heart	Celastraceae
Euonymus obovatus	running strawberry bush	Celastraceae
Eupatorium	thoroughwort	Asteraceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Eupatorium album	white thoroughwort	Asteraceae
Eupatorium altissimum	tall thoroughwort	Asteraceae
Eupatorium fistulosum	trumpetweed	Asteraceae
Eupatorium godfreyanum	Godfrey's thoroughwort	Asteraceae
Eupatorium maculatum	spotted joe pye weed	Asteraceae
Eupatorium maculatum var. *maculatum*	spotted joe pye weed	Asteraceae
Eupatorium perfoliatum	common boneset	Asteraceae
Eupatorium perfoliatum var. *perfoliatum*	common boneset	Asteraceae
Eupatorium pilosum	rough boneset	Asteraceae
Eupatorium purpureum	spotted joe pye weed	Asteraceae
Eupatorium purpureum var. *purpureum*	sweetscented joe pye weed	Asteraceae
Eupatorium rotundifolium	roundleaf thoroughwort	Asteraceae
Eupatorium rotundifolium var. *ovatum*	roundleaf thoroughwort	Asteraceae
Eupatorium serotinum	lateflowering thoroughwort	Asteraceae
Eupatorium sessilifolium	upland boneset	Asteraceae
Eupatorium sessilifolium var. *sessilifolium*	upland boneset	Asteraceae
Eupatorium steelei	Steele's eupatorium	Asteraceae
Euphorbia corollata	flowering spurge	Euphorbiaceae
Euphorbia pubentissima	false flowering spurge	Euphorbiaceae
Eurybia	aster	Asteraceae
Eurybia chlorolepis	mountain aster	Asteraceae
Eurybia divaricata	white wood aster	Asteraceae
Eurybia macrophylla	bigleaf aster	Asteraceae
Eurybia radula	low rough aster	Asteraceae
Eurybia schreberi	Schreber's aster	Asteraceae
Eurybia surculosa	creeping aster	Asteraceae
Euthamia caroliniana	slender goldentop	Asteraceae
Euthamia galetorum	slendor goldentop	Asteraceae
Euthamia graminifolia	flat-top goldentop	Asteraceae
Eutrochium	joe pye weed	Asteraceae
Eutrochium maculatum	spotted joe pyeweed	Asteraceae
Fagus grandifolia	American beech	Fagaceae
Fern, unknown	unknown fern	
Festuca	fescue	Poaceae
Festuca rubra	red fescue	Poaceae
Festuca subverticillata	nodding fescue	Poaceae
Fissidens	fissidens moss	Fissidentaceae
Flavocetraria cucullata		Parmeliaceae
Flavocetraria nivalis		Parmeliaceae
Flavoparmelia baltimorensis	Baltimore flavoparmelia lichen	Parmeliaceae
Foliose lichen	foliose lichen	
Fontinalis	fontinalis moss	Fontinalaceae
Forb, unknown	unknown forb species	
Fothergilla	witchalder	Hamamelidaceae
Fragaria	strawberry	Rosaceae
Fragaria vesca	woodland strawberry	Rosaceae
Fragaria virginiana	Virginia strawberry	Rosaceae
Fragaria virginiana ssp. *virginiana*	Virginia strawberry	Rosaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Frangula alnus	glossy buckthorn	Rhamnaceae
Fraxinus	ash	Oleaceae
Fraxinus americana	white ash	Oleaceae
Fraxinus nigra	black ash	Oleaceae
Fraxinus pennsylvanica	green ash	Oleaceae
Frullania asagrayana		Jubulaceae
Fruticose lichen	fruticose lichen	
Galax	galax	Diapensiaceae
Galax urceolata	beetleweed	Diapensiaceae
Galearis spectabilis	showy orchid	Orchidaceae
Galeopsis tetrahit	brittlestem hempnettle	Lamiaceae
Galinsoga quadriradiata	shaggy soldier	Asteraceae
Galium	bedstraw	Rubiaceae
Galium aparine	stickywilly	Rubiaceae
Galium asprellum	rough bedstraw	Rubiaceae
Galium boreale	northern bedstraw	Rubiaceae
Galium circaezans	licorice bedstraw	Rubiaceae
Galium circaezans var. *circaezans*	licorice bedstraw	Rubiaceae
Galium circaezans var. *hypomalacum*	licorice bedstraw	Rubiaceae
Galium kamtschaticum	boreal bedstraw	Rubiaceae
Galium lanceolatum	lanceleaf wild licorice	Rubiaceae
Galium latifolium	purple bedstraw	Rubiaceae
Galium mollugo	false baby's breath	Rubiaceae
Galium obtusum	bluntleaf bedstraw	Rubiaceae
Galium palustre	common marsh bedstraw	Rubiaceae
Galium pilosum	hairy bedstraw	Rubiaceae
Galium pilosum var. *pilosum*	hairy bedstraw	Rubiaceae
Galium tinctorium	stiff marsh bedstraw	Rubiaceae
Galium trifidum	threepetal bedstraw	Rubiaceae
Galium triflorum	fragrant bedstraw	Rubiaceae
Gamochaeta purpurea	spoonleaf purple everlasting	Asteraceae
Gaultheria	snowberry	Ericaceae
Gaultheria hispidula	creeping snowberry	Ericaceae
Gaultheria procumbens	eastern teaberry	Ericaceae
Gaylussacia	huckleberry	Ericaceae
Gaylussacia baccata	black huckleberry	Ericaceae
Gaylussacia frondosa	blue huckleberry	Ericaceae
Gaylussacia ursina	bear huckleberry	Ericaceae
Gentiana	gentian	Gentianaceae
Gentiana austromontana	Appalachian gentian	Gentianaceae
Gentiana decora	showy gentian	Gentianaceae
Gentiana linearis	narrowleaf gentian	Gentianaceae
Gentianella quinquefolia	agueweed	Gentianaceae
Gentianella quinquefolia ssp. *quinquefolia*	agueweed	Gentianaceae
Geranium	geranium	Geraniaceae
Geranium maculatum	spotted geranium	Geraniaceae
Geranium robertianum	Robert geranium	Geraniaceae
Geum	avens	Rosaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Geum canadense	white avens	Rosaceae
Geum laciniatum	rough avens	Rosaceae
Geum macrophyllum	largeleaf avens	Rosaceae
Geum peckii	mountain avens	Rosaceae
Geum rivale	purple avens	Rosaceae
Geum vernum	spring avens	Rosaceae
Geum virginianum	cream avens	Rosaceae
Glechoma hederacea	ground ivy	Lamiaceae
Gleditsia triacanthos	honeylocust	Fabaceae
Glyceria	mannagrass	Poaceae
Glyceria borealis	small floating mannagrass	Poaceae
Glyceria canadensis	rattlesnake mannagrass	Poaceae
Glyceria grandis	American mannagrass	Poaceae
Glyceria melicaria	melic mannagrass	Poaceae
Glyceria nubigena	Great Smoky Mountain mannagrass	Poaceae
Glyceria septentrionalis	floating mannagrass	Poaceae
Glyceria striata	fowl mannagrass	Poaceae
Goodyera pubescens	downy rattlesnake plantain	Orchidaceae
Goodyera repens	lesser rattlesnake plantain	Orchidaceae
Goodyera tesselata	checkered rattlesnake plantain	Orchidaceae
Grass, unknown	unknown grass species	
Gratiola neglecta	clammy hedgehyssop	Scrophulariaceae
Gymnocarpium appalachianum	Appalachian oakfern	Dryopteridaceae
Gymnocarpium dryopteris	western oakfern	Dryopteridaceae
Hackelia	stickseed	Boraginaceae
Hackelia virginiana	beggarslice	Boraginaceae
Halesia tetraptera	mountain silverbell	Styracaceae
Halesia tetraptera var. *monticola*	mountain silverbell	Styracaceae
Hamamelis virginiana	American witchhazel	Hamamelidaceae
Harrimanella hypnoides	mossplant	Ericaceae
Hedeoma pulegioides	American false pennyroyal	Lamiaceae
Hedera helix	English ivy	Araliaceae
Hedwigia ciliata	ciliate hedwigia moss	Hedwigiaceae
Helenium autumnale	common sneezeweed	Asteraceae
Helianthemum	frostweed	Cistaceae
Helianthemum bicknellii	hoary frostweed	Cistaceae
Helianthus	sunflower	Asteraceae
Helianthus decapetalus	thinleaf sunflower	Asteraceae
Helianthus divaricatus	woodland sunflower	Asteraceae
Helianthus laevigatus	smooth sunflower	Asteraceae
Helianthus microcephalus	small woodland sunflower	Asteraceae
Helianthus strumosus	paleleaf woodland sunflower	Asteraceae
Helianthus tuberosus	Jerusalem artichoke	Asteraceae
Heliopsis helianthoides	smooth oxeye	Asteraceae
Hemerocallis	daylily	Liliaceae
Hemerocallis fulva	orange daylily	Liliaceae
Hepatica	hepatica	Ranunculaceae
Hepatica nobilis	hepatica	Ranunculaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Hepatica nobilis var. *acuta*	sharplobe hepatica	Ranunculaceae
Hepatica nobilis var. *obtusa*	roundlobe hepatica	Ranunculaceae
Heracleum maximum	common cowparsnip	Apiaceae
Hesperis matronalis	dames rocket	Brassicaceae
Heteranthera dubia	grassleaf mudplantain	Pontederiaceae
Heteromeles arbutifolia	toyon	Rosaceae
Heuchera	alumroot	Saxifragaceae
Heuchera americana	American alumroot	Saxifragaceae
Heuchera americana var. *americana*	American alumroot	Saxifragaceae
Heuchera americana var. *hirsuticaulis*	American alumroot	Saxifragaceae
Heuchera caroliniana	Carolina alumroot	Saxifragaceae
Heuchera pubescens	downy alumroot	Saxifragaceae
Heuchera villosa	hairy alumroot	Saxifragaceae
Heuchera villosa var. *villosa*	hairy alumroot	Saxifragaceae
Hexastylis	heartleaf	Aristolochiaceae
Hexastylis arifolia	littlebrownjug	Aristolochiaceae
Hexastylis heterophylla	variableleaf heartleaf	Aristolochiaceae
Hexastylis shuttleworthii	largeflower heartleaf	Aristolochiaceae
Hexastylis virginica	Virginia heartleaf	Aristolochiaceae
Hibiscus laevis	halberdleaf rosemallow	Malvaceae
Hieracium	hawkweed	Asteraceae
Hieracium ×floribundum	hawkweed	Asteraceae
Hieracium caespitosum	meadow hawkweed	Asteraceae
Hieracium greenii	Maryland hawkweed	Asteraceae
Hieracium gronovii	queendevil	Asteraceae
Hieracium paniculatum	Allegheny hawkweed	Asteraceae
Hieracium scabrum	rough hawkweed	Asteraceae
Hieracium venosum	rattlesnakeweed	Asteraceae
Holcus lanatus	common velvetgrass	Poaceae
Houstonia caerulea	azure bluet	Rubiaceae
Houstonia longifolia	longleaf summer bluet	Rubiaceae
Houstonia purpurea	Venus' pride	Rubiaceae
Houstonia purpurea var. *purpurea*	Venus' pride	Rubiaceae
Houstonia serpyllifolia	thymeleaf bluet	Rubiaceae
Humulus japonicus	Japanese hop	Cannabaceae
Humulus lupulus	common hop	Cannabaceae
Huperzia appalachiana	Appalachian clubmoss	Lycopodiaceae
Huperzia lucidula	shining clubmoss	Lycopodiaceae
Huperzia selago	fir clubmoss	Lycopodiaceae
Hybanthus concolor	eastern greenviolet	Violaceae
Hydrangea	hydrangea	Hydrangeaceae
Hydrangea arborescens	wild hydrangea	Hydrangeaceae
Hydrangea radiata	silverleaf hydrangea	Hydrangeaceae
Hydrocotyle americana	American marshpennywort	Apiaceae
Hydrocotyle ranunculoides	floating marshpennywort	Apiaceae
Hydrophyllum canadense	bluntleaf waterleaf	Hydrophyllaceae
Hydrophyllum macrophyllum	largeleaf waterleaf	Hydrophyllaceae
Hydrophyllum virginianum	eastern waterleaf	Hydrophyllaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Hylocomium	hylocomium feather moss	Hylocomiaceae
Hylocomium splendens	splendid feather moss	Hylocomiaceae
Hylotelephium telephioides	Allegheny stonecrop	Crassulaceae
Hypericum	St. Johnswort	Clusiaceae
Hypericum ascyron	great St. Johnswort	Clusiaceae
Hypericum buckleii	Buckley's St. Johnswort	Clusiaceae
Hypericum canadense	lesser Canadian St. Johnswort	Clusiaceae
Hypericum ellipticum	pale St. Johnswort	Clusiaceae
Hypericum gentianoides	orangegrass	Clusiaceae
Hypericum hypericoides ssp. *multicaule*	St. Andrew's cross	Clusiaceae
Hypericum mitchellianum	Blue Ridge St. Johnswort	Clusiaceae
Hypericum mutilum	dwarf St. Johnswort	Clusiaceae
Hypericum perforatum	common St. Johnswort	Clusiaceae
Hypericum prolificum	shrubby St. Johnswort	Clusiaceae
Hypericum punctatum	spotted St. Johnswort	Clusiaceae
Hypericum uralum		Clusiaceae
Hypnum	hypnum moss	Hypnaceae
Hypnum curvifolium	curveleaf hypnum moss	Hypnaceae
Hypnum fertile	hypnum moss	Hypnaceae
Hypnum imponens	hypnum moss	Hypnaceae
Hypoxis hirsuta	common goldstar	Liliaceae
Ilex	holly	Aquifoliaceae
Ilex ambigua	Carolina holly	Aquifoliaceae
Ilex montana	mountain holly	Aquifoliaceae
Ilex mucronata	catberry	Aquifoliaceae
Ilex opaca	American holly	Aquifoliaceae
Ilex opaca var. *opaca*	American holly	Aquifoliaceae
Ilex verticillata	common winterberry	Aquifoliaceae
Impatiens	touch-me-not	Balsaminaceae
Impatiens capensis	jewelweed	Balsaminaceae
Impatiens pallida	pale touch-me-not	Balsaminaceae
Ionactis linariifolius	flaxleaf whitetop aster	Asteraceae
Ipomoea	morning-glory	Convolvulaceae
Ipomoea hederacea	ivyleaf morning-glory	Convolvulaceae
Ipomoea lacunosa	whitestar	Convolvulaceae
Ipomoea pandurata	man of the earth	Convolvulaceae
Iris	iris	Iridaceae
Iris cristata	dwarf crested iris	Iridaceae
Iris pseudacorus	paleyellow iris	Iridaceae
Iris verna	dwarf violet iris	Iridaceae
Iris versicolor	harlequin blueflag	Iridaceae
Isanthus brachiatus	fluxweed	Lamiaceae
Isoetes	quillwort	Isoetaceae
Isotria verticillata	large whorled pogonia	Orchidaceae
Jeffersonia diphylla	twinleaf	Berberidaceae
Juglans	walnut	Juglandaceae
Juglans cinerea	butternut	Juglandaceae
Juglans nigra	black walnut	Juglandaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Juncus	rush	Juncaceae
Juncus brevicaudatus	narrowpanicle rush	Juncaceae
Juncus canadensis	Canadian rush	Juncaceae
Juncus coriaceus	leathery rush	Juncaceae
Juncus dudleyi	Dudley's rush	Juncaceae
Juncus effusus	common rush	Juncaceae
Juncus effusus var. *pylaei*	common rush	Juncaceae
Juncus effusus var. *solutus*	lamp rush	Juncaceae
Juncus filiformis	thread rush	Juncaceae
Juncus gymnocarpus	Pennsylvania rush	Juncaceae
Juncus marginatus	grassleaf rush	Juncaceae
Juncus militaris	bayonet rush	Juncaceae
Juncus secundus	lopsided rush	Juncaceae
Juncus tenuis	poverty rush	Juncaceae
Juncus trifidus	highland rush	Juncaceae
Juniperus communis	common juniper	Cupressaceae
Juniperus virginiana	eastern redcedar	Cupressaceae
Juniperus virginiana var. *virginiana*	eastern redcedar	Cupressaceae
Justicia americana	American water-willow	Acanthaceae
Kalmia angustifolia	sheep laurel	Ericaceae
Kalmia latifolia	mountain laurel	Ericaceae
Kalmia polifolia	bog laurel	Ericaceae
Krigia biflora	twoflower dwarfdandelion	Asteraceae
Krigia montana	mountain dwarfdandelion	Asteraceae
Krigia virginica	Virginia dwarfdandelion	Asteraceae
Kummerowia striata	Japanese clover	Fabaceae
Lactuca	lettuce	Asteraceae
Lactuca biennis	tall blue lettuce	Asteraceae
Lactuca canadensis	Canada lettuce	Asteraceae
Lactuca floridana	woodland lettuce	Asteraceae
Lactuca floridana var. *villosa*	woodland lettuce	Asteraceae
Lamiaceae	Lamiaceae family	Lamiaceae
Laportea	laportea	Urticaceae
Laportea canadensis	Canadian woodnettle	Urticaceae
Lapsana communis	common nipplewort	Asteraceae
Larix decidua	European larch	Pinaceae
Larix laricina	tamarack	Pinaceae
Lasallia	blistered navel lichen	Umbilicariaceae
Lasallia papulosa	blistered naval lichen	Umbilicariaceae
Lasallia pensylvanica	Pensylvania blistered naval lichen	Umbilicariaceae
Lathyrus	pea	Fabaceae
Lathyrus venosus	veiny pea	Fabaceae
Lechea	pinweed	Cistaceae
Lechea racemulosa	Illinois pinweed	Cistaceae
Ledum groenlandicum	bog Labrador tea	Ericaceae
Leersia	cutgrass	Poaceae
Leersia oryzoides	rice cutgrass	Poaceae
Leersia virginica	whitegrass	Poaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Leiophyllum buxifolium	sandmyrtle	Ericaceae
Lemna	duckweed	Lemnaceae
Lemna minor	common duckweed	Lemnaceae
Leonurus cardiaca	common motherwort	Lamiaceae
Lepidium virginicum	Virginia pepperweed	Brassicaceae
Lepidium virginicum var. *virginicum*	Virginia pepperweed	Brassicaceae
Lepraria lobificans	dust lichen	Stereocaulaceae
Lespedeza	lespedeza	Fabaceae
Lespedeza cuneata	sericea lespedeza	Fabaceae
Lespedeza hirta	hairy lespedeza	Fabaceae
Lespedeza hirta ssp. *hirta*	hairy lespedeza	Fabaceae
Lespedeza procumbens	trailing lespedeza	Fabaceae
Lespedeza repens	creeping lespedeza	Fabaceae
Lespedeza violacea	violet lespedeza	Fabaceae
Lespedeza virginica	slender lespedeza	Fabaceae
Leucanthemum vulgare	oxeye daisy	Asteraceae
Leucobryum	leucobryum moss	Leucobryaceae
Leucobryum albidum	leucobryum moss	Leucobryaceae
Leucobryum glaucum	leucobryum moss	Leucobryaceae
Leucospora	leucospora	Scrophulariaceae
Leucospora multifida	narrowleaf paleseed	Scrophulariaceae
Leucothoe	doghobble	Ericaceae
Leucothoe axillaris	coastal doghobble	Ericaceae
Leucothoe fontanesiana	highland doghobble	Ericaceae
Leucothoe racemosa	swamp doghobble	Ericaceae
Leucothoe recurva	redtwig doghobble	Ericaceae
Liatris	blazing star	Asteraceae
Liatris pilosa	shaggy blazing star	Asteraceae
Liatris spicata	dense blazing star	Asteraceae
Liatris turgida	turgid blazing star	Asteraceae
Lichen, unknown	unknown lichen	
Ligusticum canadense	Canadian licorice-root	Apiaceae
Ligustrum	privet	Oleaceae
Ligustrum obtusifolium	border privet	Oleaceae
Ligustrum sinense	Chinese privet	Oleaceae
Ligustrum vulgare	European privet	Oleaceae
Lilium	lily	Liliaceae
Lilium canadense	Canada lily	Liliaceae
Lilium grayi	Gray's lily	Liliaceae
Lilium michauxii	Carolina lily	Liliaceae
Lilium superbum	turk's-cap lily	Liliaceae
Linaria vulgaris	butter and eggs	Scrophulariaceae
Lindera	spicebush	Lauraceae
Lindera benzoin	northern spicebush	Lauraceae
Lindera benzoin var. *benzoin*	northern spicebush	Lauraceae
Lindernia dubia	yellowseed false pimpernel	Scrophulariaceae
Linnaea borealis	twinflower	Caprifoliaceae
Linum striatum	ridged yellow flax	Linaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Liparis liliifolia	brown widelip orchid	Orchidaceae
Liquidambar styraciflua	sweetgum	Hamamelidaceae
Liriodendron tulipifera	tuliptree	Magnoliaceae
Listera smallii	kidneyleaf twayblade	Orchidaceae
Lithospermum	stoneseed	Boraginaceae
Lithospermum canescens	hoary puccoon	Boraginaceae
Lobelia	lobelia	Campanulaceae
Lobelia cardinalis	cardinalflower	Campanulaceae
Lobelia inflata	Indian-tobacco	Campanulaceae
Lobelia kalmii	Ontario lobelia	Campanulaceae
Lobelia puberula	downy lobelia	Campanulaceae
Lobelia siphilitica	great blue lobelia	Campanulaceae
Lobelia siphilitica var. *siphilitica*	great blue lobelia	Campanulaceae
Loiseleuria procumbens	alpine azalea	Ericaceae
Lolium arundinaceum	tall fescue	Poaceae
Lolium perenne	perennial ryegrass	Poaceae
Lolium pratense	meadow fescue	Poaceae
Lonicera canadensis	American fly honeysuckle	Caprifoliaceae
Lonicera dioica	limber honeysuckle	Caprifoliaceae
Lonicera japonica	Japanese honeysuckle	Caprifoliaceae
Lonicera maackii	Amur honeysuckle	Caprifoliaceae
Lonicera morrowii	Morrow's honeysuckle	Caprifoliaceae
Lonicera oblongifolia	swamp fly honeysuckle	Caprifoliaceae
Lonicera tatarica	Tatarian honeysuckle	Caprifoliaceae
Lonicera villosa	mountain fly honeysuckle	Caprifoliaceae
Lotus corniculatus	bird's-foot trefoil	Fabaceae
Ludwigia palustris	marsh seedbox	Onagraceae
Luzula	woodrush	Juncaceae
Luzula acuminata	hairy woodrush	Juncaceae
Luzula acuminata var. *acuminata*	hairy woodrush	Juncaceae
Luzula acuminata var. *carolinae*	Carolina woodrush	Juncaceae
Luzula bulbosa	bulbous woodrush	Juncaceae
Luzula echinata	hedgehog woodrush	Juncaceae
Luzula multiflora	common woodrush	Juncaceae
Luzula parviflora	smallflowered woodrush	Juncaceae
Luzula spicata	spiked woodrush	Juncaceae
Lycopodiella appressa	southern bog clubmoss	Lycopodiaceae
Lycopodiella inundata	inundated clubmoss	Lycopodiaceae
Lycopodiella subappressa	northern bog clubmoss	Lycopodiaceae
Lycopodium	clubmoss	Lycopodiaceae
Lycopodium annotinum	stiff clubmoss	Lycopodiaceae
Lycopodium clavatum	running clubmoss	Lycopodiaceae
Lycopodium complanatum	groundcedar	Lycopodiaceae
Lycopodium dendroideum	tree groundpine	Lycopodiaceae
Lycopodium digitatum	fan clubmoss	Lycopodiaceae
Lycopodium hickeyi	Pennsylvania clubmoss	Lycopodiaceae
Lycopodium lagopus	one-cone clubmoss	Lycopodiaceae
Lycopodium obscurum	rare clubmoss	Lycopodiaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Lycopodium sitchense	Sitka clubmoss	Lycopodiaceae
Lycopus	waterhorehound	Lamiaceae
Lycopus americanus	American water horehound	Lamiaceae
Lycopus uniflorus	northern bugleweed	Lamiaceae
Lycopus virginicus	Virginia water horehound	Lamiaceae
Lyonia ligustrina	maleberry	Ericaceae
Lyonia ligustrina var. *ligustrina*	maleberry	Ericaceae
Lysimachia	yellow loosestrife	Primulaceae
Lysimachia ciliata	fringed loosestrife	Primulaceae
Lysimachia nummularia	creeping jenny	Primulaceae
Lysimachia quadriflora	fourflower yellow loosestrife	Primulaceae
Lysimachia quadrifolia	whorled yellow loosestrife	Primulaceae
Lysimachia terrestris	earth loosestrife	Primulaceae
Lythrum salicaria	purple loosestrife	Lythraceae
Maclura pomifera	Osage-orange	Moraceae
Magnolia acuminata	cucumber tree	Magnoliaceae
Magnolia fraseri	mountain magnolia	Magnoliaceae
Magnolia tripetala	umbrella-tree	Magnoliaceae
Maianthemum	mayflower	Liliaceae
Maianthemum canadense	Canada mayflower	Liliaceae
Maianthemum racemosum	feathery false lily of the valley	Liliaceae
Maianthemum racemosum ssp. *racemosum*	feathery false lily of the valley	Liliaceae
Maianthemum trifolium	threeleaf false lily of the valley	Liliaceae
Malus	apple	Rosaceae
Malus angustifolia var. *angustifolia*	southern crab apple	Rosaceae
Malus baccata	Siberian crap apple	Rosaceae
Malus coronaria	sweet crab apple	Rosaceae
Malus pumila	paradise apple	Rosaceae
Matteuccia struthiopteris	ostrich fern	Dryopteridaceae
Medeola virginiana	Indian cucumber	Liliaceae
Medicago	alfalfa	Fabaceae
Medicago lupulina	black medick	Fabaceae
Medicago sativa	alfalfa	Fabaceae
Meehania cordata	Meehan's mint	Lamiaceae
Melampyrum lineare	narrowleaf cowwheat	Scrophulariaceae
Melampyrum lineare var. *latifolium*	narrowleaf cowwheat	Scrophulariaceae
Melampyrum lineare var. *lineare*	narrowleaf cowwheat	Scrophulariaceae
Melanthium latifolium	slender bunchflower	Liliaceae
Melanthium parviflorum	Appalachian bunchflower	Liliaceae
Melanthium virginicum	Virginia bunchflower	Liliaceae
Melilotus officinalis	sweetclover	Fabaceae
Menispermum canadense	common moonseed	Menispermaceae
Mentha	mint	Lamiaceae
Mentha arvensis	wild mint	Lamiaceae
Menyanthes trifoliata	buckbean	Menyanthaceae
Menziesia pilosa	minniebush	Ericaceae
Microstegium	browntop	Poaceae
Microstegium vimineum	Nepalese browntop	Poaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Milium effusum	American milletgrass	Poaceae
Mimulus alatus	sharpwing monkeyflower	Scrophulariaceae
Mimulus ringens	Allegheny monkeyflower	Scrophulariaceae
Minuartia glabra	Appalachian stitchwort	Caryophyllaceae
Minuartia groenlandica	Greenland stitchwort	Caryophyllaceae
Miscanthus sinensis	Chinese silvergrass	Poaceae
Mitchella repens	partridgeberry	Rubiaceae
Mitella diphylla	twoleaf miterwort	Saxifragaceae
Mitella nuda	naked miterwort	Saxifragaceae
Mnium	mnium calcareous moss	Mniaceae
Mnium hornum	horn calcareous moss	Mniaceae
Mollugo verticillata	green carpetweed	Molluginaceae
Monarda	beebalm	Lamiaceae
Monarda clinopodia	white bergamot	Lamiaceae
Monarda didyma	scarlet beebalm	Lamiaceae
Monarda fistulosa	wild bergamot	Lamiaceae
Moneses	single delight	Pyrolaceae
Moneses uniflora	single delight	Pyrolaceae
Monotropa hypopitys	pinesap	Monotropaceae
Monotropa uniflora	Indianpipe	Monotropaceae
Monotropsis odorata	pygmypipes	Monotropaceae
Morella pensylvanica	northern bayberry	Myricaceae
Morus alba	white mulberry	Moraceae
Morus rubra	red mulberry	Moraceae
Morus rubra var. *rubra*	red mulberry	Moraceae
Moss, unknown	unknown moss	
Muhlenbergia	muhly	Poaceae
Muhlenbergia frondosa	wirestem muhly	Poaceae
Muhlenbergia glomerata	spiked muhly	Poaceae
Muhlenbergia schreberi	nimblewill	Poaceae
Muhlenbergia sobolifera	rock muhly	Poaceae
Muhlenbergia sylvatica	woodland muhly	Poaceae
Muhlenbergia tenuiflora	slimflower muhly	Poaceae
Mycelis muralis	wall-lettuce	Asteraceae
Myosotis	forget-me-not	Boraginaceae
Myosotis scorpioides	true forget-me-not	Boraginaceae
Myosotis stricta	strict forget-me-not	Boraginaceae
Myrica gale	sweetgale	Myricaceae
Myriophyllum	watermilfoil	Haloragaceae
Narcissus	daffodil	Liliaceae
Nasturtium officinale	watercress	Brassicaceae
Nepeta cataria	catnip	Lamiaceae
Nonvascular plant, unknown	unknown nonvascular plant	
Nuphar	pond-lily	Nymphaeaceae
Nuphar lutea ssp. *advena*	yellow pond-lily	Nymphaeaceae
Nuphar lutea ssp. *rubrodisca*	yellow pond-lily	Nymphaeaceae
Nuphar lutea ssp. *variegata*	varigated yellow pond-lily	Nymphaeaceae
Nymphaea odorata	American white waterlily	Nymphaeaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Nymphoides cordata	little floatingheart	Menyanthaceae
Nyssa sylvatica	blackgum	Cornaceae
Oclemena acuminata	whorled wood aster	Asteraceae
Oclemena nemoralis	bog aster	Asteraceae
Oenothera	evening primrose	Onagraceae
Oenothera biennis	common evening primrose	Onagraceae
Oenothera fruticosa	narrowleaf evening primrose	Onagraceae
Oenothera parviflora	northern evening primrose	Onagraceae
Oligoneuron rigidum var. *rigidum*	stiff goldenrod	Asteraceae
Onoclea sensibilis	sensitive fern	Dryopteridaceae
Oplismenus hirtellus subsp. undulatifolius	basketgrass	Poaceae
Orchidaceae	Orchidaceae family	
Origanum	origanum	Lamiaceae
Orthilia secunda	sidebells wintergreen	Pyrolaceae
Oryzopsis asperifolia	roughleaf ricegrass	Poaceae
Osmorhiza	sweetroot	Apiaceae
Osmorhiza claytonii	Clayton's sweetroot	Apiaceae
Osmorhiza longistylis	longstyle sweetroot	Apiaceae
Osmunda cinnamomea	cinnamon fern	Osmundaceae
Osmunda cinnamomea var. *cinnamomea*	cinnamon fern	Osmundaceae
Osmunda claytoniana	interrupted fern	Osmundaceae
Osmunda regalis	royal fern	Osmundaceae
Osmunda regalis var. *spectabilis*	royal fern	Osmundaceae
Ostrya virginiana	hophornbeam	Betulaceae
Ostrya virginiana	hophornbeam	Betulaceae
Ostrya virginiana var. *virginiana*	hophornbeam	Betulaceae
Oxalis	woodsorrel	Oxalidaceae
Oxalis dillenii	slender yellow woodsorrel	Oxalidaceae
Oxalis grandis	great yellow woodsorrel	Oxalidaceae
Oxalis montana	mountain woodsorrel	Oxalidaceae
Oxalis stricta	common yellow oxalis	Oxalidaceae
Oxydendrum arboreum	sourwood	Ericaceae
Oxypolis rigidior	stiff cowbane	Apiaceae
Oxyria digyna	alpine mountainsorrel	Polygonaceae
Packera	ragwort	Asteraceae
Packera anonyma	Small's ragwort	Asteraceae
Packera antennariifolia	shale barren ragwort	Asteraceae
Packera aurea	golden ragwort	Asteraceae
Packera obovata	roundleaf ragwort	Asteraceae
Packera paupercula	balsam groundsel	Asteraceae
Packera schweinitziana	Schweinitz's ragwort	Asteraceae
Panax quinquefolius	American ginseng	Araliaceae
Panax trifolius	dwarf ginseng	Araliaceae
Panicum	panicgrass	Poaceae
Panicum anceps	beaked panicgrass	Poaceae
Panicum capillare	witchgrass	Poaceae
Panicum philadelphicum	Philadelphia panicgrass	Poaceae
Panicum virgatum	switchgrass	Poaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Paraleucobryum	paraleucobryum moss	Dicranaceae
Parietaria pensylvanica	Pennsylvania pellitory	Urticaceae
Parmelia	shield lichen	Parmeliaceae
Parnassia asarifolia	kidneyleaf grass of Parnassus	Saxifragaceae
Parnassia glauca	fen grass of Parnassus	Saxifragaceae
Paronychia	nailwort	Caryophyllaceae
Paronychia argyrocoma	silvery nailwort	Caryophyllaceae
Paronychia canadensis	smooth forked nailwort	Caryophyllaceae
Paronychia fastigiata	hairy forked nailwort	Caryophyllaceae
Paronychia montana	mountain nailwort	Caryophyllaceae
Parthenium integrifolium	wild quinine	Asteraceae
Parthenium integrifolium var. *integrifolium*	wild quinine	Asteraceae
Parthenocissus quinquefolia	Virginia creeper	Vitaceae
Parthenocissus vitacea	woodbine	Vitaceae
Paspalum setaceum	thin paspalum	Poaceae
Passiflora incarnata	purple passionflower	Passifloraceae
Passiflora lutea	yellow passionflower	Passifloraceae
Pastinaca sativa	wild parsnip	Apiaceae
Patis racemosa	blackseed ricegrass	Poaceae
Paulownia tomentosa	princesstree	Scrophulariaceae
Pedicularis	lousewort	Scrophulariaceae
Pedicularis canadensis	Canadian lousewort	Scrophulariaceae
Pellaea atropurpurea	purple cliffbrake	Pteridaceae
Peltandra virginica	green arrow arum	Araceae
Pennisetum glaucum	pearl millet	Poaceae
Penstemon	beardtongue	Scrophulariaceae
Penstemon canescens	eastern gray beardtongue	Scrophulariaceae
Penstemon digitalis	foxglove beardtongue	Scrophulariaceae
Penstemon laevigatus	eastern smooth beardtongue	Scrophulariaceae
Penthorum sedoides	ditch stonecrop	Crassulaceae
Petasites frigidus	arctic sweet coltsfoot	Asteraceae
Phacelia	phacelia	Hydrophyllaceae
Phacelia bipinnatifida	fernleaf phacelia	Hydrophyllaceae
Phacelia dubia var. *dubia*	smallflower phacelia	Hydrophyllaceae
Phacelia fimbriata	fringed phacelia	Hydrophyllaceae
Phalaris arundinacea	reed canarygrass	Poaceae
Phegopteris connectilis	long beechfern	Thelypteridaceae
Phegopteris hexagonoptera	broad beechfern	Thelypteridaceae
Phemeranthus teretifolius	quill fameflower	Portulacaceae
Philadelphus hirsutus	streambank mock orange	Hydrangeaceae
Phleum alpinum	alpine timothy	Poaceae
Phleum pratense	timothy	Poaceae
Phlox	phlox	Polemoniaceae
Phlox carolina	thickleaf phlox	Polemoniaceae
Phlox carolina ssp. *carolina*	thickleaf phlox	Polemoniaceae
Phlox divaricata	wild blue phlox	Polemoniaceae
Phlox maculata ssp. *pyramidalis*	wild sweetwilliam	Polemoniaceae
Phlox subulata	moss phlox	Polemoniaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Photinia	chokeberry	Rosaceae
Photinia floribunda	purple chokeberry	Rosaceae
Photinia melanocarpa	black chokeberry	Rosaceae
Photinia pyrifolia	red chokeberry	Rosaceae
Phragmites australis	common reed	Poaceae
Phryma leptostachya	American lopseed	Verbenaceae
Phyla lanceolata	lanceleaf fogfruit	Verbenaceae
Phyllodoce caerulea	blue mountainheath	Ericaceae
Physalis	groundcherry	Solanaceae
Physalis heterophylla	clammy groundcherry	Solanaceae
Physalis longifolia var. *subglabrata*	longleaf groundcherry	Solanaceae
Physalis virginiana var. *virginiana*	Virginia groundcherry	Solanaceae
Physcia millegrana	rosette lichen	Physciaceae
Physocarpus	ninebark	Rosaceae
Physocarpus opulifolius	common ninebark	Rosaceae
Physocarpus opulifolius var. *opulifolius*	common ninebark	Rosaceae
Phytolacca americana	American pokeweed	Phytolaccaceae
Phytolacca americana var. *americana*	American pokeweed	Phytolaccaceae
Picea abies	Norway spruce	Pinaceae
Picea glauca	white spruce	Pinaceae
Picea mariana	black spruce	Pinaceae
Picea rubens	red spruce	Pinaceae
Pieris floribunda	mountain fetterbush	Ericaceae
Pilea	clearweed	Urticaceae
Pilea pumila	Canadian clearweed	Urticaceae
Pilea pumila var. *pumila*	Canadian clearweed	Urticaceae
Pinus	pine	Pinaceae
Pinus banksiana	jack pine	Pinaceae
Pinus echinata	shortleaf pine	Pinaceae
Pinus pungens	Table Mountain pine	Pinaceae
Pinus resinosa	red pine	Pinaceae
Pinus rigida	pitch pine	Pinaceae
Pinus strobus	eastern white pine	Pinaceae
Pinus sylvestris	Scots pine	Pinaceae
Pinus virginiana	Virginia pine	Pinaceae
Piptatherum racemosum	blackseed ricegrass	Poaceae
Piptochaetium avenaceum	blackseed speargrass	Poaceae
Pityopsis graminifolia var. *latifolia*	narrowleaf silkgrass	Asteraceae
Plantago	plantain	Plantaginaceae
Plantago lanceolata	narrowleaf plantain	Plantaginaceae
Plantago major	common plantain	Plantaginaceae
Plantago rugelii	blackseed plantain	Plantaginaceae
Plantago virginica	Virginia plantain	Plantaginaceae
Platanthera	fringed orchid	Orchidaceae
Platanthera ciliaris	yellow fringed orchid	Orchidaceae
Platanthera clavellata	small green wood orchid	Orchidaceae
Platanthera dilatata	scentbottle	Orchidaceae
Platanthera flava	palegreen orchid	Orchidaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Platanthera grandiflora	greater purple fringed orchid	Orchidaceae
Platanthera hyperborea	northern green orchid	Orchidaceae
Platanthera lacera	green fringed orchid	Orchidaceae
Platanthera orbiculata	lesser roundleaved orchid	Orchidaceae
Platanthera psycodes	lesser purple fringed orchid	Orchidaceae
Platanus occidentalis	American sycamore	Platanaceae
Pleopeltis polypodioides	resurrection fern	Polypodiaceae
Pleopeltis polypodioides ssp. *michauxiana*	resurrection fern	Polypodiaceae
Pleurozium schreberi	Schreber's big red stem moss	Hylocomiaceae
Poa	Poa	Poaceae
Poa alsodes	grove bluegrass	Poaceae
Poa annua	annual bluegrass	Poaceae
Poa autumnalis	autumn bluegrass	Poaceae
Poa compressa	Canada bluegrass	Poaceae
Poa cuspidata	early bluegrass	Poaceae
Poa nemoralis	wood bluegrass	Poaceae
Poa palustris	fowl bluegrass	Poaceae
Poa pratensis	Kentucky bluegrass	Poaceae
Poa saltuensis	oldpasture bluegrass	Poaceae
Poa sylvestris	woodland bluegrass	Poaceae
Poa trivialis	rough bluegrass	Poaceae
Poaceae	poaceae family	Poaceae
Poaceae - long-fruited	unknown grass second species	Poaceae
Podophyllum peltatum	mayapple	Berberidaceae
Pogonia ophioglossoides	snakemouth orchid	Orchidaceae
Polygala curtissii	Curtiss' milkwort	Polygalaceae
Polygala paucifolia	gaywings	Polygalaceae
Polygala sanguinea	purple milkwort	Polygalaceae
Polygala senega	Seneca snakeroot	Polygalaceae
Polygonatum	Solomon's seal	Liliaceae
Polygonatum biflorum	smooth Solomon's seal	Liliaceae
Polygonatum biflorum var. *commutatum*	smooth Solomon's seal	Liliaceae
Polygonatum pubescens	hairy Solomon's seal	Liliaceae
Polygonum	knotweed	Polygonaceae
Polygonum amphibium	water knotweed	Polygonaceae
Polygonum arifolium	halberdleaf tearthumb	Polygonaceae
Polygonum careyi	Carey's smartweed	Polygonaceae
Polygonum cespitosum	Oriental lady's thumb	Polygonaceae
Polygonum cespitosum var. *longisetum*	Oriental lady's thumb	Polygonaceae
Polygonum cilinode	fringed black bindweed	Polygonaceae
Polygonum cuspidatum	Japanese knotweed	Polygonaceae
Polygonum hydropiper	marshpepper knotweed	Polygonaceae
Polygonum hydropiperoides	swamp smartweed	Polygonaceae
Polygonum lapathifolium	curlytop knotweed	Polygonaceae
Polygonum pensylvanicum	Pennsylvania smartweed	Polygonaceae
Polygonum perfoliatum	Asiatic tearthumb	Polygonaceae
Polygonum persicaria	spotted ladysthumb	Polygonaceae
Polygonum punctatum	dotted smartweed	Polygonaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Polygonum sagittatum	arrowleaf tearthumb	Polygonaceae
Polygonum scandens	climbing false buckwheat	Polygonaceae
Polygonum scandens var. *cristatum*	climbing false buckwheat	Polygonaceae
Polygonum scandens var. *scandens*	climbing false buckwheat	Polygonaceae
Polygonum tenue	pleatleaf knotweed	Polygonaceae
Polygonum virginianum	jumpseed	Polygonaceae
Polygonum viviparum	alpine bistort	Polygonaceae
Polymnia canadensis	whiteflower leafcup	Asteraceae
Polypodium	polypody	Polypodiaceae
Polypodium appalachianum	Appalachian polypody	Polypodiaceae
Polypodium virginianum	rock polypody	Polypodiaceae
Polystichum acrostichoides	Christmas fern	Dryopteridaceae
Polystichum acrostichoides var. *acrostichoides*	Christmas fern	Dryopteridaceae
Polystichum braunii	Braun's hollyfern	Dryopteridaceae
Polytrichum	polytrichum moss	Polytrichaceae
Polytrichum commune	polytrichum moss	Polytrichaceae
Polytrichum juniperinum	juniper polytrichum moss	Polytrichaceae
Polytrichum ohioense	Ohio polytrichum moss	Polytrichaceae
Polytrichum pallidisetum	polytrichum moss	Polytrichaceae
Polytrichum strictum	polytrichum moss	Polytrichaceae
Pontederia cordata	pickerelweed	Pontederiaceae
Populus alba	white poplar	Salicaceae
Populus balsamifera	balsam poplar	Salicaceae
Populus balsamifera ssp. *balsamifera*	balsam poplar	Salicaceae
Populus deltoides	eastern cottonwood	Salicaceae
Populus deltoides ssp. *deltoides*	eastern cottonwood	Salicaceae
Populus grandidentata	bigtooth aspen	Salicaceae
Populus heterophylla	swamp cottonwood	Salicaceae
Populus tremuloides	quaking aspen	Salicaceae
Porteranthus stipulatus	American ipecac	Rosaceae
Porteranthus trifoliatus	Bowman's root	Rosaceae
Portulaca grandiflora	rose moss	Portulacaceae
Portulaca oleracea	little hogweed	Portulacaceae
Potamogeton	pondweed	Potamogetonaceae
Potamogeton epihydrus	ribbonleaf pondweed	Potamogetonaceae
Potamogeton natans	floating pondweed	Potamogetonaceae
Potentilla	cinquefoil	Rosaceae
Potentilla canadensis	dwarf cinquefoil	Rosaceae
Potentilla canadensis var. *canadensis*	dwarf cinquefoil	Rosaceae
Potentilla norvegica	Norwegian cinquefoil	Rosaceae
Potentilla recta	sulphur cinquefoil	Rosaceae
Potentilla simplex	common cinquefoil	Rosaceae
Prenanthes	rattlesnakeroot	Asteraceae
Prenanthes alba	white rattlesnakeroot	Asteraceae
Prenanthes altissima	tall rattlesnakeroot	Asteraceae
Prenanthes boottii	alpine rattlesnakeroot	Asteraceae
Prenanthes nana	dwarf rattlesnakeroot	Asteraceae
Prenanthes roanensis	Roan Mountain rattlesnakeroot	Asteraceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Prenanthes serpentaria	cankerweed	Asteraceae
Prenanthes trifoliolata	gall of the earth	Asteraceae
Prosartes lanuginosa	yellow fairybells	Liliaceae
Prunella vulgaris	common selfheal	Lamiaceae
Prunella vulgaris ssp. *lanceolata*	lance selfheal	Lamiaceae
Prunus	plum	Rosaceae
Prunus alleghaniensis	Allegheny plum	Rosaceae
Prunus angustifolia	Chickasaw plum	Rosaceae
Prunus avium	sweet cherry	Rosaceae
Prunus pensylvanica	pin cherry	Rosaceae
Prunus serotina	black cherry	Rosaceae
Prunus serotina var. *serotina*	black cherry	Rosaceae
Prunus susquehanae	Sesquehana sandcherry	Rosaceae
Prunus virginiana	chokecherry	Rosaceae
Prunus virginiana var. *virginiana*	chokecherry	Rosaceae
Pseudognaphalium	cudweed	Asteraceae
Pseudognaphalium obtusifolium ssp. *obtusifolium*	rabbit-tobacco	Asteraceae
Ptelea	hoptree	Rutaceae
Ptelea trifoliata	common hoptree	Rutaceae
Pteridium aquilinum	western brackenfern	Dennstaedtiaceae
Pteridium aquilinum var. *latiusculum*	western brackenfern	Dennstaedtiaceae
Pteridium aquilinum var. *pseudocaudatum*	western brackenfern	Dennstaedtiaceae
Ptilidium ciliare		Pteilidiaceae
Ptilidium pulcherrimum		Ptilidiaceae
Pueraria montana	kudz	Fabaceae
Pueraria montana var. *lobata*	kudzu	Fabaceae
Pycnanthemum	mountainmint	Lamiaceae
Pycnanthemum clinopodioides	basil mountainmint	Lamiaceae
Pycnanthemum incanum	hoary mountainmint	Lamiaceae
Pycnanthemum montanum	thinleaf mountainmint	Lamiaceae
Pycnanthemum muticum	clustered mountainmint	Lamiaceae
Pycnanthemum virginianum	Virginia mountainmint	Lamiaceae
Pyrola	wintergreen	Pyrolaceae
Pyrola americana	American wintergreen	Pyrolaceae
Pyrola elliptica	waxflower shinleaf	Pyrolaceae
Pyrularia pubera	buffalo nut	Santalaceae
Quercus	oak	Fagaceae
Quercus acutissima	sawtooth oak	Fagaceae
Quercus alba	white oak	Fagaceae
Quercus bicolor	swamp white oak	Fagaceae
Quercus coccinea	scarlet oak	Fagaceae
Quercus coccinea var. *coccinea*	scarlet oak	Fagaceae
Quercus falcata	southern red oak	Fagaceae
Quercus ilicifolia	bear oak	Fagaceae
Quercus marilandica	blackjack oak	Fagaceae
Quercus michauxii	swamp chestnut oak	Fagaceae
Quercus montana	chestnut oak	Fagaceae
Quercus muehlenbergii	chinquapin oak	Fagaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Quercus palustris	pin oak	Fagaceae
Quercus prinoides	dwarf chinquapin oak	Fagaceae
Quercus prinus	swamp chestnut oak	Fagaceae
Quercus rubra	northern red oak	Fagaceae
Quercus stellata	post oak	Fagaceae
Quercus velutina	black oak	Fagaceae
Racomitrium lanuginosum	racomitrium moss	Grimmiaceae
Ranunculus	buttercup	Ranunculaceae
Ranunculus abortivus	littleleaf buttercup	Ranunculaceae
Ranunculus acris	tall buttercup	Ranunculaceae
Ranunculus allegheniensis	Allegheny Mountain buttercup	Ranunculaceae
Ranunculus bulbosus	St. Anthony's turnip	Ranunculaceae
Ranunculus hispidus	bristly buttercup	Ranunculaceae
Ranunculus hispidus var. *caricetorum*	bristly buttercup	Ranunculaceae
Ranunculus hispidus var. *hispidus*	bristly buttercup	Ranunculaceae
Ranunculus hispidus var. *nitidus*	bristly buttercup	Ranunculaceae
Ranunculus pensylvanicus	Pennsylvania buttercup	Ranunculaceae
Ranunculus recurvatus	blisterwort	Ranunculaceae
Ranunculus sardous	hairy buttercup	Ranunculaceae
Rhamnus	buckthorn	Rhamnaceae
Rhamnus alnifolia	alderleaf buckthorn	Rhamnaceae
Rhamnus cathartica	common buckthorn	Rhamnaceae
Rhododendron	rhododendron	Ericaceae
Rhododendron arborescens	smooth azalea	Ericaceae
Rhododendron calendulaceum	flame azalea	Ericaceae
Rhododendron canadense	rhodora	Ericaceae
Rhododendron carolinianum	Carolina azalea	Ericaceae
Rhododendron catawbiense	Catawba rosebay	Ericaceae
Rhododendron cumberlandense	Cumberland rhododendron	Ericaceae
Rhododendron lapponicum	lapland rosebay	Ericaceae
Rhododendron maximum	great laurel	Ericaceae
Rhododendron minus	piedmont rhododendron	Ericaceae
Rhododendron periclymenoides	pink azalea	Ericaceae
Rhododendron prinophyllum	early azalea	Ericaceae
Rhododendron viscosum	swamp azalea	Ericaceae
Rhodotypos scandens	jetbead	Rosaceae
Rhus aromatica	fragrant sumac	Anacardiaceae
Rhus aromatica var. *aromatica*	fragrant sumac	Anacardiaceae
Rhus copallinum	winged sumac	Anacardiaceae
Rhus copallinum var. *latifolia*	winged sumac	Anacardiaceae
Rhus glabra	smooth sumac	Anacardiaceae
Rhus typhina	staghorn sumac	Anacardiaceae
Rhynchospora alba	white beaksedge	Cyperaceae
Rhynchospora capitellata	brownish beaksedge	Cyperaceae
Rhynchospora recognita	globe beaksedge	Cyperaceae
Rhytidiadelphus triquetrus	rough goose neck moss	Hylocomiaceae
Ribes	currant	Grossulariaceae
Ribes americanum	American black currant	Grossulariaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Ribes cynosbati	eastern prickly gooseberry	Grossulariaceae
Ribes glandulosum	skunk currant	Grossulariaceae
Ribes hirtellum	hairystem gooseberry	Grossulariaceae
Ribes lacustre	prickly currant	Grossulariaceae
Ribes rotundifolium	Appalachian gooseberry	Grossulariaceae
Ribes triste	red currant	Grossulariaceae
Riccia	riccia	Ricciaceae
Robinia	locust	Fabaceae
Robinia hispida	bristly locust	Fabaceae
Robinia pseudoacacia	black locust	Fabaceae
Rorippa	yellowcress	Brassicaceae
Rorippa palustris	bog yellowcress	Brassicaceae
Rorippa palustris ssp. *fernaldiana*	Fernald's yellowcress	Brassicaceae
Rorippa sylvestris	creeping yellowcress	Brassicaceae
Rosa	rose	Rosaceae
Rosa blanda	smooth rose	Rosaceae
Rosa carolina	Carolina rose	Rosaceae
Rosa carolina var. *carolina*	Carolina rose	Rosaceae
Rosa multiflora	multiflora rose	Rosaceae
Rosa nitida	shining rose	Rosaceae
Rosa palustris	swamp rose	Rosaceae
Rotala ramosior	lowland rotala	Lythraceae
Rubus	blackberry	Rosaceae
Rubus allegheniensis	Allegheny blackberry	Rosaceae
Rubus allegheniensis var. *allegheniensis*	Allegheny blackberry	Rosaceae
Rubus argutus	sawtooth blackberry	Rosaceae
Rubus canadensis	smooth blackberry	Rosaceae
Rubus chamaemorus	cloudberry	Rosaceae
Rubus flagellaris	northern dewberry	Rosaceae
Rubus hispidus	bristly dewberry	Rosaceae
Rubus idaeus	American red raspberry	Rosaceae
Rubus idaeus ssp. *strigosus*	grayleaf red raspberry	Rosaceae
Rubus occidentalis	black raspberry	Rosaceae
Rubus odoratus	purpleflowering raspberry	Rosaceae
Rubus odoratus var. *odoratus*	purpleflowering raspberry	Rosaceae
Rubus pensilvanicus	Pennsylvania blackberry	Rosaceae
Rubus pergratus	upland blackberry	Rosaceae
Rubus phoenicolasius	wine raspberry	Rosaceae
Rubus pubescens	dwarf red blackberry	Rosaceae
Rubus setosus	setose blackberry	Rosaceae
Rubus trivialis	southern dewberry	Rosaceae
Rudbeckia hirta	blackeyed Susan	Asteraceae
Rudbeckia laciniata	cutleaf coneflower	Asteraceae
Rudbeckia triloba	browneyed Susan	Asteraceae
Ruellia caroliniensis	Carolina wild petunia	Acanthaceae
Rugelia nudicaulis	Rugel's Indianplantain	Asteraceae
Rumex	dock	Polygonaceae
Rumex acetosella	common sheep sorrel	Polygonaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Rumex crispus	curly dock	Polygonaceae
Rumex hastatulus	heartwing sorrel	Polygonaceae
Rumex obtusifolius	bitter dock	Polygonaceae
Rumex orbiculatus	greater water dock	Polygonaceae
Sagittaria latifolia	broadleaf arrowhead	Alismataceae
Salix	willow	Salicaceae
Salix argyrocarpa	Labrador willow	Salicaceae
Salix bebbiana	Bebb willow	Salicaceae
Salix candida	sageleaf willow	Salicaceae
Salix caroliniana	coastal plain willow	Salicaceae
Salix discolor	pussy willow	Salicaceae
Salix eriocephala	Missouri River willow	Salicaceae
Salix fragilis	crack willow	Salicaceae
Salix herbacea	snowbed willow	Salicaceae
Salix humilis	prairie willow	Salicaceae
Salix lucida	shining willow	Salicaceae
Salix nigra	black willow	Salicaceae
Salix pedicellaris	bog willow	Salicaceae
Salix pellita	satiny willow	Salicaceae
Salix petiolaris	meadow willow	Salicaceae
Salix planifolia	diamondleaf willow	Salicaceae
Salix pyrifolia	balsam willow	Salicaceae
Salix sericea	silky willow	Salicaceae
Salix uva-ursi	bearberry willow	Salicaceae
Salix viminalis	basket willow	Salicaceae
Salvia lyrata	lyreleaf sage	Lamiaceae
Salvia urticifolia	nettleleaf sage	Lamiaceae
Sambucus nigra	black elderberry	Caprifoliaceae
Sambucus nigra ssp. *canadensis*	American black elderberry	Caprifoliaceae
Sambucus racemosa	red elderberry	Caprifoliaceae
Sambucus racemosa var. *racemosa*	red elderberry	Caprifoliaceae
Samolus valerandi ssp. *parviflorus*	seaside brookweed	Primulaceae
Sanguinaria canadensis	bloodroot	Papaveraceae
Sanicula	sanicle	Apiaceae
Sanicula canadensis	Canadian blacksnakeroot	Apiaceae
Sanicula canadensis var. *canadensis*	Canadian blacksnakeroot	Apiaceae
Sanicula marilandica	Maryland sanicle	Apiaceae
Sanicula odorata	clustered blacksnakeroot	Apiaceae
Sanicula trifoliata	largefruit blacksnakeroot	Apiaceae
Saponaria officinalis	bouncingbet	Caryophyllaceae
Sarracenia purpurea	purple pitcherplant	Sarraceniaceae
Sassafras albidum	sassafras	Lauraceae
Saururus cernuus	lizard's tail	Saururaceae
Saxifraga michauxii	Michaux's saxifrage	Saxifragaceae
Saxifraga micranthidifolia	lettuceleaf saxifrage	Saxifragaceae
Saxifraga occidentalis	Alberta saxifrage	Saxifragaceae
Saxifraga pensylvanica	eastern swamp saxifrage	Saxifragaceae
Saxifraga virginiensis	early saxifrage	Saxifragaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Schedonorus arundinaceus	tall fescue	Poaceae
Schedonorus pratensis	meadow fescue	Poaceae
Scheuchzeria palustris	rannoch-rush	Scheuchzeriaceae
Schistidium apocarpum	schistidium moss	Grimmiaceae
Schizachne purpurascens	false melic	Poaceae
Schizachyrium scoparium	little bluestem	Poaceae
Schoenoplectus americanus	chairmaker's bulrush	Cyperaceae
Schoenoplectus subterminalis	swaying bulrush	Cyperaceae
Schoenoplectus tabernaemontani	softstem bulrush	Cyperaceae
Scirpus	bulrush	Cyperaceae
Scirpus atrocinctus	blackgirdle bulrush	Cyperaceae
Scirpus atrovirens	green bulrush	Cyperaceae
Scirpus cyperinus	woolgrass	Cyperaceae
Scirpus expansus	woodland bulrush	Cyperaceae
Scirpus hattorianus	mosquito bulrush	Cyperaceae
Scirpus microcarpus	panicled bulrush	Cyperaceae
Scirpus pedicellatus	stalked bulrush	Cyperaceae
Scirpus polyphyllus	leafy bulrush	Cyperaceae
Scleria triglomerata	whip nutrush	Cyperaceae
Scrophularia lanceolata	lanceleaf figwort	Scrophulariaceae
Scrophularia marilandica	carpenter's square	Scrophulariaceae
Scutellaria	skullcap	Lamiaceae
Scutellaria elliptica	hairy skullcap	Lamiaceae
Scutellaria elliptica var. *elliptica*	hairy skullcap	Lamiaceae
Scutellaria elliptica var. *hirsuta*	hairy skullcap	Lamiaceae
Scutellaria galericulata	marsh skullcap	Lamiaceae
Scutellaria incana	hoary skullcap	Lamiaceae
Scutellaria integrifolia	helmet flower	Lamiaceae
Scutellaria lateriflora	blue skullcap	Lamiaceae
Scutellaria ovata	heartleaf skullcap	Lamiaceae
Scutellaria saxatilis	smooth rock skullcap	Lamiaceae
Scutellaria serrata	showy skullcap	Lamiaceae
Securigera varia	crownvetch	Fabaceae
Sedum glaucophyllum	cliff stonecrop	Crassulaceae
Sedum ternatum	woodland stonecrop	Crassulaceae
Selaginella apoda	meadow spikemoss	Selaginellaceae
Selaginella rupestris	northern selaginella	Selaginellaceae
Senecio	ragwort	Asteraceae
Senna hebecarpa	American senna	Fabaceae
Sericocarpus asteroides	toothed whitetop aster	Asteraceae
Sericocarpus linifolius	narrowleaf whitetop aster	Asteraceae
Setaria	bristlegrass	Poaceae
Setaria faberi	Japanese bristlegrass	Poaceae
Setaria parviflora	marsh bristlegrass	Poaceae
Setaria pumila	yellow foxtail	Poaceae
Setaria viridis	green bristlegrass	Poaceae
Sibbaldiopsis tridentata	shrubby fivefingers	Rosaceae
Sida spinosa	prickly fanpetals	Malvaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Silene antirrhina	sleepy silene	Caryophyllaceae
Silene caroliniana ssp. *pensylvanica*	Pennsylvania catchfly	Caryophyllaceae
Silene latifolia ssp. *alba*	bladder campion	Caryophyllaceae
Silene noctiflora	nightflowering silene	Caryophyllaceae
Silene stellata	widowsfrill	Caryophyllaceae
Silene virginica	fire pink	Caryophyllaceae
Silene virginica var. *virginica*	fire pink	Caryophyllaceae
Silene vulgaris	maidenstears	Caryophyllaceae
Silphium compositum	kidneyleaf rosinweed	Asteraceae
Silphium trifoliatum	whorled rosinweed	Asteraceae
Silphium trifoliatum var. *trifoliatum*	whorled rosinweed	Asteraceae
Sisyrinchium angustifolium	narrowleaf blue-eyed grass	Iridaceae
Sisyrinchium mucronatum	needletip blue-eyed grass	Iridaceae
Sium suave	hemlock waterparsnip	Apiaceae
Smallanthus uvedalius	hairy leafcup	Asteraceae
Smilax	greenbrier	Smilacaceae
Smilax biltmoreana	Biltmore's carrionflower	Smilacaceae
Smilax bona-nox	saw greenbrier	Smilacaceae
Smilax glauca	cat greenbrier	Smilacaceae
Smilax herbacea	smooth carrionflower	Smilacaceae
Smilax hugeri	Huger's carrionflower	Smilacaceae
Smilax pulverulenta	downy carrionflower	Smilacaceae
Smilax rotundifolia	roundleaf greenbrier	Smilacaceae
Smilax tamnoides	bristly greenbrier	Smilacaceae
Solanum americanum	American black nightshade	Solanaceae
Solanum carolinense	Carolina horsenettle	Solanaceae
Solanum dulcamara	climbing nightshade	Solanaceae
Solanum nigrum	black nightshade	Solanaceae
Solanum ptychanthum	West Indian nightshade	Solanaceae
Solidago	goldenrod	Asteraceae
Solidago altissima	Canada goldenrod	Asteraceae
Solidago arguta	Atlantic goldenrod	Asteraceae
Solidago arguta var. *arguta*	Atlantic goldenrod	Asteraceae
Solidago arguta var. *caroliniana*	Atlantic goldenrod	Asteraceae
Solidago bicolor	white goldenrod	Asteraceae
Solidago caesia	wreath goldenrod	Asteraceae
Solidago canadensis	Canada goldenrod	Asteraceae
Solidago canadensis var. *canadensis*	Canada goldenrod	Asteraceae
Solidago curtisii	mountain decumbent goldenrod	Asteraceae
Solidago cutleri	Cutler's alpine goldenrod	Asteraceae
Solidago erecta	showy goldenrod	Asteraceae
Solidago flexicaulis	zigzag goldenrod	Asteraceae
Solidago gigantea	giant goldenrod	Asteraceae
Solidago glomerata	clustered goldenrod	Asteraceae
Solidago hispida	hairy goldenrod	Asteraceae
Solidago juncea	early goldenrod	Asteraceae
Solidago macrophylla	largeleaf goldenrod	Asteraceae
Solidago nemoralis	gray goldenrod	Asteraceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Solidago odora	anisescented goldenrod	Asteraceae
Solidago odora var. *odora*	anisescented goldenrod	Asteraceae
Solidago patula	roundleaf goldenrod	Asteraceae
Solidago pinetorum	Small's goldenrod	Asteraceae
Solidago puberula	downy goldenrod	Asteraceae
Solidago roanensis	Roan Mountain goldenrod	Asteraceae
Solidago rugosa	wrinkleleaf goldenrod	Asteraceae
Solidago rugosa ssp. *aspera*	wrinkleleaf goldenrod	Asteraceae
Solidago simplex	Mt. Albert goldenrod	Asteraceae
Solidago simplex ssp. *randii*	Rand's goldenrod	Asteraceae
Solidago simplex ssp. *randii* var. *randii*	Rand's goldenrod	Asteraceae
Solidago speciosa var. *speciosa*	showy goldenrod	Asteraceae
Solidago squarrosa	stout goldenrod	Asteraceae
Solidago uliginosa	bog goldenrod	Asteraceae
Solidago uliginosa var. *linoides*	bog goldenrod	Asteraceae
Solidago ulmifolia	elmleaf goldenrod	Asteraceae
Solidago ulmifolia var. *ulmifolia*	elmleaf goldenrod	Asteraceae
Sorbus	mountain ash	Rosaceae
Sorbus americana	American mountain ash	Rosaceae
Sorbus decora	northern mountain ash	Rosaceae
Sorghastrum nutans	Indiangrass	Poaceae
Sparganium	bur-reed	Sparganiaceace
Sparganium americanum	American bur-reed	Sparganiaceae
Sparganium androcladum	branched bur-reed	Sparganiaceae
Sparganium angustifolium	narrowleaf bur-reed	Sparganiaceae
Sparganium emersum	European bur-reed	Sparganiaceae
Sparganium eurycarpum	broadfruit bur-reed	Sparganiaceae
Sparganium fluctuans	floating bur-reed	Sparganiaceae
Sphagnum	sphagnum	Sphagnaceae
Sphagnum capillifolium	sphagnum	Sphagnaceae
Sphagnum centrale	sphagnum	Sphagnaceae
Sphagnum compactum	low sphagnum	Sphagnaceae
Sphagnum contortum	contorted sphagnum	Sphagnaceae
Sphagnum fuscum	sphagnum	Sphagnaceae
Sphagnum girgensohnii	Girgensohn's sphagnum	Sphagnaceae
Sphagnum magellanicum	Magellan's sphagnum	Sphagnaceae
Sphagnum palustre	prairie sphagnum	Sphagnaceae
Sphagnum russowii	Russow's sphagnum	Sphagnaceae
Sphagnum squarrosum	sphagnum	Sphagnaceae
Sphenopholis intermedia	slender wedgescale	Poaceae
Sphenopholis nitida	shiny wedgescale	Poaceae
Sphenopholis pensylvanica	swamp wedgescale	Poaceae
Spigelia marilandica	woodland pinkroot	Loganiaceae
Spiraea	spirea	Rosaceae
Spiraea alba	white meadowsweet	Rosaceae
Spiraea alba var. *latifolia*	white meadowsweet	Rosaceae
Spiraea betulifolia	white spirea	Rosaceae
Spiraea betulifolia var. *corymbosa*	shinyleaf meadowsweet	Rosaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Spiraea tomentosa	steeplebush	Rosaceae
Spiranthes	lady's tresses	Orchidaceae
Sporobolus	dropseed	Poaceae
Sporobolus vaginiflorus	poverty dropseed	Poaceae
Stachys	hedgenettle	Lamiaceae
Stachys clingmanii	Clingman's hedgenettle	Lamiaceae
Stachys latidens	broadtooth hedgenettle	Lamiaceae
Stachys nuttallii	heartleaf hedgenettle	Lamiaceae
Stachys tenuifolia	smooth hedgenettle	Lamiaceae
Staphylea trifolia	American bladdernut	Staphyleaceae
Stellaria alsine	bog chickweed	Caryophyllaceae
Stellaria borealis	boreal starwort	Caryophyllaceae
Stellaria corei	Tennessee starwort	Caryophyllaceae
Stellaria graminea	grass-like starwort	Caryophyllaceae
Stellaria longifolia	longleaf starwort	Caryophyllaceae
Stellaria media	common chickweed	Caryophyllaceae
Stellaria media ssp. *media*	common chickweed	Caryophyllaceae
Stellaria pubera	star chickweed	Caryophyllaceae
Stenanthium gramineum	eastern featherbells	Liliaceae
Stenanthium gramineum var. *micranthum*	eastern featherbells	Liliaceae
Stereocaulon saxatile	snow lichen	Stereocaulaceae
Streptopus amplexifolius	claspleaf twistedstalk	Liliaceae
Streptopus lanceolatus	twistedstalk	Liliaceae
Streptopus lanceolatus var. *lanceolatus*	twistedstalk	Liliaceae
Streptopus lanceolatus var. *roseus*	twistedstalk	Liliaceae
Stuckenia filiformis	fineleaf pondweed	Potamogetonaceae
Symphoricarpos	snowberry	Caprifoliaceae
Symphoricarpos albus	common snowberry	Caprifoliaceae
Symphoricarpos orbiculatus	coralberry	Caprifoliaceae
Symphyotrichum	aster	Asteraceae
Symphyotrichum cordifolium	common blue wood aster	Asteraceae
Symphyotrichum divaricatum	southern annual saltmarsh aster	Asteraceae
Symphyotrichum dumosum	rice button aster	Asteraceae
Symphyotrichum laeve var. *concinnum*	smooth blue aster	Asteraceae
Symphyotrichum laeve var. *laeve*	smooth blue aster	Asteraceae
Symphyotrichum lanceolatum	white panicle aster	Asteraceae
Symphyotrichum lanceolatum ssp. *lanceolatum*	white panicle aster	Asteraceae
Symphyotrichum lateriflorum	calico aster	Asteraceae
Symphyotrichum lateriflorum var. *lateriflorum*	calico aster	Asteraceae
Symphyotrichum lowrieanum	Lowrie's blue wood aster	Asteraceae
Symphyotrichum novae-angliae	New England aster	Asteraceae
Symphyotrichum novi-belgii	New York aster	Asteraceae
Symphyotrichum oblongifolium	aromatic aster	Asteraceae
Symphyotrichum patens var. *patens*	late purple aster	Asteraceae
Symphyotrichum phlogifolium	thinleaf late purple aster	Asteraceae
Symphyotrichum pilosum	hairy white oldfield aster	Asteraceae
Symphyotrichum prenanthoides	crookedstem aster	Asteraceae
Symphyotrichum puniceum	purplestem aster	Asteraceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Symphyotrichum puniceum var. *puniceum*	purplestem aster	Asteraceae
Symphyotrichum racemosum	smooth white oldfield aster	Asteraceae
Symphyotrichum retroflexum	rigid whitetop aster	Asteraceae
Symphyotrichum undulatum	wavyleaf aster	Asteraceae
Symphyotrichum urophyllum	white arrowleaf aster	Asteraceae
Symphytum	comfrey	Boraginaceae
Symplocarpus foetidus	skunk cabbage	Araceae
Symplocos tinctoria	common sweetleaf	Symplocaceae
Taenidia integerrima	yellow pimpernel	Apiaceae
Taenidia montana	mountain pimpernel	Apiaceae
Talinum teretifolium	quil fameflower	Portulacaceae
Taraxacum officinale	common dandelion	Asteraceae
Taxus canadensis	Canada yew	Taxaceae
Tephrosia virginiana	Virginia tephrosia	Fabaceae
Teucrium canadense	Canada germander	Lamiaceae
Thalia	alligator-flag	Marantaceae
Thalictrum	meadow-rue	Ranunculaceae
Thalictrum clavatum	mountain meadow-rue	Ranunculaceae
Thalictrum coriaceum	maid of the mist	Ranunculaceae
Thalictrum dioicum	early meadow-rue	Ranunculaceae
Thalictrum pubescens	king of the meadow	Ranunculaceae
Thalictrum revolutum	waxyleaf meadow-rue	Ranunculaceae
Thalictrum thalictroides	rue anemone	Ranunculaceae
Thaspium	meadowparsnip	Apiaceae
Thaspium barbinode	hairyjoint meadowparsnip	Apiaceae
Thaspium trifoliatum	purple meadowparsnip	Apiaceae
Thaspium trifoliatum var. *aureum*	purple meadowparsnip	Apiaceae
Thelypteris noveboracensis	New York fern	Thelypteridaceae
Thelypteris palustris	eastern marsh fern	Thelypteridaceae
Thelypteris palustris var. *pubescens*	eastern marsh fern	Thelypteridaceae
Thelypteris simulata	bog fern	Thelypteridaceae
Thuidium	thuidium moss	Thuidaceae
Thuidium delicatulum	delicate thuidium moss	Thuidiaceae
Thuja occidentalis	arborvitae	Cupressaceae
Tiarella cordifolia	heartleaf foamflower	Saxifragaceae
Tiarella cordifolia var. *cordifolia*	heartleaf foamflower	Saxifragaceae
Tilia	basswood	Tiliaceae
Tilia americana	American basswood	Tiliaceae
Tilia americana var. *americana*	American basswood	Tiliaceae
Tilia americana var. *heterophylla*	American basswood	Tiliaceae
Tipularia discolor	crippled cranefly	Orchidaceae
Torilis japonica	erect hedgeparsley	Apiaceae
Torreyochloa pallida	palse false mannagrass	Poaceae
Torreyochloa pallida var. *fernaldii*	Fernald's false mannagrass	Poaceae
Toxicodendron pubescens	Atlantic poison oak	Anacardiaceae
Toxicodendron radicans	eastern poison ivy	Anacardiaceae
Toxicodendron rydbergii	western poison ivy	Anacardiaceae
Toxicodendron vernix	poison sumac	Anacardiaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Tradescantia	spiderwort	Commelinaceae
Tradescantia ohiensis	bluejacket	Commelinaceae
Tradescantia subaspera	zigzag spiderwort	Commelinaceae
Tradescantia subaspera var. *montana*	zigzag spiderwort	Commelinaceae
Tradescantia virginiana	Virginia spiderwort	Commelinaceae
Trapa natans	water chestnut	Trapaceae
Trautvetteria caroliniensis	Carolina bugbane	Ranunculaceae
Trautvetteria caroliniensis var. *caroliniensis*	Carolina bugbane	Ranunculaceae
Triadenum fraseri	Fraser's marsh St. Johnswort	Clusiaceae
Triadenum virginicum	Virginia marsh St. Johnswort	Clusiaceae
Trichophorum alpinum	alpine bulrush	Cyperaceae
Trichophorum cespitosum	tufted bulrush	Cyperaceae
Trichophorum planifolium	bashful bulrush	Cyperaceae
Tridens flavus	purpletop tridens	Poaceae
Trientalis borealis	starflower	Primulaceae
Trientalis borealis ssp. *borealis*	starflower	Primulaceae
Trifolium	clover	Fabaceae
Trifolium campestre	field clover	Fabaceae
Trifolium pratense	red clover	Fabaceae
Trifolium repens	white clover	Fabaceae
Trillium	trillium	Liliaceae
Trillium catesbaei	bashful wakerobin	Liliaceae
Trillium cernuum	whip-poor-will flower	Liliaceae
Trillium cuneatum	little sweet Betsy	Liliaceae
Trillium erectum	red trillium	Liliaceae
Trillium grandiflorum	white trillium	Liliaceae
Trillium luteum	yellow wakerobin	Liliaceae
Trillium sessile	toadshade	Liliaceae
Trillium simile	jeweled wakerobin	Liliaceae
Trillium sulcatum	furrowed wakerobin	Liliaceae
Trillium undulatum	painted trillium	Liliaceae
Trillium vaseyi	sweet wakerobin	Liliaceae
Triodanis perfoliata	clasping Venus' looking-glass	Campanulaceae
Triosteum	horse-gentian	Caprifoliaceae
Triosteum angustifolium	yellowfruit horse-gentian	Caprifoliaceae
Triosteum aurantiacum	orangefruit horse-gentian	Caprifoliaceae
Triosteum perfoliatum	feverwort	Caprifoliaceae
Tripsacum dactyloides	eastern gamagrass	Poaceae
Tsuga canadensis	eastern hemlock	Pinaceae
Tsuga caroliniana	Carolina hemlock	Pinaceae
Tsuga heterophylla	western hemlock	Pinaceae
Tussilago farfara	coltsfoot	Asteraceae
Typha	cattail	Typhaceae
Typha angustifolia	narrowleaf cattail	Typhaceae
Typha latifolia	broadleaf cattail	Typhaceae
Typha ×glauca	hybrid cattail	Typhaceae
Ulmus	elm	Ulmaceae
Ulmus alata	winged elm	Ulmaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Ulmus americana	American elm	Ulmaceae
Ulmus rubra	slippery elm	Ulmaceae
Umbilicaria	navel lichen	Umbilicariaceae
Umbilicaria mammulata	navel lichen	Umbilicariaceae
Urtica dioica	stinging nettle	Urticaceae
Usnea	beard lichen	Parmeliaceae
Utricularia	bladderwort	Lentibulariaceae
Utricularia cornuta	horned bladderwort	Lentibulariaceae
Utricularia geminiscapa	hiddenfruit bladderwort	Lentibulariaceae
Utricularia intermedia	flatleaf bladderwort	Lentibulariceae
Utricularia macrorhiza	common bladderwort	Lentibulariaceae
Uvularia	bellwort	Liliaceae
Uvularia grandiflora	largeflower bellwort	Liliaceae
Uvularia perfoliata	perfoliate bellwort	Liliaceae
Uvularia puberula	mountain bellwort	Liliaceae
Uvularia sessilifolia	sessileleaf bellwort	Liliaceae
Vaccinium	blueberry	Ericaceae
Vaccinium angustifolium	lowbush blueberry	Ericaceae
Vaccinium arboreum	farkleberry	Ericaceae
Vaccinium boreale	northern blueberry	Ericaceae
Vaccinium cespitosum	dwarf bilberry	Ericaceae
Vaccinium corymbosum	highbush blueberry	Ericaceae
Vaccinium erythrocarpum	southern mountain cranberry	Ericaceae
Vaccinium fuscatum	black highbush blueberry	Ericaceae
Vaccinium hirsutum	hairy blueberry	Ericaceae
Vaccinium macrocarpon	cranberry	Ericaceae
Vaccinium myrtilloides	velvetleaf huckleberry	Ericaceae
Vaccinium oxycoccos	small cranberry	Ericaceae
Vaccinium pallidum	Blue Ridge blueberry	Ericaceae
Vaccinium simulatum	upland highbush blueberry	Ericaceae
Vaccinium stamineum	deerberry	Ericaceae
Vaccinium uliginosum	bog blueberry	Ericaceae
Vaccinium vitis-idaea	lingonberry	Ericaceae
Vaccinium vitis-idaea ssp. *minus*	northern mountain cranberry	Ericaceae
Vallisneria	eelgrass	Hydrocharitaceae
Vallisneria americana	American eelgrass	Hydrocharitaceae
Veratrum parviflorum	Appalachian bunchflower	Liliaceae
Veratrum viride	green false hellebore	Liliaceae
Verbascum thapsus	common mullein	Scrophulariaceae
Verbena hastata	swamp verbena	Verbenaceae
Verbena simplex	narrowleaf vervain	Verbenaceae
Verbena urticifolia	white vervain	Verbenaceae
Verbesina	crownbeard	Asteraceae
Verbesina alternifolia	wingstem	Asteraceae
Verbesina occidentalis	yellow crownbeard	Asteraceae
Vernonia	ironweed	Asteraceae
Vernonia gigantea	giant ironweed	Asteraceae
Vernonia gigantea ssp. *gigantea*	giant ironweed	Asteraceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Vernonia glauca	broadleaf ironweed	Asteraceae
Vernonia noveboracensis	New York ironweed	Asteraceae
Veronica	speedwell	Scrophulariaceae
Veronica americana	American speedwell	Scrophulariaceae
Veronica arvensis	corn speedwell	Scrophulariaceae
Veronica hederifolia	ivyleaf speedwell	Scrophulariaceae
Veronica officinalis	common gypsyweed	Scrophulariaceae
Veronica serpyllifolia	thymeleaf speedwell	Scrophulariaceae
Veronica wormskjoldii	American alpine speedwell	Scrophulariaceae
Viburnum	viburnum	Caprifoliaceae
Viburnum acerifolium	mapleleaf viburnum	Caprifoliaceae
Viburnum dentatum	southern arrowwood	Caprifoliaceae
Viburnum edule	squashberry	Caprifoliaceae
Viburnum lantanoides	hobblebush	Caprifoliaceae
Viburnum lentago	nannyberry	Caprifoliaceae
Viburnum nudum	possumhaw	Caprifoliaceae
Viburnum nudum var. *cassinoides*	withe-rod	Caprifoliaceae
Viburnum nudum var. *nudum*	possumhaw	Caprifoliaceae
Viburnum opulus	European cranberrybush	Caprifoliaceae
Viburnum opulus var. *americanum*	American cranberrybush	Caprifoliaceae
Viburnum plicatum	Japanese snowball	Caprifoliaceae
Viburnum prunifolium	blackhaw	Caprifoliaceae
Viburnum rafinesqueanum	downy arrowwood	Caprifoliaceae
Viburnum recognitum	southern arrowwood	Caprifoliaceae
Viburnum rufidulum	rusty blackhaw	Caprifoliaceae
Vicia	vetch	Fabaceae
Vicia caroliniana	Carolina vetch	Fabaceae
Vicia cracca	bird vetch	Fabaceae
Vicia sativa ssp. *nigra*	garden vetch	Fabaceae
Vinca	periwinkle	Apocynaceae
Viola	violet	Violaceae
Viola ×palmata	early blue violet	Violaceae
Viola ×primulifolia		Violaceae
Viola affinis	sand violet	Violaceae
Viola bicolor	field pansy	Violaceae
Viola blanda	sweet white violet	Violaceae
Viola blanda var. *blanda*	sweet white violet	Violaceae
Viola canadensis	Canadian white violet	Violaceae
Viola canadensis var. *canadensis*	Canadian white violet	Violaceae
Viola cucullata	marsh blue violet	Violaceae
Viola hastata	halberdleaf yellow violet	Violaceae
Viola hirsutula	southern woodland violet	Violaceae
Viola labradorica	alpine violet	Violaceae
Viola macloskeyi	small white violet	Violaceae
Viola macloskeyi ssp. *pallens*	smooth white violet	Violaceae
Viola pedata	birdfoot violet	Violaceae
Viola pubescens	downy yellow violet	Violaceae
Viola pubescens var. *pubescens*	downy yellow violet	Violaceae

Table E–1 (continued). Plant species list from the Appalachian National Scenic Trail vegetation mapping project (sorted by scientific name of plant species).

Scientific Name	Common Name	Family
Viola pubescens var. *scabriuscula*	downy yellow violet	Violaceae
Viola renifolia	white violet	Violaceae
Viola rostrata	longspur violet	Violaceae
Viola rotundifolia	roundleaf yellow violet	Violaceae
Viola sagittata	arrowleaf violet	Violaceae
Viola sagittata var. *ovata*	arrowleaf violet	Violaceae
Viola selkirkii	Selkirk's violet	Violaceae
Viola sororia	common blue violet	Violaceae
Viola striata	striped cream violet	Violaceae
Viola triloba	three-lobe violet	Violaceae
Vitis	grape	Vitaceae
Vitis aestivalis	summer grape	Vitaceae
Vitis aestivalis var. *aestivalis*	summer grape	Vitaceae
Vitis aestivalis var. *bicolor*	summer grape	Vitaceae
Vitis cinerea	graybark grape	Vitaceae
Vitis cinerea var. *baileyana*	graybark grape	Vitaceae
Vitis labrusca	fox grape	Vitaceae
Vitis riparia	riverbank grape	Vitaceae
Vitis rotundifolia	muscadine	Vitaceae
Vitis vulpina	frost grape	Vitaceae
Waldsteinia fragarioides	Appalachian barren strawberry	Rosaceae
Warnstorfia fluitans var. *fluitans*	warnstorfia moss	Amblystegiaceae
Wisteria sinensis	Chinese wisteria	Fabaceae
Wolffia	watermeal	Lemnaceae
Woodsia ilvensis	rusty woodsia	Dryopteridaceae
Woodsia obtusa ssp. *obtusa*	bluntlobe cliff fern	Dryopteridaceae
Woodwardia virginica	Virginia chainfern	Blechnaceae
woody seedlings, not specified	woody seedlings	
Xanthium strumarium	rough cocklebur	Asteraceae
Xanthoparmelia	xanthoparmelia lichen	Parmeliaceae
Xanthoparmelia conspersa	xanthoparmelia lichen	Parmeliaceae
Xanthoparmelia plittii	Plitt's xanthoparmelia lichen	Parmeliaceae
Xanthorhiza simplicissima	yellowroot	Ranunculaceae
Xerophyllum asphodeloides	eastern turkeybeard	Liliaceae
Yucca filamentosa	Adam's needle	Agavaceae
Zanthoxylum americanum	common pricklyash	Rutaceae
Zea mays	corn	Poaceae
Zizia aptera	meadow zizia	Apiaceae
Zizia aurea	golden zizia	Apiaceae
Zizia trifoliata	meadow alexanders	Apiaceae

Appendix F: Descriptions of Map Classes

Explanation of Map-Class Descriptions

This appendix provides descriptions of the 169 map classes used to map the Appalachian National Scenic Trail (APPA) for the National Park Service (NPS) Vegetation Mapping Inventory (VMI) Program. Of these 169 map classes, 150 represent 261 of the 280 U.S. National Vegetation Classification (USNVC) associations identified with this vegetation mapping project; 19 associations were determined always less than minimum mapping unit (MMU). (Some map classes represent more than one association whereas others represent a single association.) Another 11 map classes represent cultural vegetation types (agricultural and developed) in the USNVC, 3 map classes represent nonvegetation open water (non-USNVC), and 5 map classes represent natural landscapes that have undergone catastrophic disturbance or some other form of modification to natural vegetation preventing accurate vegetation classification and placement in the USNVC.

For those map classes representing vegetation associations in the USNVC, "Appendix C: Descriptions of Vegetation Associations" and "Appendix D: Field Key to Vegetation Associations" should be used to complement the map-class descriptions in this appendix.

Each map-class description provides the formal map-class code and name used for mapping. For those map classes representing a single vegetation association in the USNVC, the association's common name was used as the map-class name (e.g., Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest). For those map classes representing more than one association in the USNVC, a comparable map-class name was derived (e.g., Chestnut Oak / Heath Forest for the collective associations of Central Appalachian-Northern Piedmont Chestnut Oak Forest and Low-Elevation Mixed Oak / Heath Forest). For those map classes representing cultural vegetation, either the common name at the lowest level mapped in the USNVC was used as the map-class name (e.g., Herbaceous Agricultural Vegetation, which is a Cultural Subclass), or a generic map-class name was derived (e.g., Developed Area). For vegetation map classes lacking a direct link to the USNVC, a descriptive map-class name was derived (e.g. Recently Burned Landscape). For those map classes representing nonvegetation features, a generic map-class name was derived (e.g., Open Water Lake).

For all map classes representing USNVC associations, the USNVC classification name(s) and code(s) that the map class represents are provided at the beginning of each map-class description. Each map class is described with a focus on how it presents in the APPA landscape, noting that this type of description may not reflect how the various USNVC types present across their range. Descriptions are from a mapping, rather than an ecological, perspective, but ecological concepts relevant to the mapping effort were integrated into the map-class description. Full ecological descriptions of each vegetation association are available in "Appendix C: Descriptions of Vegetation Associations."

Tree species such as northern red oak (*Quercus rubra*), eastern redcedar (*Juniperus virginiana*), and sweetgum (*Liquidambar styraciflua*) are assumed to be of heights greater than 5 meters (m), unless otherwise specified (e.g., shrub-height trees) in the description. The term "hardwood trees" refers to all deciduous tree species. The term "tree species" includes general references to trees as conifers and hardwoods. Furthermore, unless otherwise noted, the herbaceous types have greater than 10%

herbaceous cover and less than 25% total tree and shrub canopy closure, shrubland types have greater than 25% shrub canopy closure and less than 25% tree canopy closure, woodlands have greater than 25% tree canopy closure, and forests typically have greater than 60% tree canopy closure.

Adjectives are used in the map-class descriptions to provide a general idea of the commonness of each map class by area and percent cover of the APPA vegetation map layer. These adjectives are detailed in Table F–1.

Table F–1. Adjectives used to describe map-class commonness of occurance by area and percent cover of the Appalachian National Scenic Trail vegetation map layer.

Adjective	Area (ha)	Percent cover
Exceptionally rare	0–11.09	0–0.0099
Rare	11.1–110.92	0.01–0.099
Uncommon	110.93–543.50	0.1–0.49
Common	543.51–2,761.85	0.5–2.49
Very common	>2,761.86	>2.5

When map-class signatures or presentations are discussed, unless otherwise specified, they are in reference to the color-infrared component of the 4-band aerial imagery used during the mapping process, unless otherwise specified.

When accuracy assessment (AA) results are reported in the map-class description, two views are discussed—mapped too aggressively and mapped too conservatively. The view of "mapped too aggressively" refers to errors in the users' accuracy. The users' accuracy reports on the probability that an AA site in the tested map class does not have a vegetation type that is represented by the map class. This is an error of commission indicating where too much of APPA was mapped as the tested map class. The lower the users' accuracy for a map class, the higher the likelihood that the map class was overmapped (i.e., mapped too aggressively). The view of "mapped too conservatively" refers to errors in the producers' accuracy. The producers' accuracy reports on the probability that an AA site in a different map class has a vegetation type that is represented by the tested map class. This is an error of omission indicating where too little area of APPA was mapped as the tested map class. The lower the producers' accuracy for a map class, the higher the likelihood that the map class was undermapped (i.e., mapped too conservatively).

Straight accuracies are listed for users' and producers' in the reporting of AA results. When straight accuracies are below 80%, the 90% confidence intervals are provided to present where the interval range is in regards to the 80% accuracy standard set by the NPS VMI Program. The 90% confidence intervals to users' and producers' accuracies for all map classes that were included in the AA study are included with the suite of data products developed for the APPA vegetation mapping project.

Along with text descriptions of the map classes, images form field pictures are provided when possible to visually depict the vegetation types and nonvegetation features that the map classes represent. Worth noting is that the images are a partial representation; capturing all variations within a map class would not be possible.

Throughout this appendix, APPA also is referred to as the "AT corridor" for the Appalachian Trail corridor, or simply as the "corridor" after the AT corridor context is established. For brevity purpose, references to other national-park units use the following official NPS park-unit abbreviations:

- Delaware Water Gap National Recreation Area (DEWA),
- Great Smoky Mountains National Park (GRSM), and
- Shenandoah National Park (SHEN).

Map-Classification Lists

Within a particular map-class description, map classes (other than the map class being directly described) are referenced by their map-class codes. Map-class names to these map-class codes are listed in Table F–2 at the end of this appendix; this listing of map classes is sorted alphabetically by map-class code. Map-classification codes, names, and their crosswalk (cross-reference) to vegetation types in the USNVC (when applicable), are listed in Table G–1 in "Appendix G: Map Classification by Map-Class Category." Table H–1 in "Appendix H: Map Classification by U.S. National Vegetation Classification" lists the map-classification set within the hierarchy of the USNVC.

Minimum Mapping Units

The NPS VMI Program's standard MMU of 0.5 hectare (ha) was applied to mapping forest, cultural, and park-special vegetation map classes. For woodland, shrubland, herbaceous, sparse vegetation, and nonvegetated open-water map classes, a MMU of 0.25 ha was applied. The only exceptions were nine map classes representing alpine shrub, herbaceous, and sparse vegetation associations in the USNVC, which were mapped with a MMU of 0.125 ha. These nine map classes were used only in the alpine zone of New Hampshire and Maine. The 0.25 ha MMU was applied to woodland map classes because woodland map classes were generally rare along the AT corridor. The 0.25 ha MMU was applied to non-alpine shrubland, herbaceous, and sparse vegetation map classes because the map classes frequently interfaced with each other and because the map classes were generally rare within the AT corridor. The 0.125 ha MMU was specifically applied to the nine alpine map classes in New Hampshire and Maine because of the consistent occurrence of mappable small-patch variation within the very restricted alpine zone. Without this 0.125 ha MMU, most of the mappable variation within the alpine zone would not be mapped.

For polygons that represent vegetation crossing outside the boundary for the APPA vegetation mapping project, mappers allowed the polygons to be mapped less than the MMU if the vegetation continued over the project boundary, was contiguous, and covered at least the standard MMU for that map class. In these instances, map classes with a 0.5 ha MMU were mapped down to 0.1 ha and map classes with a 0.25 ha or 0.125 ha MMU were mapped down to 0.05 ha. For example, a 0.18 ha polygon of the Acidic Hardwood Swamp Forest (FAHS) map class would be mapped inside the project boundary if at least 0.32 ha of contiguous connected FAHS was outside the boundary.

No Map Class

There are 19 vegetation associations in the USNVC that were not defined by any 1 map class. These associations were observed always below the MMU. The 19 associations are as follows:

- *Vitis aestivalis* Vine-Scrub (CEGL003890),
- *Alnus serrulata - Lindera benzoin* / *Scutellaria lateriflora - Thelypteris noveboracensis* Seepage Shrubland (CEGL003909),
- *Impatiens* (*capensis*, *pallida*) - *Monarda didyma - Rudbeckia laciniata* var. *humilis* Herbaceous Seep (CEGL004293),
- *Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis* Forested Herbaceous Seep (CEGL004296),
- *Asplenium montanum - Heuchera villosa* Felsic Cliff Sparse Vegetation (CEGL004980),
- *Alnus incana* ssp. *rugosa - Nemopanthus mucronatus* / *Sphagnum* spp. Acidic Peatland (CEGL006158),
- *Tsuga caroliniana - Pinus* (*rigida*, *pungens*, *virginiana*) Forest (CEGL006178),
- *Chrysosplenium americanum* Seepage Meadow (CEGL006193),
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex* (*sterilis*, *hystericina*, *flava*) Fen (CEGL006326),
- *Drosera rotundifolia - Viola* spp. Cliff Sparse Vegetation (CEGL006429),
- *Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Seepage Meadow (CEGL006448),
- *Dulichium arundinaceum - Carex folliculata - Juncus* spp. Seepage Meadow (CEGL006552),
- *Symplocarpus foetidus - Impatiens capensis* Seepage Meadow (CEGL006567),
- *Tsuga caroliniana* / *Kalmia latifolia - Rhododendron catawbiense* Forest (CEGL007139),
- *Acer rubrum* var. *trilobum - Nyssa sylvatica* / *Osmunda cinnamomea - Carex intumescens* / *Sphagnum lescurii* Seep Forest (CEGL007443),
- *Tsuga canadensis - Acer rubrum* - (*Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Seep Forest (CEGL007565),
- *Carex gynandra - Platanthera clavellata - Drosera rotundifolia - Carex ruthii* / *Sphagnum* spp. Herbaceous Seep (CEGL007697),
- *Quercus prinus - Juniperus virginiana* - (*Pinus virginiana*) / *Philadelphus hirsutus - Celtis occidentalis* Woodland (CEGL007720), and
- *Glyceria striata - Carex gynandra - Chelone glabra - Symphyotrichum puniceum* / *Sphagnum* spp. Herbaceous Seep (CEGL008438).

Small clumps (inclusions) of each of these 19 associations exist within appropriate habitats along the AT corridor. As with each association that is represented by the various map classes described in this appendix, the 19 associations also are described in "Appendix C: Descriptions of Vegetation Associations" and also are included in "Appendix D: Field Key to Vegetation Associations."

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FABF – Southern Appalachian Boulderfield Forest (Currant and Rockcap Fern Type) F-13
FBGP – Southern Appalachian Beech Gap F-14
FCAB – Central Appalachian High-Elevation Boulderfield Forest F-15
FCRO – Central Appalachian Northern Red Oak Forest F-16
FROH – High-Elevation Red Oak Forest F-17
WROT – Red Oak Talus Woodland F-19
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FMFB – Montane Balsam Fir - Birch Forest F-22
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FCNO – Central & Northern Oak Forest F-39
FCOH – Chestnut Oak / Heath Forest F-41
FCOM – Chestnut Oak - Mixed Oak Forest F-43
FMCO – Appalachian Sugar Maple - Chinquapin Oak Limestone Forest F-45
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FCWH – Central Appalachian White Pine - Hemlock Forest F-72
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FXSF – Successional Mixed Spruce - Fir - Hardwood Forest F-129
FXVP – Ruderal Virginia Pine Forest F-130
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HECM – Eastern Cattail Marsh F-173
HGFM – Graminoid & Forb Wet Meadow & Marsh F-174
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HRGS – Graminoid & Scour Riverbank F-177
HTSM – Southern New England Threeway Sedge Fen F-178
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SBBT – Blueberry Peatland Thicket F-186
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SLBS – Swamp-Loosestrife & Buttonbush Shrub Swamp F-188
SNAS – Northern Appalachian High-Elevation Seepage Shrubland F-189
SRBS – Rocky Bar and Shore (Alder - Yellowroot Type) F-190
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VAFB – Alpine Fell-field & Bald F-196
VBAC – Near-Boreal Alkaline Cliff F-197
VCAB – Central Appalachian Acidic Boulderfield F-198
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VEAC – Eastern Temperate Acidic Cliff F-200
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FABF – Southern Appalachian Boulderfield Forest (Currant and Rockcap Fern Type)

The Southern Appalachian Boulderfield Forest (Currant and Rockcap Fern Type) (FABF) map class represents the *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest Association (CEGL006124) in the USNVC. The forest association that makes up this map class only occurs in the AT corridor in the southernmost portion and occurs at high elevation over bouldery substrate. The FABF map class is exceptionally rare within the corridor covering 3.3 ha (0.003% of APPA).

Dominated by a short-statured and generally open monotypic canopy of northern hardwood trees over boulders, this map class only occurs above 1,460 m within the corridor. Often intermixed with the FSAH map class, the ability to see the boulders in the imagery was critical to mapping this map class. Because of the elevation, the FABF map class was completely senesced when the project imagery was collected and is otherwise identical in signature to the high-elevation presentation of the FSAH map class.

The AA results indicate that FABF was mapped with a users' accuracy of 50% (90% confidence interval of -4–104%) and a producers' accuracy of 67% (90% confidence interval of 5–128%). (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses a few instances where FABF was mapped either too aggressively (to the FSAH map class) or too conservatively (from the SBDH map class).



An example of the FABF map class showing the characteristically stunted canopy of northern hardwoods over boulders.

FBGP – Southern Appalachian Beech Gap

The Southern Appalachian Beech Gap (FBGP) map class represents the *Fagus grandifolia* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest Association (CEGL006130) in the USNVC. The forest association that makes up this map class only occurs in the AT corridor in the southern portion and is limited to the highest elevations (above 1,400 m elevation). The FBGP map class is uncommon within the corridor covering 256.0 ha (0.2% of APPA).

Almost exclusively dominated by short-statured or stunted and open-canopied American beech (*Fagus grandifolia*), the FBGP map class generally presents as a monotypic stand of leaf-off hardwoods below the spruce-fir line. Occasionally, however, a beech clone would still have senesced leaves and present a very distinct and consistent signature of light-pink, tan, or off-white in the aerial imagery.

The AA results indicate that FBGP was mapped well with a users' accuracy of 90% and a producers' accuracy of 93%. The AA discloses three instances where FBGP was mapped either too aggressively (to two map classes) or too conservatively (from the FSAH map class). Most of both the users' and producers' errors come from confusion with FSAH where the percent cover of American beech was either over or under estimated.



An example of the FBGP map class showing the dominance of short-statured American beech with an open canopy allowing for a rich herb layer to develop.

FCAB – Central Appalachian High-Elevation Boulderfield Forest

The Central Appalachian High-Elevation Boulderfield Forest (FCAB) map class represents the *Betula alleghaniensis* / *Sorbus americana* - *Acer spicatum* / *Polypodium appalachianum* Forest Association (CEGL008504) in the USNVC. The forest association that makes up this map class only occurs within the AT corridor in SHEN in north-central Virginia above 850 m elevation. The FCAB map class is rare within the corridor covering 19.7 ha (0.02% of APPA).

This northern hardwood dominated map class is an open canopied yellow birch (*Betula alleghaniensis*) forest over acidic bouldery substrate. Often intermixed with the FCRO and FCHW map classes, FCAB lacks the oak of FCRO and maintains a much more open canopy than FCHW, with FCHW lacking the bouldery substrate. Generally, this map class presents as a hardwood forest of white and yellow fuzzy-crowned trees on very steep slopes with the rocky substrate visible through the canopy gaps.

The AA results indicate that FCAB was mapped well with a users' accuracy of 82% and a producers' accuracy of 90%. The AA discloses two instances where FCAB was mapped either too aggressively (to the FCHW map class) or too conservatively (from the FCRO map class). These errors result from misinterpreting the ground layer either as a boulder field when it was not (in the case of FCHW) or as not a boulder field when it was (FCRO).



Two examples of the FCAB map class showing the open canopy dominated by northern hardwood tree species over a bouldery substrate from above the canopy (left) and below the canopy (right).

FCRO – Central Appalachian Northern Red Oak Forest

The Central Appalachian Northern Red Oak Forest (FCRO) map class represents the *Quercus rubra* - (*Quercus alba*) / *Ilex montana* / *Dennstaedtia punctilobula* - *Lysimachia quadrifolia* Forest Association (CEGL008506) in the USNVC. The forest association that makes up this map class in the AT corridor only occurs in central Virginia above 920 m elevation. The FCRO map class is common within the corridor covering 1,023.3 ha (0.9% of APPA).

This northern red oak (*Quercus rubra*) dominated (often greater than 75% of the canopy) map class is restricted to the highest elevations of central Virginia, is only in the AT corridor above 920 m elevation, and is generally common only above 1,100 m elevation. The signature and landscape position of FCRO proved reliable because this map class exists on ridge and mountain tops. The northern red oak in this forest generally present as a crisp, tan to gold to pink to red and broad-crowned canopy, but with canopy structure more open than comparable oak forests at lower elevation. The oak may be intermixed with lighter-pink and white-crowned hardwood tree species, but often the hardwoods were completely senesced and leafless in the project imagery.

Because FCRO presents a nearly identical topographic profile and signature to FROH, mappers consulted with ecologists for a geographic location to split these map classes and determined this location to be the general area of Roanoke, Virginia. Because no high-elevation northern red oak forests are known to exist within the AT corridor for several miles north and south of Roanoke, this generalized location worked effectively to split these similar map classes.

The AA results indicate that FCRO was mapped with a users' accuracy of 92% and a producers' accuracy of 71% (90% confidence interval of 56–86%). The AA discloses several instances where FCRO was mapped either too aggressively (to two map classes) or too conservatively (from four map classes). The users' error indicates no clear pattern, whereas the producers' error indicates an overly conservative approach to applying FCRO in the tension zone with lower elevation co-occurring oak forest map classes and a consistent underestimation of oak coverage in the FCHW map class.



An example of the FCRO map class showing the moderately open, short-statured canopy dominated by northern red oak over eastern hayscented fern.

FROH – High-Elevation Red Oak Forest

The High-Elevation Red Oak Forest (FROH) map class represents the following three associations in the USNVC:

- *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest (CEGL007298),
- *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299), and
- *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300).

This map class primarily represents the highest elevation northern red oak (*Quercus rubra*) dominated forests in the AT corridor south of Roanoke, Virginia. The FROH map class is common within the corridor covering 2,195.1 ha (2.0% of APPA).

This northern red oak dominated (often greater than 75% of the canopy) map class is restricted to the highest elevations of the southern portion of the AT corridor from the Roanoke, Virginia, area south to Springer Mountain in Georgia. The FROH map class exists above 1,220 m elevation, common only above 1,340 m elevation. The signature and landscape position of FROH proved reliable because this map class exists on ridge and mountain tops. The northern red oak in this forest generally present as a crisp, tan to gold to pink to red and broad-crowned canopy, but with canopy structure more open and smaller crowned than comparable oak forests at lower elevation. The oak may be intermixed with lighter-pink and white-crowned hardwood tree species, but often the hardwoods were completely senesced and leafless in the project imagery.

Because FROH presents a nearly identical topographic profile and signature to FCRO, mappers consulted with ecologists for a geographic location to split these map classes and determined this location to be the general area of Roanoke, Virginia. Because no high-elevation northern red oak forests are known to exist within the AT corridor for several miles north and south of Roanoke, this generalized location worked effectively to split these similar map classes.

The AA results indicate that FROH was mapped with a users' accuracy of 78% (90% confidence interval of 65–90%) and a producers' accuracy of 61% (90% confidence interval of 49–73%). The AA discloses several instances where FROH was mapped either too aggressively (to six map classes) or too conservatively (from six map classes). The majority of the users' errors come from an overly aggressive application among co-occurring oak forest map classes, whereas the majority of the producers' errors come from an overly conservative application among both co-occurring oak and co-occurring hardwood forest map classes.

The 90% confidence interval for the producers' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower producers' accuracy for the FROH map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."




Two examples of the FROH map class showing association CEGL007299 with an evergreen shrub layer under a closed northern red oak canopy (left) and association CEGL007300 with a dense fern understory under a closed northern red oak canopy (right). Note the presence of bedrock in both images.

WROT – Red Oak Talus Woodland

The Red Oak Talus Woodland (WROT) map class represents the following four associations in the USNVC:

- *Quercus prinus* / *Rhus* spp. / *Deschampsia flexuosa* Woodland (CEGL006074),
- *Quercus rubra* - (*Quercus prinus*) / *Vaccinium* spp. / *Deschampsia flexuosa* Woodland (CEGL006134),
- *Betula lenta* - *Quercus prinus* / *Parthenocissus quinquefolia* Woodland (CEGL006565), and
- *Quercus rubra* - *Betula lenta* / *Polypodium virginianum* Woodland (CEGL006585).

This map class primarily represents oak dominated talus slopes within the AT corridor from the southern border of DEWA in Pennsylvania north to the terminus in Maine. The WROT map class is uncommon within the corridor covering 341.6 ha (0.3% of APPA).

Originally, the associations CEGL006074 and CEGL006134 defined the WROT map class, but the AA process determined consistent confusion with a former map class representing associations CEGL006565 and CEGL006585 mapped north of DEWA. The four associations, therefore, were combined to form the WROT map class. A potential source of confusion is that a different former map class represented CEGL006565 and CEGL006585 south of DEWA and this map class was confused with and collapsed into the FCHW map class. Thus, both WROT and FCHW contain CEGL006565 and CEGL006585 as rare components, but the remaining vegetation associations in WROT and FCHW are geographically and ecologically exclusive.

The WROT map class is defined by red and chestnut oak (*Quercus rubra* and *Q. prinus*) trees and scrub over talus, boulders, and, occasionally, bedrock. Confined to steep warm-topography slopes below 790 m elevation, this map class generally presents as an open canopy of crisp, tan, pink, and red crowned, short- to medium-statured trees with talus, boulders, or bedrock visible through the canopy gaps.

The AA results indicate that WROT was mapped with a users' accuracy of 78% (90% confidence interval of 69–88%) and a producers' accuracy of 96%. The AA discloses several instances where WROT was mapped either too aggressively (to five map classes) or too conservatively (from two map classes). The majority of the users' errors come from an overly aggressive application of WROT among co-occurring oak forest map classes, whereas the producers' errors suggest a misidentification of the dominant canopy species.




Two examples of the WROT map class showing association CEGL006074 with a chestnut oak canopy (left) compared to association CEGL006134 with a northern red oak canopy (right). Both examples show an open oak canopy over rock.

FBHH – Blue Ridge Hemlock - Northern Hardwood Forest

The Blue Ridge Hemlock - Northern Hardwood Forest (FBHH) map class represents the *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest Association (CEGL007861) in the USNVC. The forest association that makes up this map class is confined to the higher elevations of the southern portion of the AT corridor. The FBHH map class is uncommon within the corridor covering 387.6 ha (0.4% of APPA).

Dominated by yellow birch (*Betula alleghaniensis*) and other northern hardwoods over a thick shrub layer of great laurel (*Rhododendron maximum*), the canopy of FBHH was historically mixed with eastern hemlock (*Tsuga canadensis*). When this project initiated, eastern hemlock was healthy in the southern portion of the AT corridor; however, as the project progressed, various non-native insects nearly eliminated this species in the range of this map class. As a consequence, this map class currently contains a fraction of the eastern hemlock that it once did. This map class now generally presents as a northern hardwood forest over a thick evergreen shrub layer above 1,160 m elevation on sheltered sites and then more commonly above 1,280 m elevation. The FBHH map class generally is intermixed with the FSAH and FROH map classes, but lacks the oaks of FROH and has the evergreen shrub layer that FSAH lacks.

The AA results indicate that FBHH was mapped with a users' accuracy of 66% (90% confidence interval of 49–82%) and a producers' accuracy of 73% (90% confidence interval of 57–89%). The AA discloses several instances where FBHH was mapped either too aggressively (to five map classes) or too conservatively (from five map classes). The majority of the users' errors come from an overly aggressive application in co-occurring oak and northern hardwood map classes, whereas the producers' error is lightly spread across the five map classes, likely resulting from an underestimation of eastern hemlock cover in a variety of map classes.



An example of the FBHH map class showing the characteristic northern hardwood canopy over great laurel. Note the dead eastern hemlock on the right side of the image.

FMFB – Montane Balsam Fir - Birch Forest

The Montane Balsam Fir - Birch Forest (FMFB) map class represents the *Abies balsamea* - (*Betula papyrifera* var. *cordifolia*) Forest Association (CEGL006112) in the USNVC. The forest association that makes up this map class occurs in the AT corridor on the highest peaks from northern Massachusetts north to Mount Katahdin in Maine. The FMFB map class is very common within APPA covering 5,675.2 ha (5.1% of APPA).

Appearing only above 980 m elevation on the slopes of Mount Greylock in Massachusetts, the minimum elevation for FMFB gradually decreases northerly along the AT corridor until Mount Katahdin in Maine, where FMFB begins at 640 m elevation. Generally, FMSF occurs below the elevation of FMFB. Otherwise, FMFB is up to the tree line, where it interfaces with the botanically similar SMCK. The FMFB is map class generally presents as a balsam fir (*Abies balsamea*) dominated (greater than 50%, often 90%) single-clade forest, with a red and rounded crown; some associated (less than 25%) red spruce (*Picea rubens*), with a rough, purple, star-shaped crown; and some associated mountain paper birch (*Betula papyrifera* var. *cordifolia*). On occasion, mountain paper birch would codominate or even dominate over balsam fir.

The AA results indicate that FMFB was mapped well with both a users' and producers' accuracy of 94%. The AA discloses a few instances where FMFB was mapped either too aggressively (to two map classes) or too conservatively (from two map class). This confusion relates to the under or overestimation of balsam fir canopy cover.



An example of the FMFB map class showing a mix of balsam fir and mountain paper birch.

FSHH – Red Spruce - Northern Hardwood Forest (Herb Type)

The Red Spruce - Northern Hardwood Forest (Herb Type) (FSHH) map class represents the *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Oxalis montana* - *Solidago glomerata* Forest Association (CEGL006256) in the USNVC. The forest association that makes up this map class only occurs within the AT corridor in the southern most portions of the corridor in the higher reaches (above 1,350 m elevation). The FSHH map class is common within the corridor covering 636.9 ha (0.6% of APPA).

Dominated by a mix of red spruce (*Picea rubens*) and northern hardwoods, particularly yellow birch (*Betula alleghaniensis*), the FSHH map class occurs as the transitional forest between the lower-elevation hardwood-dominated forests and higher-elevation conifer-dominated forests. This map class is common along the backbone of the Smoky Mountains and on the surrounding higher ranges within the AT corridor. In the APPA imagery set, this map class presents as a mixed spruce-hardwood canopy forest with a closed, dense canopy. The assumption was that an evergreen shrub layer either would be visible through the canopy gaps or unable to persist under a closed canopy.

The AA results indicate that FSHH was mapped well with a users' accuracy of 88% and a producers' accuracy of 83%. The AA discloses three instances where FSHH was mapped either too aggressively (to FSFD map class) or too conservatively (from the FSFD or FSHS map classes). The error originating with FSFD comes from misestimation of the hardwood tree canopy cover while the producers' errors come from an overly conservative estimation of the deciduous shrub and herb cover in FSHS.



Two examples of the FSHH map class showing the mixed spruce-northern hardwood canopy over a dense shrub layer generally with a more open canopy (left) and sparse shrub layer, generally with a more closed canopy (right).

FSHS – Spruce - Hardwood / Shrub Forest

The Spruce - Hardwood / Shrub Forest (FSHS) map class represents two associations in the USNVC—the *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron* (*maximum*, *catawbiense*) Forest Association (CEGL004983) and the *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest Association (CEGL006152) in the USNVC. The forest associations that make up this map class only occur within the AT corridor in the southern most portions of the corridor in the higher reaches (above 1,400 m elevation). The FSHS map class is rare within the corridor covering 94.6 ha (0.09% of APPA).

Dominated by a mix of red spruce (*Picea rubens*) and northern hardwoods, particularly yellow birch (*Betula alleghaniensis*), the FSHS map class occurs as the transitional forest between the lower-elevation hardwood-dominated forests and the higher-elevation conifer-dominated forests. The FSHS map class is defined by the presence of an evergreen shrub layer and was uncommon along the backbone of the Smoky Mountains and on the surrounding higher ranges within the AT corridor. In the APPA imagery set, this map class presents as a mixed spruce-hardwood canopy forest with a broken to open canopy showing the red glow of an evergreen shrub layer. The assumption was that an evergreen shrub layer either would be visible through the canopy gaps or unable to persist under a closed canopy.

The AA results indicate that FSHS was mapped with a users' accuracy of 75% (90% confidence interval of 62–88%) and a producers' accuracy of 100%. The AA discloses four instances where FSHS was mapped too aggressively. These errors primarily result from an overly aggressive estimation of evergreen shrub cover, from confusion with FSHH, and from an overly aggressive estimation red spruce cover for the other instances.



An example of the FSHS map class showing the characteristically open canopy of mixed spruce and northern hardwoods over a dense evergreen shrub layer.

FTHS – Transitional Northern Hardwood - Red Spruce Forest

The Transitional Northern Hardwood - Red Spruce Forest (FTHS) map class represents the *Betula alleghaniensis* - *Picea rubens* / *Dryopteris campyloptera* Forest Association (CEGL006267) in the USNVC. The forest association that makes up this map class occurs in the AT corridor from southcentral Massachusetts north to the terminus in Maine. The FTHS map class is very common within the corridor covering 4,004.1 ha (3.6% of APPA).

Codominated to dominated (25–75% canopy cover, each) by red spruce (*Picea rubens*) and northern hardwood tree species, especially yellow birch (*Betula alleghaniensis*), this map class is rare in Massachusetts, but becomes a ubiquitous part of the forested landscape in Maine. Balsam fir (*Abies balsamea*) was occasionally associated to codominant (10–25% canopy cover) in some examples, likely because of disturbance. Presenting an interesting elevational profile, FTHS is wedged between the lower FNAH and the higher FMSF; however, FTHS does intermix with FNAH, FMSF, and many other similar map classes.

The FTHS map class generally presents as a mixed conifer-hardwood forest of red spruce, with dark-purple conical crowns and of northern hardwoods, with fuzzy crowns of white, tan, yellow, orange, and pink. Occasionally, the northern hardwoods had completely senesced; therefore, only bare branches and red spruce were visible, which was most common in higher-elevation examples.

The AA results indicate that FTHS was mapped with a users' accuracy of 83% and a producers' accuracy of 74% (90% confidence interval of 60–87%). The AA discloses several instances where FTHS was mapped either too aggressively (to three map classes) or too conservatively (from seven map classes). The primary source of users' error comes from the overly aggressive estimation of recovery in a ruderal red spruce forest map class and from the overly conservation estimation of red spruce canopy cover in co-occurring northern hardwood forest map classes.



Two examples of the FTHS map class both showing association CEGL006267 being dominated by northern hardwood tree species (left) and by red spruce (right).

FFFS – Fraser Fir / Shrub Forest

The Fraser Fir / Shrub Forest (FFFS) map class represents two associations in the USNVC—the *Abies fraseri* / *Viburnum lantanoides* / *Dryopteris campyloptera* - *Oxalis montana* / *Hylocomium splendens* Forest (CEGL006049) and the *Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest (CEGL006308). The forest associations that make up this map class only occur in the southern most portion of the AT corridor in the highest reaches (above 1,830 m elevation) and are limited to the corridor as FFFS passes through GRSM. The FFFS map class is uncommon within the corridor covering 118.1 ha (0.1% of APPA).

Dominated by Fraser fir (*Abies fraseri*), the FFFS map class generally presented as a monotypic stand of fir or fir mixed with sparse red spruce (*Picea rubens*). Present above the spruce-dominated forest downslope, this map class tends to cover the peaks of the highest mountains in the Southern Blue Ridge ecoregion. The ability to split the two associations apart was explored, but the visibility of the shrub layer, either evergreen or deciduous, was unreliable. Generally, the Fraser fir in FFFS tend to present a redder, more robust signature than the spruce because of the flatter and more horizontal plane of Fraser fir leaves, with the overall effect being a dense red-conifer forest.

The AA results indicate that FFFS was mapped with a users' accuracy of 100% and a producers' accuracy of 78% (90% confidence interval of 65–92%). The AA discloses two instances where FFFS was mapped too conservatively (to two other co-occurring high-elevation conifer map classes). Most of this confusion was because of a consistent underestimation of Fraser fir cover in the FSFD map class.



Two examples of the FFFS map class both showing association CEGL006049, with a very sparse herb layer (left) and a very dense herb layer (right), depending on canopy closure.

FMSF – Montane Spruce - Fir Forest

The Montane Spruce - Fir Forest (FMSF) map class represents the *Picea rubens* - *Abies balsamea* / *Sorbus americana* Forest Association (CEGL006128) in the USNVC. The forest association that makes up this map class occurs in the AT corridor on the highest peaks from northern Massachusetts north to Mount Katahdin in Maine. The FMSF map class is common within the corridor covering 2,419.6 ha (2.2% of APPA).

Starting around an elevation of 700 m on the slopes of Mount Greylock in Massachusetts, the FMSF map class is confined to a range between 640 m elevation (above FLSF) and 1,070 m elevation (below FMFB). This window is widest in Vermont and New Hampshire and gradually narrows to a small patch right at 670 m elevation on the slopes of Mount Katahdin in Maine.

Dominated (greater than 50% canopy cover) by red spruce (*Picea rubens*), the FMSF map class often approaches 100% red spruce canopy. The map class, however, can have co-dominant (generally less than 40% canopy cover) balsam fir (*Abies balsamea*) and generally lacks (less than 25% canopy) northern hardwood tree species. This canopy composition is potentially identical to FLSF; therefore, an elevation cutoff of 670 m and above, but down to 550 m (based on landscape context), was utilized to split these two map classes. This map class generally presented as a sea of red spruce with dark-red to purple pointy cone-shaped crowns of similar size and height sparsely interspersed with the fuzzy white, yellow, and pink cone-shaped crowns of northern hardwoods and the rounded red crowns of balsam fir.

The AA results indicate that FMSF was mapped well with both a users' and producers' accuracy of 94%. The AA discloses three instances where FMSF was mapped either too aggressively (to two spruce map classes) or too conservatively (from the FXSF map class). This confusion results from the misestimation of red spruce canopy cover, for the overly aggressive application, and the degree of disturbance in a re spruce-dominated forest, for the overly conservative application.



Two examples of the FMSF map class showing a version with a completely closed red spruce canopy (left) and a version with a much more open canopy showing significant balsam fir regeneration (right).

FSFD – Red Spruce - Fraser Fir Forest (Deciduous Shrub Type)

The Red Spruce - Fraser Fir Forest (Deciduous Shrub Type) (FSFD) map class represents the *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Oxalis montana* - *Dryopteris campyloptera* / *Hylocomium splendens* Forest Association (CEGL007131) in the USNVC. The forest association that makes up this map class only occurs within the AT corridor in the southern portion of the corridor in the higher reaches (above 1,450 m elevation). The FSFD map class is uncommon within the corridor covering 479.5 ha (0.4% of APPA).

Dominated by a mix of red spruce (*Picea rubens*) and Fraser fir (*Abies fraseri*), the FSFD map class can occur over any type of understory (including spruce and fir regeneration) with the exception of evergreen shrub. Present above the hardwood dominated lower slopes, this map class generally occurs along the backbone of the Smoky Mountains and on the surrounding higher ranges within the AT corridor. In the APPA imagery set, this map class presented as a mixed spruce-fir canopy forest either with a closed canopy or an open canopy that lacked an evergreen shrub layer. The assumption was that an evergreen shrub layer either would be visible through the canopy gaps or unable to persist under a closed canopy.

The AA results indicate that FSFD was mapped with both a users' and producers' accuracy of 71% (90% confidence interval of 56–85%). The AA discloses several instances where FSFD was mapped either too aggressively (to four map classes) or too conservatively (from two map classes). Almost all the error, both users' and producers', comes from confusion with co-occurring mixed red spruce – Fraser fir forest map classes where either the shrub and herb layers were misinterpreted or the northern hardwood tree canopy cover was misestimated.



Two examples of the FSFD map class showing a very sparse understory below a dense spruce-fir canopy (left) and a very dense understory dominated by deciduous shrubs and herbs (right).

FSFE – Red Spruce - Fraser Fir Forest (Evergreen Shrub Type)

The Red Spruce - Fraser Fir Forest (Evergreen Shrub Type) (FSFE) map class represents the *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest Association (CEGL007130) in the USNVC. The forest association that makes up this map class only occurs within the AT corridor in the southern most portion of the corridor in the higher reaches (above 1,450 m elevation). The FSFE map class is rare within the corridor covering 108.4 ha (0.098% of APPA).

Dominated by a mix of red spruce (*Picea rubens*) and Fraser fir (*Abies fraseri*), the FSFE map class can only occur over an understory of evergreen shrub (this does not include spruce and fir regeneration). Present above the hardwood dominated lower slopes, this map class is occasionally along the backbone of the Smoky Mountains and on the surrounding higher ranges within the AT corridor. In the APPA imagery set, this map class presented as a mixed spruce-fir canopy forest with an open canopy showing a consistent red glow from a dense evergreen shrub layer. The assumption was that an evergreen shrub layer either would be visible through the canopy gaps or unable to persist under a closed canopy.

The AA results indicate that FSFE was mapped with a users' accuracy of 74% (90% confidence interval of 60–89%) and a producers' accuracy of 92%. The AA discloses three instances where FSFE was mapped either too aggressively (to two map classes) or too conservatively (from the FSFD map class). Almost all the error, both users' and producers', comes from confusion with the FSFD map class. The confusion was caused by misinterpretation of whether the shrub and herb layer was evergreen (for FSFE) or deciduous (for FSFD).



Two examples of the FSFE map class showing the potential for a sparse evergreen shrub layer over dense conifer regeneration, generally with a more closed canopy (left), and the potential for a dense evergreen shrub layer, generally with a more open canopy (right).

WPPS – Pitch Pine Rocky Summit

The Pitch Pine Rocky Summit (WPPS) map class represents the *Pinus rigida* / (*Quercus ilicifolia*) / *Photinia melanocarpa* / *Deschampsia flexuosa* Woodland Association (CEGL006116) in the USNVC. This map class represents dry pine woodlands and open forest within the AT corridor from the Delaware River in New Jersey north to northern Massachusetts. The WPPS map class is rare within the corridor covering 37.1 ha (0.03% of APPA).

The WPPS map class is defined by an open pitch pine (*Pinus rigida*) dominated canopy, with a dark-pink to purple small and wispy crown, on hot or dry and often steep topographic positions under 730 m elevation. Often, patches of bear oak (*Quercus ilicifolia*), with a tight and flat orange-tan canopy, were present as a dominant tall shrub.

The AA results indicate that WPPS was mapped well with a users' accuracy of 100% and a producers' accuracy of 96%. The AA discloses one instance where WPPS was mapped too conservatively from the co-occurring WROT map class because of the underestimation of pitch pine canopy cover.



An example of the WPPS map class showing a pitch pine dominated woodland over open grass and shrub.

WSFR – Northern Appalachian Red Spruce Rocky Ridge

The Northern Appalachian Red Spruce Rocky Ridge (WSFR) map class represents the *Picea rubens* / *Vaccinium angustifolium* / *Sibbaldiopsis tridentata* Woodland Association (CEGL006053) in the USNVC. The woodland association that makes up this map class occurs within the AT corridor from the Connecticut River in New Hampshire north to Mount Katahdin in Maine. The WSFR map class is uncommon within the corridor covering 287.3 ha (0.3% of APPA).

The WSFR map class is on upper slopes and ridge tops below 1,000 m elevation where bedrock is at the surface in the AT corridor. Often exclusively dominated by red spruce (*Picea rubens*), which present as dark-red to purple pointy cones of similar size and height, this map class is generally an open and patchy woodland with large areas of open shrub, herb, and bedrock visible in the canopy gaps.

The WSFR map class was mapped very consistently. The AA process discovered no new instances of the WSFR map class, and no instances of WSFR were confused with a different map class.



An example of the red spruce dominated woodland over bedrock that defines the WSFR map class.

FAMO – Appalachian Mixed Oak Forest

The Appalachian Mixed Oak Forest (FAMO) map class represents the following six associations in the USNVC:

- *Quercus rubra* - *Acer rubrum* / *Pyrularia pubera* / *Thelypteris noveboracensis* Forest (CEGL006192),
- *Quercus alba* - *Quercus* (*rubra*, *prinus*) / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest (CEGL007230),
- *Quercus alba* - *Quercus rubra* - *Carya ovalis* / *Acer saccharum* / *Polystichum acrostichoides* Forest (CEGL007233),
- *Quercus alba* - *Quercus coccinea* - *Quercus falcata* / *Kalmia latifolia* - *Vaccinium pallidum* Forest (CEGL007691),
- *Quercus alba* - *Quercus rubra* - *Quercus prinus* / *Collinsonia canadensis* - *Podophyllum peltatum* Forest (CEGL007692), and
- *Quercus rubra* - *Tilia americana* var. *heterophylla* - (*Halesia tetraptera* var. *monticola*) / *Collinsonia canadensis* - *Prosartes lanuginosa* Forest (CEGL007878).

This map class primarily represents a very diverse mix of red and white oak (*Quercus rubra*, *Q. alba*) dominated forest in the AT corridor from Springer Mountain in Georgia north to the New River in Virginia. The FAMO map class is very common within the corridor covering 6,047.5 ha (5.5% of APPA).

The FAMO map class is a complex mix of low-elevation mesic to dry-mesic northern red oak and white oak dominated forests resulting from map-class collapses that occurred post-mapping. The FAMO map class was initially conceived as two map classes that represented low-elevation mesic to dry-mesic forest dominated by either northern red oak or white oak. During the AA process, however, the two map classes were consistently confused because northern red oak and white oak were confused or because northern red oak and white oak intermixed.

The signature and landscape position of FAMO that proved reliable because this map class exists on lower and mid-slopes in mesic to dry-mesic positions below 1,220 m elevation, though occasionally up to 1,280 m elevation. These oak forests generally present a crisp, darker-pink to red and broad-crowned canopy representing the red and white oak. These forests are intermixed with lighter-pink and white-crowned oaks with smaller crowns representing other oak species, yellow-crowned hickory (*Carya* spp.), and various hardwood tree species.

The AA results indicate that FAMO was mapped with both a users' and producers' accuracy of 74% (90% confidence interval of 66–82%). The AA discloses several instances where FAMO was mapped either too aggressively (to four map classes) or too conservatively (from six map classes). The majority of the users' errors come from an overly aggressive application among co-occurring oak forest map classes, whereas the majority of the producers' errors come from an overly conservative application among co-occurring hardwood forest map classes.



Four examples of the FAMO map class showing associations CEGL006192 (upper left), CEGL007230 (upper right), CEGL007692 (lower left), and CEGL007878 (lower right). All examples show a closed northern red oak or white oak canopy over a variety of different shrub and herb layers.

FAOH – Central Appalachian Oak - Hickory Forest

The Central Appalachian Oak - Hickory Forest (FAOH) map class represents the following five associations in the USNVC:

- *Quercus rubra* - *Quercus prinus* - *Carya ovalis* / (*Cercis canadensis*) / *Solidago caesia* Forest (CEGL008514),
- *Quercus alba* - *Quercus prinus* - *Carya glabra* / *Cornus florida* / *Vaccinium pallidum* Forest (CEGL008515),
- *Quercus prinus* - *Quercus rubra* - *Carya ovalis* / *Carex pensylvanica* - (*Calamagrostis porteri*) Forest (CEGL008516),
- *Quercus rubra* - *Acer saccharum* / *Ostrya virginiana* / *Cardamine concatenata* Forest (CEGL008517), and
- *Quercus rubra* - *Carya ovata* - *Fraxinus americana* / Actaea racemosa - *Hydrophyllum virginianum* Forest (CEGL008518).

This map class primarily represents a very diverse mix of mixed oak (*Quercus* spp.) and hickory (*Carya* spp.) dominated forest in the AT corridor from the South Fork Holston River in Virginia north to the Maryland-Pennsylvania border. The FAOH map class is very common within the corridor covering 5,973.6 ha (5.4% of APPA).

The FAOH map class presents a complex mix of low-elevation to mid-elevation mesic to dry-mesic forests held together by the consistent mix of oak, hickory, and occasional hardwood tree species. The signature and landscape position of FAOH proved reliable because this map class exists on lower and mid-slopes in mesic to dry-mesic positions below 1,220 m elevation, though occasionally up to 1,280 m elevation. The oaks in this forest generally present as crisp, tan to pink to red-crowned narrow to broad-branching trees with a somewhat open to completely closed canopy. White to yellow-crowned hickory, which have a fuzzier appearance with smaller, more open crowns, and a wide mix of other hardwood tree species, consistently mix with the other hardwood tree species.

The AA results indicate that FAOH was mapped with a users' accuracy of 69% (90% confidence interval of 53–85%) and a producers' accuracy of 53% (90% confidence interval of 38–67%). The AA discloses several instances where FAOH was mapped either too aggressively (to 5 map classes) or too conservatively (from 10 map classes). The majority of these errors, both users' and producers', come from occasional confusion with four different co-occurring oak forest map classes.

The 90% confidence interval for the producers' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower producers' accuracy for the FAOH map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."




Two examples of the FAOH map class showing association CEGL008514 (left), which is a much more acidic mix of oak and hickory, compared to association CEGL008518 (right), which is a much more calcareous mix of oak and hickory.

FCAO – Central Appalachian Oak Forest

The Central Appalachian Oak Forest (FCAO) map class represents two associations in the USNVC—the *Quercus prinus* - *Quercus rubra* / *Hamamelis virginiana* Forest (CEGL006057) and the *Quercus prinus* - *Quercus rubra* / *Vaccinium pallidum* - (*Rhododendron periclymenoides*) Forest (CEGL008523). The forest associations that make up this map class occur within the AT corridor from Giles County in Virginia north to the Delaware River in Pennsylvania. The FCAO map class is common within the corridor covering 2,764.5 ha (2.49% of APPA).

Dominated by a mix of northern red oak (*Quercus rubra*) and chestnut oak (*Quercus prinus*) over deciduous shrub, this map class generally was most common on dry-mesic slopes below 1,070 m elevation. Because of an identical signature with some associations in the FCOM map class, mappers consulted with ecologists for a geographic location to split the two map classes and determined this location to be the Montgomery-Giles County line in Virginia. Following AA, however, a complicating factor arose when a secondary, rare map class that spanned this line collapsed into the FCOM map class. This factor has resulted in a small area of FCOM to be mapped north of the Montgomery-Giles County line; but the vegetation in this small group of polygons is singularly attributed to the *Quercus prinus* / *Rhododendron catawbiense* - *Kalmia latifolia* Forest Association (CEGL00008524) in FCOM, which has an evergreen understory not in FCAO.

The FCAO map class generally presents as large-crowned closed-canopy oaks with crisp, pink or red crowns with forests tending to be a good mix of pink and red crowns, though some examples are only of pink or, more commonly, red crowns. Notably absent are hardwood trees or hickory (*Carya* spp.) from the canopy, which helps distinguish this map class from the very common FAOH. Occasionally, in areas prone to ice storms or gypsy moth (*Lymantria dispar*) damage, this forest presents a very broken and degraded canopy, though the forest maintains the other aspects familiar to the map class.

The AA results indicate that FCAO was mapped with a users' accuracy of 70% (90% confidence interval of 55–85%) and a producers' accuracy of 47% (90% confidence interval of 33–60%). The AA discloses several instances where FCAO was mapped either too aggressively (to 5 map classes) or too conservatively (from 11 map classes). For the map classes with users' error, all but one class also had producers' error; and, these four classes were also oak forest map classes, showing a general confusion between these oak forest map classes. For the remaining map classes with producers' errors, the errors are generally in hardwood forest map classes and indicate a consistent underestimation of oak cover in these map classes.

The 90% confidence interval for the producers' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower producers' accuracy for the FCAO map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."




Two examples of the FCAO map class showing associations CEGL006057 (left) and CEGL008523 (right).

FCHO – Central Appalachian Hemlock - Chestnut Oak Forest

The Central Appalachian Hemlock - Chestnut Oak Forest (FCHO) map class represents the *Tsuga canadensis* - *Quercus prinus* - *Betula lenta* Forest Association (CEGL006923) in the USNVC. The forest association that makes up this map class within the AT corridor only occurs from central Pennsylvania to central Massachusetts. The FCHO map class is uncommon within the corridor covering 231.4 ha (0.2% of APPA).

Dominated by a mix of eastern hemlock (*Tsuga canadensis*) and chestnut oak (*Quercus prinus*), the FCHO map class is restricted to north-facing or other protected slopes below 550 m elevation. Generally, this map class presents as a chestnut oak forest with bright-pink, crisp, and broad crowns with the occasional tall eastern hemlock poking a dark-purple top through the oak crowns. When examined more closely, especially with ancillary leaf-off imagery, the amount of hemlock cover in these forests would become much more apparent. On occasion, especially in the northern portion of the range of this map class, northern red oak (*Quercus rubra*) would mix with, or even supplant the chestnut oak, providing for a red rather than pink oak canopy.

A confusing factor is that when this project initiated, eastern hemlock was healthy in the southern portion of the AT corridor; however, as the project progressed, various non-native insects nearly eliminated this species in the southern range of this map class, while leaving eastern hemlock untouched in the northern portions.

The AA results indicate that FCHO was mapped with a users' accuracy of 67% (90% confidence interval of 51–83%) and a producers' accuracy of 71% (90% confidence interval of 56–87%). The AA discloses several instances where FCHO was mapped either too aggressively (to three map classes) or too conservatively (from eight map classes). The errors come either from an overly aggressive estimation of hemlock cover for the users' error or from an overly conservative estimation of hemlock cover for the producers' error.



An example of the FCHO map class showing the characteristically mix of chestnut oak and eastern hemlock.

FCNO – Central & Northern Oak Forest

The Central & Northern Oak Forest (FCNO) map class represents the following six associations in the USNVC:

- *Quercus* (*velutina*, *alba*) / *Vaccinium pallidum* / *Pteridium aquilinum* High Allegheny Plateau, Western Allegheny Plateau Forest (CEGL006018),
- *Acer saccharum* - *Quercus rubra* / *Hepatica nobilis* var. *obtusa* Forest (CEGL006046),
- *Quercus prinus* - *Quercus* (*rubra*, *velutina*) / *Vaccinium* (*angustifolium*, *pallidum*) Forest (CEGL006282),
- *Quercus* (*alba*, *rubra*, *velutina*) - *Carya* spp. / *Viburnum acerifolium* Forest (CEGL006336),
- *Quercus rubra* - *Acer saccharum* - *Fagus grandifolia* / *Viburnum acerifolium* Forest (CEGL006633), and
- *Quercus rubra* - *Acer saccharum* / *Viburnum acerifolium* - *Lindera benzoin* Forest (CEGL006635).

This map class primarily represents a very diverse mix of oak (*Quercus* spp.) forests within the AT corridor from the Conodoguinet Creek in Pennsylvania north to the terminus in Maine. The FCNO map class is very common within the corridor covering 8,324.1 ha (7.5% of APPA), making FCNO the second-most common map class in the corridor.

The FCNO map class is an oak-dominated (generally greater than 40% canopy) forest with varying amounts of codominant hickory (*Carya* spp.) and northern hardwoods. Extensively covering mesic lowlands up to dry-mesic ridgetops, the northern and southern ends of this map class differ greatly, but the incremental changes between associations were insufficient to further split these associations into more map classes. The oak in the map class generally present as crisp, darker-pink to red, broad-crowned, closed-canopy trees. These oak may or may not be intermixed with lighter-pink, yellow, and white-crowned hickory and northern hardwoods with smaller crowns.

Occasionally, in areas prone to ice storms or gypsy moth (*Lymantria dispar*) damage, this forest presents a very broken and degraded canopy, though the forest maintains the other aspects familiar to the map class. When the canopy becomes too disturbed, the crowns too young and small, or the hardwood species more ruderal in nature, indicates that the forest would be more accurately represented by the FXOM map class.

A point of confusion for the FCNO map class is that association CEGL006282 also occurs in the FCNO map class north of DEWA, though not south of DEWA. Additionally, CEGL006282 occurs in the FSCO map class, and FSCO and FCNO overlap. This complication results from the unforeseen collapse of oak heath map classes north of DEWA, but not south of DEWA.

The AA results indicate that FCNO was mapped with a users' accuracy of 86% and a producers' accuracy of 75% (90% confidence interval of 67–83%). The AA discloses several instances where FCNO was mapped either too aggressively (to six map classes) or too conservatively (from nine map classes). The users' error is split into either an overly aggressive application of FCNO among other oak-dominated map classes or an over estimation of oak cover in hardwood forest map classes. The

producers' errors are more widely spread among an overly conservative estimation of oak canopy coverage in oak woodland map classes, an under estimation of oak coverage in hardwood forest map classes, and an under estimation of oak coverage in a mixed conifer-oak map class.



Four examples of the FCNO map class showing associations CEGL006046 (upper left), CEGL006282 (upper right), CEGL006336 (lower left), and CEGL006635 (lower right). All examples show a closed oak canopy with or without mixed hickory and northern hardwoods over a variety of different shrub and herb layers.

FCOH – Chestnut Oak / Heath Forest

The Chestnut Oak / Heath Forest (FCOH) map class represents two associations in the USNVC—the *Quercus prinus* - (*Quercus coccinea*, *Quercus rubra*) / *Kalmia latifolia* / *Vaccinium pallidum* Forest (CEGL006299) and the *Quercus alba* - *Quercus* (*coccinea*, *velutina*, *prinus*) / *Gaylussacia baccata* Forest (CEGL008521). The forest associations that make up this map class are in the AT corridor from central Virginia north to the Conodoguinet Creek in Pennsylvania. The FCOH map class is very common within the corridor covering 6,234.4 ha (5.6% of APPA).

The FCOH map class is an oak-dominated (generally greater than 40%, often greater than 75% canopy) forest with varying amounts of hickory (*Carya* spp.) and hardwoods and occasional (less than 25% canopy) pine (*Pinus* spp.) over a heath shrub layer. Extensively covering dry-mesic and hot, dry slopes and ridgetops, this map class will also creep around to cooler, more sheltered slopes where little soil is present to maintain moisture in the forest. The oak in the map class generally present as crisp, tan, pink, and red, small- to medium-crowned, open- to closed-canopy trees. These oak may or may not be intermixed with lighter-pink, orange, yellow, and white-crowned hickory and hardwoods with smaller crowns. Occasionally, in areas affected by ice storms or gypsy moth (*Lymantria dispar*) damage, this forest presents a very broken and degraded canopy, though the forest maintains the other aspects familiar to the map class.

Because of an identical signature with some associations in the FCOM and FSCO map classes, mappers consulted with ecologists for a geographic location to split these map classes. The FCOH-FCOM split was determined to be the Montgomery-Giles County line in Virginia. However, following AA, a complicating factor arose when a secondary, rare map class that spanned this line collapsed into the FCOM map class. This factor has resulted in a small area of FCOM to be mapped north of the Montgomery-Giles County line; but the vegetation in this small group of polygons is singularly attributed to the *Quercus prinus* / *Rhododendron catawbiense* - *Kalmia latifolia* Forest Association (CEGL00008524) in FCOM, which has a rhododendron understory not in FCOH. The FCOH-FSCO split was determined to be the Conodoguinet Creek in Pennsylvania, and these two map classes do not overlap.

The AA results indicate that FCOH was mapped with a users' accuracy of 77% (90% confidence interval of 62–91%) and a producers' accuracy of 82%. The AA discloses several instances where FCOH was mapped either too aggressively (to four map classes) or too conservatively (from three map classes). The majority of these errors are caused by a misinterpretation of the oak species causing confusing with other co-occurring oak forest map classes.




Two examples of the FCOH map class showing associations CEGL006299 (left) and CEGL008521 (right) with a closed oak canopy over a heath shrub layer.

FCOM – Chestnut Oak - Mixed Oak Forest

The Chestnut Oak - Mixed Oak Forest (FCOM) map class represents the following five associations in the USNVC:

- *Quercus rubra* - *Quercus prinus* - *Magnolia* (*acuminata*, *fraseri*) / *Acer pensylvanicum* Forest (CEGL004817),
- *Quercus* (*prinus*, *coccinea*) / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271),
- *Quercus prinus* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest (CEGL006286),
- *Quercus prinus* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL007267), and
- *Quercus prinus* / *Rhododendron catawbiense* - *Kalmia latifolia* Forest (CEGL008524).

This map class primarily represents a very diverse mix of red and chestnut oak (*Quercus rubra*, *Q. prinus*) dominated forest in the AT corridor from Springer Mountain in Georgia north to central Virginia. The FCOM map class is very common within the corridor covering 4,973.5 ha (4.5% of APPA).

The FCOM map class is an oak-dominated (generally greater than 40%, often greater than 75% canopy) forest with varying amounts of hickory (*Carya* spp.) and hardwoods and occasional (less than 25% canopy) pine (*Pinus* spp.) over a heath shrub layer that can be deciduous, evergreen, or mixed. Extensively covering dry-mesic and hot, dry slopes and ridgetops, this map class will also creep around to cooler, more sheltered slopes where little soil is present to maintain moisture in the forest. The oak in the map class generally present as crisp, tan, pink, and red, small- to medium-crowned, open- to closed-canopy trees. These may or may not be intermixed with lighter-pink, orange, yellow, and white-crowned hickory and hardwoods with smaller crowns. Occasionally, in areas affected by ice storms, forest fires, or gypsy moth (*Lymantria dispar*) damage, this forest presents a very broken and degraded canopy, though the forest maintains the other aspects familiar to the map class.

Because of an identical signature with some associations in the FCOM and FCOH map classes, mappers consulted with ecologists for a geographic location to split these two map classes and determined this location to be the Montgomery-Giles County line in Virginia. However, following AA, a complicating factor arose when a secondary, rare map class that spanned this line collapsed into the FCOM map class. This factor has resulted in a small area of FCOM to be mapped north of the Montgomery-Giles County line; but the vegetation in this small group of polygons is singularly attributed to the *Quercus prinus* / *Rhododendron catawbiense* - *Kalmia latifolia* Forest Association (CEGL00008524) in FCOM, which has a rhododendron understory not in FCOM or FCOH.

The AA results indicate that FCOM was mapped with a users' accuracy of 86% and a producers' accuracy of 54% (90% confidence interval of 45–63%). The AA discloses several instances where FCOM was mapped either too aggressively (to 4 map classes) or too conservatively (from 14 map classes). Most of the users' errors relate to confusion with other co-occurring oak forest map classes.

The producers' errors indicate confusion with co-occurring oak forest map classes, an overly conservative estimation of oak cover in ruderal hardwood forest map classes, an overly conservative estimation of oak cover in mixed conifer-oak forest map classes, and an overly conservative estimation of oak canopy cover in oak woodland map classes.

The 90% confidence interval for the producers' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a lower producers' accuracy for the FCOM map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."



Four examples of the FCOM map class showing associations CEGL004817 with a deciduous shrub layer (upper left), CEGL006271 with a deciduous shrub layer (upper right), CEGL006271 with an evergreen shrub layer (lower left), and CEGL006286 with an evergreen shrub layer (lower right). All examples show the associations under a chestnut oak canopy.

FMCO – Appalachian Sugar Maple - Chinquapin Oak Limestone Forest

The Appalachian Sugar Maple - Chinquapin Oak Limestone Forest (FMCO) map class represents the *Acer saccharum* - *Quercus muehlenbergii* / *Cercis canadensis* Forest Association (CEGL006017) in the USNVC. The forest association that makes up this map class only occurs in the AT corridor at one site in central Virginia. The FMCO map class is exceptionally rare within the corridor covering 1.4 ha (0.001% of APPA).

Based on vegetation plot data and conversations with ecologists, the FMCO map class was a "map known locations" map class, which means that only confirmed locations were mapped. For FMCO, therefore, a single polygon was mapped in southwestern Virginia on a steeply sloping, sheltered, calcareous hillside. This location was supported by both a vegetation plot and a field reconnaissance visit prior to mapping. The site generally presents as mixed oak-mixed northern hardwood forest, with the oaks having crisp, pink and orange broadly branching crowns and the northern hardwoods having fluffy white, yellow, and pink crowns between and below the larger oaks. This signature is similar to potential signatures in the FAOH and FAMO map classes; therefore, the potential exists for other examples of the FMCO on the landscape, but no others are known.

The FMCO map class was mapped very consistently. The AA process discovered no new instances of the FMCO map class, and no instances of FMCO were confused with a different map class.



An example of the FMCO map class showing the light-green sugar maple canopy interspersed with chinquapin oak.

FOHG – Oak - Hickory Forest & Woodland

The Oak - Hickory Forest & Woodland (FOHG) map class represents two associations in the USNVC—the *Quercus rubra - Carya* (*glabra*, *ovata*) / *Ostrya virginiana* / *Carex lucorum* Forest (CEGL006301) and the *Carya glabra* Woodland (CEGL006640). The associations that make up this map class occur in the AT corridor from the southwestern side of DEWA in Pennsylvania north to the Connecticut-Massachusetts border. The FOHG map class is uncommon within the corridor covering 227.7 ha (0.2% of APPA).

Dominated by a mix of northern red oak (*Quercus rubra*) and hickory (*Carya* spp.) over herbaceous vegetation, the FOHG map class was on dry-mesic moderate to steep slopes with a warm aspect below 490 m elevation. Initially, only the association CEGL006301 defined this map class; however, during the AA process, several sites were discovered that did not fit well with CEGL006301 or with any other existing association. The classifiers, therefore, decided to create association CEGL006640 to define this association. The vegetation in CEGL006640 was only noted in the FOHG map class. Presenting as an open woodland (at least 25% canopy cover) to moderately-closed forest, the canopy of FOHG is generally a mix of codominant northern red oak, with crisp, red crowns and mixed hickory, with soft, white, yellow, and greenish-tan crowns.

The AA results indicate that FOHG was mapped with a users' accuracy of 90% and a producers' accuracy of 75% (90% confidence interval of 62–88%). The AA discloses several instances where FOHG was mapped either too aggressively (to two map classes) or too conservatively (from three map classes). The majority of these errors come from confusion with the WROT map class, which is a co-occurring oak-dominated woodland map class.



Two examples of the FOHG map class showing the closed-canopy association CEGL006301 over sedge with oak and hickory codominant (left) and open hickory-dominated woodland association CEGL006640 (right).

FSCO – Lower New England High Slope Chestnut Oak Forest

The Lower New England High Slope Chestnut Oak Forest (FSCO) map class represents the *Quercus prinus* - *Quercus* (*rubra*, *velutina*) / *Vaccinium* (*angustifolium*, *pallidum*) Forest Association (CEGL006282) in the USNVC. The forest association that makes up this map class is in the AT corridor from north of Conodoguinet Creek in Pennsylvania north to the southwestern boundary of DEWA in Pennsylvania. The FSCO map class is very common within the corridor covering 4,144.0 ha (3.7% of APPA).

The FSCO map class is an oak-dominated (generally greater than 40%, often greater than 90% canopy) forest with varying amounts of hickory (*Carya* spp.) and hardwoods, and the map class defines the dry ridgetops that the AT corridor runs along in Pennsylvania. Extensively covering these dry, hot, and acidic slopes and ridgetops, this map class will also creep around to cooler, more sheltered slopes where little soil is present to maintain moisture in the forest. The oak in the map class generally present as crisp, tan, pink, and red, small- to medium-crowned, open- to closed-canopy trees. These oak may or may not be intermixed with lighter-pink, orange, yellow, and white-crowned hickory and hardwoods with smaller crowns, especially in areas that experienced persistent disturbance. Occasionally, in areas affected by ice storms or gypsy moth (*Lymantria dispar*) damage, this forest presents a very broken and degraded canopy, though the forest maintains the other aspects familiar to the map class.

Because of an identical signature and structure with the FCOH map class, mappers consulted with ecologists for a geographic location to split the two map classes and determined this location to be the Conodoguinet Creek in Pennsylvania.

A point of confusion for the FSCO map class is that association CEGL006282 also occurs in the FCNO map class north of DEWA, but not south of DEWA and also because the map classes FSCO and FCNO overlap. This complication results from the unforeseen collapse of oak heath map classes north of DEWA, but not south of DEWA.

The AA results indicate that FSCO was mapped with a users' accuracy of 70% (90% confidence interval of 55–84%) and a producers' accuracy of 77% (90% confidence interval of 62–91%). The AA discloses several instances where FSCO was mapped either too aggressively (to five map classes) or too conservatively (from five map classes). The great majority of the users' errors come from an overly aggressive application among co-occurring oak forest map classes, while the producers' error is split between an overly conservative application from co-occurring ruderal hardwood forest map classes and from among co-occurring oak forest map classes.



An example of the FSCO map class showing the dry and acidic oak forest of association CEGL006282 in central Pennsylvania.

FSMC – Sugar Maple - Chinquapin Oak / Sedge Forest

The Sugar Maple - Chinquapin Oak / Sedge Forest (FSMC) map class represents the *Acer saccharum* - *Quercus muehlenbergii* / *Carex platyphylla* Forest Association (CEGL006162) in the USNVC. The forest association that makes up this map class only occurs within the AT corridor at three disjunct locations in New Jersey, Connecticut, and Massachusetts. The FSMC map class is exceptionally rare within the corridor covering 7.6 ha (0.007% of APPA).

Based on vegetation plot data and conversations with ecologists, the FSMC map class was a "map known locations" map class, which means that only confirmed locations were mapped. For FSMC, that means only three groups on a sloping calcareous hillside were mapped. These locations were supported by both vegetation plots and field reconnaissance visits. The sites generally present as diverse oak-hardwood forest with the hardwoods having fluffy white or leaf-off crowns and the oak having crisp, broad, bright-red crowns. This signature is similar to potential signatures in the FCNO map class; therefore, the potential exists for other examples of the FSMC on the landscape, but no others are known.

The FSMC map class was mapped very consistently. The AA process discovered no new instances of the FSMC map class and determined only one site to be confused with a different map class. The AA, therefore, disagreed with the mapping field reconnaissance call and determined that the site was too disturbed and should have been mapped as FXCH.



An example of the FSMC map class showing the light-green sugar maple canopy interspersed with large American basswood (*Tilia americana* var. *heterophylla*) and yellow buckeye (*Aesculus flava*).

FARB – Southern Appalachian Hardwood Rich Boulderfield Forest

The Southern Appalachian Hardwood Rich Boulderfield Forest (FARB) map class represents the *Betula alleghaniensis* - *Tilia americana* var. *heterophylla* / *Acer spicatum* / *Ribes cynosbati* / *Dryopteris marginalis* Forest Association (CEGL004982) in the USNVC. The forest association that makes up this map class only occurs in the AT corridor in the southern portion and is limited to the lower elevations (below 1,220 m elevation). The FARB map class is exceptionally rare within the corridor covering 7.4 ha (0.007% of APPA).

This map class, with an open canopy of mixed northern hardwood tree species, exists over boulders and only occurs below 1,220 m elevation within the AT corridor. Often intermixed with low-elevation oak forest, this hardwood tree-dominated map class was readily visible. Generally, FARB presents as a hardwood forest of white and yellow fuzzy-crowned trees on steep slopes, with the rocky substrate visible through the canopy gaps.

The AA results indicate that FARB was mapped with both a users' and producers' accuracy of 60% (90% confidence interval of 14–106%). Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals. The AA discloses three instances where FARB was mapped either too aggressively (to two map classes) or too conservatively (from the FSAH map class). The users' errors come from an overly aggressive application among co-occurring ruderal hardwood forest map classes, while the producers' errors come from an overly conservative application with FSAH.



An example of the FARB map class showing the open canopy dominated by northern hardwood tree species over a bouldery substrate.

FCHW – Central Appalachian Hardwood Forest & Woodland

The Central Appalachian Hardwood Forest & Woodland (FCHW) map class represents the following 14 associations in the USNVC:

- *Fraxinus americana - Carya glabra* / *Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland (CEGL003683),
- *Liriodendron tulipifera - Quercus rubra - Fraxinus americana* / Asimina triloba / *Actaea racemosa* Forest (CEGL006186),
- *Acer saccharum - Fraxinus americana - Tilia americana - Liriodendron tulipifera* / *Actaea racemosa* Forest (CEGL006237),
- *Liriodendron tulipifera - Platanus occidentalis - Betula lenta* / *Lindera benzoin* / *Circaea lutetiana* ssp. *canadensis* Floodplain Forest (CEGL006255),
- *Acer saccharum - Tilia americana* / *Staphylea trifolia* / *Dryopteris marginalis* - (*Impatiens pallida*) Forest (CEGL006471),
- *Betula lenta - Quercus prinus* / *Parthenocissus quinquefolia* Woodland (CEGL006565),
- *Quercus rubra - Betula lenta* / *Polypodium virginianum* Woodland (CEGL006585),
- *Liriodendron tulipifera - Betula lenta - Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543),
- *Aesculus flava - Acer saccharum* - (*Tilia americana* var. heterophylla) / *Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695),
- *Liriodendron tulipifera - Fraxinus americana* - (*Aesculus flava*) / *A*ctaea racemosa - *Laportea canadensis* Forest (CEGL007710),
- *Liriodendron tulipifera - Pinus strobus* - (*Tsuga canadensis*) / *Carpinus caroliniana* / *Amphicarpaea bracteata* Forest (CEGL008405),
- *Betula alleghaniensis - Quercus rubra* / *Acer spicatum* / *Dryopteris intermedia - Oclemena acuminata* Forest (CEGL008502),
- *Tsuga canadensis - Quercus prinus - Liriodendron tulipifera* / *Kalmia latifolia* - (*Rhododendron catawbiense*) Forest (CEGL008512), and
- *Tilia americana - Fraxinus americana* / *Acer pensylvanicum* / *Parthenocissus quinquefolia - Impatiens pallida* Woodland (CEGL008528).

This map class represents hardwood forests within the AT corridor from southern Virginia north to the Delaware River in Pennsylvania. The FCHW map class is very common within the corridor, covering 3,043.9 ha (2.7% of APPA).

Originally conceived as three separate map classes representing low-elevation mesic hardwood coves, high-elevation northern hardwood forests, and northern hardwood woodland, the AA indicated consistent and significant confusion among the three map classes. High-elevation northern hardwood and low-elevation cove forests were consistently confused, and northern hardwood woodlands were consistently confused with low-elevation cove and high-elevation northern hardwood forests. The result is a map class that represents most of the upland deciduous tree associations over the south-central portion of the AT corridor.

A further point of confusion is that FCHW shares three vegetation associations with FSAH. These three vegetation associations, CEGL007543, CEGL007695, and CEGL007710, are all mesic hardwood cove forests from Virginia and south within the AT corridor. No clear method existed for splitting the associations and grouping the entire hardwood forest system of the southern corridor seemed excessive, so this overlap was accepted to allow for some finer resolution of the vegetation.

A final point of confusion is that when this project initiated, eastern hemlock (*Tsuga canadensis*) was healthy in the southern portion of the AT corridor; however, as the project progressed, various non-native insects nearly eliminated this species in the range of this map class. As a consequence, this map class now contains only a fraction of the eastern hemlock that it once did.

The cove forests of the southern Appalachian Mountains are some of the most biologically diverse ecosystems in the coterminous United States. When grouped together in a map class spanning the majority of mesophytic and northern hardwoods in the south-central portion of the AT corridor, the result is a map class with a wildly variable signature. Although generally dominated by hardwoods, the FCHW map class can also contain as much as 75% canopy cover of eastern white pine (*Pinus strobus*) and eastern hemlock (alive or standing dead). Crown morphology is similarly variable with many different shapes and textures and colors of red, orange, yellow, tan, pink, and white commonly intermixed; however, monotypic stands, especially of tuliptree (*Liriodendron tulipifera*), are possible. Oaks are generally absent from this map class, but may make as much as 25% of the canopy cover. Topographic position is somewhat more indicative of this map class with sheltered locations favoring mesophytic cove forests, but this map class can climb up to the crest of ridges and up the slopes of mountains to nearly 1,220 m elevation. Overall, this map class proves to have a highly variable signature and landscape position.

The AA results indicate that FCHW was mapped with a users' accuracy of 76% (90% confidence interval of 68–84%) and a producers' accuracy of 84%. The AA discloses several instances where FCHW was mapped either too aggressively (to eight map classes) or too conservatively (from eight map classes). The majority of these errors are because of either a misestimation of oak cover (both over and under) or of confusion with the ruderal mixed hardwoods map class FXCH.



Four examples of the FCHW map class showing associations CEGL006186 (upper left), CEGL006237 (upper right), CEGL006565 (lower left), and CEGL007543 (lower right). All examples show a diverse hardwood tree canopy over a variety of different shrub and herb layers.

FNAH – Northern Appalachian Hardwood Forest

The Northern Appalachian Hardwood Forest (FNAH) map class represents the following five associations in the USNVC:

- *Acer saccharum* - (*Fraxinus americana*) / *Arisaema triphyllum* Forest (CEGL006211),
- *Acer saccharum* - *Betula alleghaniensis* - *Fagus grandifolia* / *Viburnum lantanoides* Forest (CEGL006631),
- *Acer saccharum* - *Fagus grandifolia* - *Fraxinus americana* / *Arisaema triphyllum* Forest (CEGL006632),
- *Acer saccharum* - *Fraxinus americana* / *Acer spicatum* / *Caulophyllum thalictroides* Forest (CEGL006636), and
- *Acer saccharum* - *Tilia americana* / *Acer pensylvanicum* / *Caulophyllum thalictroides* Forest (CEGL006637).

This map class represents a very diverse mix of northern hardwood forests within the AT corridor dominated or codominated by sugar maple (*Acer saccharum*) and from the very northeastern corner of Pennsylvania to the terminus in Maine. The FNAH map class is very common within the corridor covering 10,088.7 ha (9.1% of APPA), making FNAH the most common map class in APPA.

The FNAH map class is a complex mix of both rich and typic northern hardwood forests with a highly-variable composition ranging from monotypic stands of single-clade sugar maple to mixed-species mixed-age stands. Initially, this map class contained only three vegetation associations; however, post mapping, two of the associations were split into four. Although a definite geographic split indicates that associations CEGL006632 and CEGL006637 are more southerly than associations CEGL006631 and CEGL006636, association CEGL006211 overlaps the range of the other four associations, and the five associations together provide no discernable signature difference.

Confined to the coolest and most protected topographies in Pennsylvania and New Jersey, the landscape positions occupied by FNAH gradually expand moving northward along the AT corridor until this map class is a ubiquitous forest across the terrain below the conifer forests.

Crown morphology is similarly variable with many different shapes and textures and colors based on stand age, composition, local conditions, and geographic location. Crowns of red, orange, yellow, tan, pink, and white commonly intermix, though monotypic stands, especially of pink and white-crowned sugar maple, are common. Not a mixed forest, this map class cannot have greater than 25% total conifer or greater than 40% northern red oak (*Quercus rubra*) cover in the canopy. Additionally, this map class lacks southern species such as tuliptree (*Liriodendron tulipifera*) and is distinctly upland lacking both swamp and floodplain tree species.

The AA results indicate that FAMA was mapped with a users' accuracy of 82% and a producers' accuracy of 58% (90% confidence interval of 46–71%). The AA discloses several instances where FCAS was mapped either too aggressively (to 5 map classes) or too conservatively (from 11 map classes). The errors fall into three general categories with the misinterpretation of the degree of disturbance in co-occurring ruderal forest map classes, an overly conservative application among

several mixed northern hardwood - conifer map classes, and an overly conservative application among several hardwood swamp forest map classes.

The 90% confidence interval for the producers' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower producers' accuracy for the FNAH map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."



Four examples of the FNAH map class showing associations CEGL006211 (upper left), CEGL006631 (upper right), CEGL006632 (lower left), and CEGL006636 (lower right). All examples show a closed northern hardwood canopy over a variety of different shrub and herb layers.

FOTM – Oak - Tuliptree - Maple Forest

The Oak - Tuliptree - Maple Forest (FOTM) map class represents two associations in the USNVC—the *Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest (CEGL006125) and the *Fagus grandifolia - Betula lenta - Liriodendron tulipifera - Acer saccharum* Forest (CEGL006296). The forest associations that make up this map class occur in the AT corridor from New Jersey north to the terminus in Maine. The FOTM map class is uncommon within the corridor covering 539.2 ha (0.49% of APPA).

The FOTM map class is always a mixed forest on the interface of southern mesic forest, northern hardwood forest, and northern red oak (*Quercus rubra*) forest. Initially, the two associations were mapped separately, but AA indicated consistent confusion between the two map class and the map classes were combined. Sites are codominated to dominated (25–75% canopy cover, each) in turn by northern red oak, sugar maple (*Acer saccharum*), tuliptree (*Liriodendron tulipifera*), and other northern hardwoods, but the exact proportion of any one canopy species varied from site to site. Similarly, this map class presents a very variable signature. Holding this map class together is the consistent presence of tuliptree, with large, soft, pink conical crowns. The tuliptree are then mixed with the crisp, broad, bright-red crowns of northern red oak; the fluffy white to pink crowns of sugar maple; and a variable mix of other northern hardwood tree species with fluffy white, pink, orange, yellow, and tan crowns.

The AA results indicate that FOTM was mapped with a users' accuracy of 52% (90% confidence interval of 35–68%) and a producers' accuracy of 89%. The AA discloses several instances where FOTM was mapped either too aggressively (to nine map classes) or too conservatively (from two map classes). The errors primarily focus on the misestimation of tuliptree canopy cover in other co-occurring forest map classes and secondarily focus on the misinterpretation of the degree of disturbance in ruderal forest map classes.

The 90% confidence interval for the users' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower users' accuracy for the FOTM map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."




Two examples of the FOTM map class showing association CEGL006125 with northern red oak and tuliptree codominant (left) and association CEGL006296 with tuliptree and northern hardwoods codominant (right).

FRVL – Southern Appalachian Limestone Rich Cove Forest

The Southern Appalachian Limestone Rich Cove Forest (FRVL) map class represents the *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* / *Cystopteris bulbifera* - *Asarum canadense* Forest Association (CEGL006472) in the USNVC. The forest association that makes up this map class only occurs within the AT corridor at one site in central Virginia. The FRVL map class is exceptionally rare within the corridor covering only 7.6 ha (0.007% of APPA).

Based on vegetation plot data and conversations with ecologists, the FRVL map class was a "map known locations" map class, which means that only confirmed locations were mapped. For FRVL, that means only two polygons (separated by a road) were mapped in central Virginia on a steeply sloping, sheltered, calcareous hillside. This location was supported by both a vegetation plot and a field reconnaissance visit prior to mapping. The site generally presents as a steep, diverse hardwood forest with the hardwoods having fluffy white, yellow, pink, and red crowns. This signature is similar to possible signatures in the FCHW map class; therefore, the potential exists for other examples of the FRVL on the landscape, but no others are known.

The FRVL map class was mapped very consistently. The AA process discovered no new instances of the FRVL map class, and no instances of FRVL were confused with a different map class.



An example of the FRVL map class showing the light-green sugar maple canopy interspersed with large American basswood (*Tilia americana* var. *heterophylla*) and yellow buckeye (*Aesculus flava*).

FSAH – Southern Appalachian Hardwood Forest

The Southern Appalachian Hardwood Forest (FSAH) map class represents the following six associations in the USNVC:

- *Aesculus flava - Betula alleghaniensis - Acer saccharum* / *Caulophyllum thalictroides - Actaea podocarpa* Forest (CEGL004973),
- *Betula alleghaniensis - Fagus grandifolia* / *Viburnum lantanoides* / *Eurybia chlorolepis - Dryopteris intermedia* Forest (CEGL007285),
- *Liriodendron tulipifera - Betula lenta - Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543),
- *Tsuga canadensis - Halesia tetraptera - Magnolia fraseri* / *Rhododendron maximum* / *Dryopteris intermedia* Forest (CEGL007693),
- *Aesculus flava - Acer saccharum* - (*Tilia americana* var. heterophylla) / *Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695), and
- *Liriodendron tulipifera - Fraxinus americana* - (*Aesculus flava*) / *Actaea racemosa - Laportea canadensis* Forest (CEGL007710).

This map class represents hardwood forest in the AT corridor from the Springer Mountain in Georgia north to the Virginia State Highway 16 crossing and also a small remnant area on Garden Mountain in Virginia above 1,160 m elevation. The FSAH map class is very common within the corridor covering 5,558.8 ha (5.0% of APPA).

Originally conceived as three separate map classes representing low-elevation mesic hardwood coves, high-elevation rich northern hardwood forests, and high-elevation typic northern hardwood forests, the AA indicated consistent and significant confusion among the three map classes. High-elevation typic and rich forests were consistently confused, and low-elevation cove and high-elevation rich forests were consistently confused. The result is a map class that represents most of the upland deciduous tree associations over the southern portion of the AT corridor.

A further point of confusion is that FSAH shares three vegetation associations with FCHW. These three vegetation associations, CEGL007543, CEGL007695, and CEGL007710, are all mesic hardwood cove forests from Virginia and south within the AT corridor. No clear method existed for splitting the associations and grouping the entire hardwood forest system of the southern corridor seemed excessive, so this overlap was accepted to provide opportunities for finer resolution of the vegetation.

A final point of confusion is that when this project initiated, eastern hemlock (*Tsuga canadensis*) was healthy in the southern portion of the AT corridor; however, as the project progressed, various non-native insects nearly eliminated this species in the range of this map class. As a consequence, this map class now contains only a small fraction of the eastern hemlock that it once did.

The cove forests of the southern Appalachian Mountains are some of the most biologically diverse ecosystems in the coterminous United States. When grouped together in a map class spanning the majority of mesophytic and northern hardwoods in the southern AT corridor, the result is a map class

with a wildly variable signature. While generally dominated by hardwoods, this map class can also contain as much as 75% canopy cover of eastern white pine (*Pinus strobus*) and eastern hemlock (alive or standing dead), though rather uncommon. Crown morphology is similarly variable with many different shapes and textures and colors of red, orange, yellow, tan, pink, and white commonly intermixed, though monotypic stands, especially of tuliptree (*Liriodendron tulipifera*), are common. Oaks are generally absent from this map class, but northern red oak (*Quercus rubra*) may make as much as 25% of the canopy cover in a few instances. Topographic position is somewhat more indicative of this map class below 1,050 m elevation with sheltered locations favoring mesophytic cove forests, but this map class can climb up to the crest of ridges and up the slopes of mountains to nearly 1,890 m elevation. At the highest elevations, this map class can cover broad north facing slopes to the exclusion of other map classes. Overall, this map class proves to have a highly-variable signature and landscape position.

The AA results indicate that FSAH was mapped with a users' accuracy of 67% (90% confidence interval of 58–76%) and a producers' accuracy of 83%. The AA discloses several instances where FSAH was mapped either too aggressively (to nine map classes) or too conservatively (from six map classes). The users' errors focus on three themes of overly aggressive application—over estimating hardwood canopy cover in oak forest map classes, misinterpreting the hardwood species in hardwood forest map classes, and over estimating the degree of recovery in ruderal hardwood forest map classes. The producers' errors focus on the two themes of misinterpreting the hardwood species in hardwood forest map classes and underestimating the hardwood canopy cover in mixed conifer-hardwood forest map classes and of misinterpreting the hardwood species in hardwood forest map classes.

The 90% confidence interval for the users' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower users' accuracy for the FSAH map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."



Four examples of the FSAH map class showing associations CEGL004973 (upper left), CEGL007285 (upper right), CEGL007543 (lower left), and CEGL007710 (lower right). All examples show a closed hardwood canopy over a variety of different shrub and herb layers.

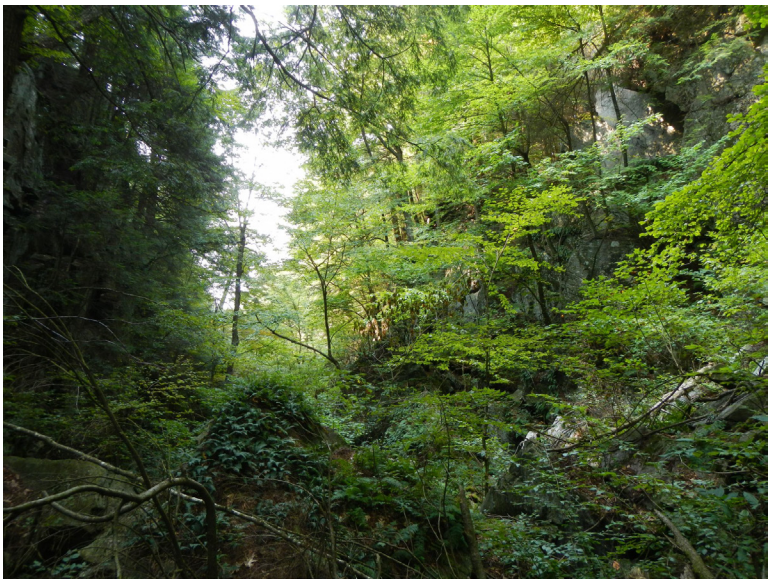
FCHH – Central Appalachian Hemlock - Hardwood Forest

The Central Appalachian Hemlock - Hardwood Forest (FCHH) map class represents two associations in the USNVC—the *Tsuga canadensis - Betula alleghaniensis - Prunus serotina / Rhododendron maximum* Forest (CEGL006206) and the *Tsuga canadensis - Acer saccharum - Fagus grandifolia / Dryopteris intermedia* Forest (CEGL006639). The forest associations that make up this map class occur in the AT corridor from central Virginia north to the Connecticut River in Vermont. The FCHH map class is common within the corridor covering 574.4 ha (0.5% of APPA).

This mixed eastern hemlock (*Tsuga canadensis*) and northern hardwood forest is rarely on protected slopes above 800 elevation m in central Virginia but is commonly on flats below 600 m elevation in northern Vermont. Though the same map class, the large geographic variation allows this map class to occur in very different settings at the ends of its range. A further confusing factor is that when this project initiated, eastern hemlock was healthy in the southern portion of the AT corridor; however, as the project progressed, various non-native insects nearly eliminated this species in the southern range of this map class while leaving the species untouched in the northern portions.

Generally, the FCHH map class presents as a mixed closed-canopy hemlock-hardwood forest. The hemlocks, when alive, have dark-purple fluffy conical crowns and the hardwoods have pink, tan, white, and yellow fuzzy crowns. Topographic position varies greatly across this map class.

The AA results indicate that FCHH was mapped with a users' accuracy of 65% (90% confidence interval of 49–80%) and a producers' accuracy of 87% (90% confidence interval of 73–101%). The AA discloses several instances where FCHH was mapped either too aggressively (to seven map classes) or too conservatively (to the FPHD map class). The majority of the overly aggressive application results from over estimating the amount of eastern hemlock cover, while the overly conservative application results from the complexity of the signature over this map class over the broad range of this map class.



An example of the FCHH map class showing a mix of hemlock and northern hardwoods.

FCHP – Central Appalachian Hardwood - White Pine Forest

The Central Appalachian Hardwood - White Pine Forest (FCHP) map class represents the following four associations in the USNVC:

- *Acer saccharum* - *Pinus strobus* / *Acer pensylvanicum* Forest (CEGL005005),
- *Pinus strobus* - *Quercus* (*rubra*, *velutina*) - *Fagus grandifolia* Forest (CEGL006293),
- *Quercus* (*rubra*, *velutina*, *alba*) - *Betula lenta* - (*Pinus strobus*) Forest (CEGL006454), and
- *Pinus strobus* - *Quercus alba* - *Quercus prinus* / *Vaccinium stamineum* Forest (CEGL008539).

This map class represents a very diverse mix of eastern white pine (*Pinus strobus*) forest mixed with codominant oaks (*Quercus* spp.) and northern hardwoods within the AT corridor from southern Virginia north to the Connecticut River in Vermont. The FCHP map class is uncommon within the corridor covering 368.2 ha (0.3% of APPA).

The FCHP map class is a complex mix of mesic to dry-mesic mixed eastern white pine, oak, and northern hardwood trees at mid- to low-elevations with maximum elevation steadily decreasing from 1,040 m in the southern portion of the range to 640 m in the northern portion of the range. Generally, this is an older, larger-crowned map class because of the broad application of the FXWP map class throughout the AT corridor on younger, more ruderal eastern white pine-dominated forests. The FCHP map class generally presents as a mix of broad and diffusely branching emergent (super canopy) dark-purple eastern white pine intermingled with crisp, red and pink-crowned oaks and a variety of northern hardwoods with white, pink, tan, orange, and yellow fuzzy crowns. The mix of trees will depend on the location and the specific vegetation association; association CEGL006293 is the most common association, but all associations are tied together by the mature super canopy of eastern white pine.

The AA results indicate that FCHP was mapped with a users' accuracy of 81% and a producers' accuracy of 76% (90% confidence interval of 64–89%). The AA discloses three instances where FCHP was mapped either too aggressively (to seven map classes) or too conservatively (from six map classes). The users' error is broad with each error accounting for one site indicating no clear trend, while the producers' error indicates a general trend of underestimating eastern white pine cover.



An example of the most common association in the FCHP map class, association CEGL006293, showing a mix of eastern white pine and oak.

FHHO – Hemlock - Hardwood - Oak Forest

The Hemlock - Hardwood - Oak Forest (FHHO) map class represents two associations in the USNVC—the *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088) and the *Quercus rubra - Tsuga canadensis - Liriodendron tulipifera* / *Hamamelis virginiana* Forest (CEGL006566). The forest associations that make up this map class occur in the AT corridor from New Jersey north to the terminus in Maine. The FHHO map class is common within the corridor covering 1,071.3 ha (1.0% of APPA).

Codominated to dominated (25-75% canopy cover) by eastern hemlock (*Tsuga canadensis*) with codominant (greater than 25% canopy cover) northern red oak (*Quercus rubra*) and a variable mix of associated (less than 25% canopy cover) northern hardwood tree species, this map class rarely occurred above 610 m elevation and was most common below 300 m elevation. The FHHO map class generally presents as a very mixed forest of eastern hemlock, with dark-purple fluffy conical crowns; of northern red oak, with crisp, bright-red broadly branching crowns; and of northern hardwoods, with fuzzy crowns of white, tan, and pink. In the southern portion of the map class, the presence of tuliptree (*Liriodendron tulipifera*), with its conical pink and crisp crown, helped to discern FHHO from other map classes, particularly FHNH. Often, the eastern hemlock crowns were only barely visible through the larger oak crowns and, therefore, relying on ancillary leaf-off imagery was necessary to estimate the eastern hemlock cover in a forest.

A complicating factor is that when this project initiated, eastern hemlock was healthy in the southern portion of the AT corridor; however, as the project progressed, various non-native insects nearly eliminated this species in the southern-most range of this map class while leaving the species untouched in the northern portions.

The AA results indicate that FHHO was mapped with a users' accuracy of 78% (90% confidence interval of 67–88%) and a producers' accuracy of 75% (90% confidence interval of 64–86%). The AA discloses several instances where FHHO was mapped either too aggressively (to seven map classes) or too conservatively (from six map classes). The errors come from both the over and underestimation of hemlock cover in oak forest and hardwood forest map classes, the underestimation of hemlock cover in mixed hemlock forest map classes, and the under estimation of wetland influence in one swamp forest map class.




Two examples of the FHHO map class showing association CEGL006088, with the left example having a more mixed canopy than the right example that is almost entirely hemlock.

FHNH – Hemlock - Northern Hardwood Forest

The Hemlock - Northern Hardwood Forest (FHNH) map class represents the *Tsuga canadensis* - *Betula alleghaniensis* - *Acer saccharum* / *Dryopteris intermedia* Forest Association (CEGL006638) in the USNVC. The forest association that makes up this map class occurs in the AT corridor from the Connecticut River in New Hampshire north to the terminus in Maine. The FHNH map class is uncommon within the corridor covering 117.2 ha (0.1% of APPA).

Codominated to dominated (25-75% canopy cover) by eastern hemlock (*Tsuga canadensis*) with codominant (greater than 25% canopy cover) northern hardwood tree species, this map class rarely occurred above 550 m elevation and was most common below 430 m elevation. Generally restricted to sheltered lower slopes, this map class lacks the eastern white pine (*Pinus strobus*) or red spruce (*Picea rubens*) in drier, higher, and more northerly hemlock map classes. Additionally, this map class is most common in southern New Hampshire and becomes increasingly rare as low-elevation red spruce becomes more common northward.

The FHNH map class generally presents as a very mixed forest of eastern hemlock, with dark-purple fluffy conical crowns and of northern hardwoods, with fuzzy crowns of white, tan, yellow, orange, and pink. Often, the eastern hemlock crowns were only barely visible through the larger oak crowns and, therefore, relying on ancillary leaf-off imagery was necessary to estimate the eastern hemlock cover in a forest.

The AA results indicate that FHNH was mapped with both a users' and producers' accuracy of 80%. The AA discloses three instances where FHNH was mapped either too aggressively (to the FPHD map class) or too conservatively (from the FHSH map class). These errors come from an over estimation of hardwood cover, in the case of FPHD, or from an overly conservative application among FHSH, where spruce is present.



An example of the he FHNH map class showing a mixed canopy of eastern hemlock and northern hardwood. The lack of a shrub or herb layer is common in this map class.

FHSH – Hemlock - Spruce - Hardwood Forest

The Hemlock - Spruce - Hardwood Forest (FHSH) map class represents the *Tsuga canadensis* - (*Betula alleghaniensis*) - *Picea rubens* / *Cornus canadensis* Forest Association (CEGL006129) in the USNVC. The forest association that makes up this map class occurs in the AT corridor from the Connecticut River in New Hampshire north to the terminus in Maine. The FHSH map class is common within the corridor covering 1,183.8 ha (1.1% of APPA).

Codominated to dominated by eastern hemlock (*Tsuga canadensis*), with 25-75% canopy cover; by red spruce (*Picea rubens*), with less than 50% cover; and with codominant (greater than 25% canopy cover) northern hardwood tree species, this map class presents an interesting and complex elevation pattern across its range. Constrained to 550–670 m elevation in Massachusetts, the elevation profile gradually widens as red spruce moves downslope with examples between 330 and 640 m elevation in Vermont, but constricting again as eastern hemlock becomes constrained to lower elevations in Maine, where the range is below 490 m elevation and then only common below 360 m elevation.

The FHSH map class generally presents as a mixed conifer-hardwood forest of eastern hemlock, with dark-purple fluffy conical crowns; of red spruce, with dark-purple flat conical crowns; and of northern hardwoods, with fuzzy crowns of white, tan, yellow, orange, and pink. Often, little to no red spruce was visible in the canopy of northern examples of this map class; however, the presence of red spruce was assumed because of the ubiquity of this species in the north.

The AA results indicate that FHSH was mapped with a users' accuracy of 70% (90% confidence interval of 55–85%) and a producers' accuracy of 88%. The AA discloses several instances where FHSH was mapped either too aggressively (to five map classes) or too conservatively (from three map classes). The majority of the users' errors come from an overly aggressive application among co-occurring spruce and hemlock forest map classes, with a secondary confusion with the FRHS swamp forest map class. The majority of the producers' errors come from an overly conservative application among co-occurring spruce forest map classes.



An example of the FHSH map class showing a mixed canopy of eastern hemlock, red spruce, and northern hardwood.

FHWO – White Pine - Hemlock - Oak Forest

The White Pine - Hemlock - Oak Forest (FHWO) map class represents the following three associations in the USNVC:

- *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102),
- *Pinus strobus* - *Quercus alba* - (*Carya alba*) / *Gaylussacia ursina* Forest (CEGL007517), and
- *Pinus strobus* - *Quercus* (*coccinea*, *prinus*) / (*Gaylussacia ursina*, *Vaccinium stamineum*) Forest (CEGL007519).

This map class primarily represents eastern white pine (*Pinus strobus*) - mixed oak (*Quercus* spp.) forests in the AT corridor from Springer Mountain in Georgia north to very southern Virginia. The FHWO map class is uncommon within the corridor covering 153.6 ha (0.1% of APPA).

When originally conceived, the FHWO map class was three separate map classes. The first collapse happened during verification when the model predicting where mesic association CEGL007517 and dry-mesic association CEGL007519 occur was ineffective. The second collapse happened during the mapping phase when the determination was made that association CEGL007102 with a dead or hidden eastern hemlock (*Tsuga canadensis*) canopy appeared indistinguishable from the eastern white pine - mixed oak associations with a hidden oak canopy.

The FHWO map class is generally on a variety of aspects, slopes, and topographic positions between 550 and 1,100 m elevation. Codominated (each 25–75% canopy cover) by emergent (super canopy) eastern white pine, with broad and diffusely branching dark-purple canopies and by mixed oaks, with crisp, tan, orange, and pink-colored and broad-crowned canopies, the FHWO is a very distinctive map class.

A complicating factor is that when this project initiated, eastern hemlock was healthy in the southern portion of the AT corridor; however, as the project progressed, various non-native insects nearly eliminated this species in the range of this map class. As a consequence, this map class now contains only a fraction of the eastern hemlock that it once did, though the eastern white pine were generally healthy.

The AA results indicate that FHWO was mapped well with a users' accuracy of 83% and a producers' accuracy of 90%. The AA discloses several instances where FHWO was mapped either too aggressively (to three map classes) or too conservatively (from three map classes). The errors were widely scattered and inconsistent, but indicate some confusion in estimating oak, eastern white pine, and eastern hemlock canopy cover on this very mixed forest map class.




Two examples of the FHWO map class showing association CEGL007102 with nearly complete conifer canopy over a very sparse understory (left) compared to association CEGL007519 with a much more mixed canopy and understory and an obvious super canopy of eastern white pine (right).

FCWH – Central Appalachian White Pine - Hemlock Forest

The Central Appalachian White Pine - Hemlock Forest (FCWH) map class represents the following three associations in the USNVC:

- *Pinus strobus - Tsuga canadensis* / *Acer pensylvanicu*m / *Polystichum acrostichoides* Forest (CEGL006019),
- *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. Swamp Forest (CEGL006279), and
- *Liriodendron tulipifera - Pinus strobus - Tsuga canadensis - Quercus rubra* / *Polystichum acrostichoides* Forest (CEGL006304).

This map class primarily represents upland eastern hemlock (*Tsuga canadensis*) - eastern white pine (*Pinus strobus*) forests in the AT corridor from central Virginia north to the Delaware River in Pennsylvania. The FCWH map class is rare within the corridor covering 78.9 ha (0.07% of APPA).

When originally conceived, the FCWH map class represented the two upland associations, CEGL006019 and CEGL006304. During the mapping phase of the Central Appalachian project area, however, the determination was made that low-land CEGL006019 or CEGL006304 would appear identical to association CEGL006279, so this map class was created. However, CEGL006279 subsequently are present in the Lower New England project area in extensive swamp forest complexes. Following poor AA results, CEGL006279 was joined to the FAHS. As a result, the decidedly upland FCWH and decidedly wetland FAHS share occurrences of the quite rare CEGL006279.

The FCWH map class was generally restricted to sheltered location below 550 m elevation, but a few instances occur up to 1,220 m elevation and may represent other vegetation types mapped incorrectly. Dominated (greater than 75% canopy cover) by mature eastern hemlock with a dark-purple conical canopy, emergent (super canopy) eastern white pine with a broad and diffusely branching dark-purple canopy, or a mix of the two, FCWH was a very distinctive and often highly degraded map class. When this project initiated, eastern hemlock was healthy in the southern portion of the AT corridor; however, as the project progressed, various non-native insects nearly eliminated this species in the range of this map class. As a consequence, this map class now contains only a fraction of the eastern hemlock that it once did, though the eastern white pine were generally healthy.

The AA results indicate that FCWH was mapped with a users' accuracy of 67% (90% confidence interval of 50–83%) and a producers' accuracy of 86%. The AA discloses several instances where FCWH was mapped either too aggressively (to seven map classes) or too conservatively (from three map classes). Both the users' and producers' errors fail to indicate a consistent pattern for mapping errors, with errors widely and lightly spread among map classes defined by oak forest, mixed oak-conifer forest, mixed hardwood-conifer forest, ruderal conifer forest, hardwoods swamp forest, dry conifer-oak woodlands, and dry conifer woodland.



An example of the FCWH map class showing surrounding association CEGL006304 with a small herbaceous seep in the middle.

FLSF – Low-Elevation Spruce - Fir Forest

The Low-Elevation Spruce - Fir Forest (FLSF) map class represents two associations in the USNVC—the *Picea rubens - Abies balsamea - Betula papyrifera* Forest (CEGL006273) and the *Picea mariana - Picea rubens / Pleurozium schreberi* Swamp Forest (CEGL006361). The forest associations that make up this map class occur in the AT corridor from northern Massachusetts north to the terminus, but are only common in Maine. The FLSF map class is common within the corridor covering 1,904.0 ha (1.7% of APPA).

Dominated (greater than 50% canopy cover) by red spruce (*Picea rubens*), the FLSF map class often approaches 100% red spruce canopy; can have associated balsam fir (*Abies balsamea*) or black spruce (*Picea mariana*); and generally lacks (less than 25% canopy) northern hardwood tree species, eastern hemlock (*Tsuga canadensis*), and eastern white pine (*Pinus strobus*). This canopy composition was potentially identical to FMSF, so an elevation cutoff of 550 m elevation and below, but up to 670 m based on landscape context, was utilized to split these two map classes. This map class generally presented as sea of red spruce with dark-red to purple pointy cone-shaped crowns of similar size and height interspersed with the fuzzy white, yellow, and pink cone-shaped crowns of northern hardwoods.

While the swamp forest association CEGL006361 is included in this upland map class, in practice CEGL006361 presents an identical signature to association CEGL006273 because CEGL006361 is not a basin forest, but forms on extensive flats where shallow water sits close to the surface over an extended area. No usable indication of ponding or flowing water was visible in the project imagery, and the topographic variations were too slight to reliably split apart these associations.

The AA results indicate that FLSF was mapped with a users' accuracy of 86% and a producers' accuracy of 57% (90% confidence interval of 37–77%). The AA discloses several instances where FLSF was mapped either too aggressively (to two map classes) or too conservatively (from five map classes). The errors come either from an overly aggressive application among eastern hemlock forest map classes or from an overly conservative approach among three co-occurring mixed hardwood - red spruce swamp forest map classes.

The 90% confidence interval for the producers' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower producers' accuracy for the FLSF map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."



Two examples of the FLSF map class showing a version on a flat (left) and a version on a slope (right).

FPHD – Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest

The Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest (FPHD) map class represents the *Pinus strobus - Tsuga canadensis* Lower New England-Northern Piedmont Forest Association (CEGL006328) in the USNVC. The forest association that makes up this map class occurs in the AT corridor from the Connecticut River in New Hampshire north to the terminus in Maine. The FPHD map class is uncommon within the corridor covering 147.7 ha (0.1% of APPA).

Codominated to dominated (25–75% canopy cover, each) by eastern hemlock (*Tsuga canadensis*) and eastern white pine (*Pinus strobus*), this low-elevation conifer forest is nearly identical to the FPHS map class except that FPHD lacks red spruce (*Picea rubens*) while FPHS has red spruce (at least 5% canopy). In practice, this small amount of red spruce is difficult to directly detect, but the geographic and elevational range of the red spruce became indicative of how to reliably split these two map classes. The presence of any red spruce in the canopy was diagnostic for FPHS rather than FPHD.

The FPHD map class generally presents as a mixed forest of eastern hemlock, with dark-purple fluffy conical crowns and of eastern white pine, with a broad and diffusely branching dark-purple crown emergent (super canopy) from the hemlock.

The AA results indicate that FPHD was mapped with a users' accuracy of 67% (90% confidence interval of 50–83%) and a producers' accuracy of 86%. The AA discloses several instances where FPHD was mapped either too aggressively (to three map classes) or too conservatively (from three map classes). The majority of the users' errors come from an overly aggressive application among co-occurring eastern hemlock and eastern white pine forest map classes, while the producers' error indicates no clear pattern.



An example of the FPHD map class showing a mixed canopy of eastern hemlock below emergent eastern white pine. The lack of a shrub or herb layer is common in this map class.

FPHS – White Pine - Hemlock - Red Spruce Forest

The White Pine - Hemlock - Red Spruce Forest (FPHS) map class represents the *Pinus strobus* - *Tsuga canadensis* - *Picea rubens* Forest Association (CEGL006324) in the USNVC. The forest association that makes up this map class occurs in the AT corridor from northern Massachusetts north to the terminus in Maine. The FPHS map class is common within the corridor covering 635.1 ha (0.6% of APPA).

Codominated to dominated (25–75% canopy cover, each) by eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), and red spruce (*Picea rubens*), this low- to mid- elevation conifer forest is nearly identical to the FPHD map class except that FPHS has red spruce (*Picea rubens*) while FPHD lacks red spruce (less than 5% canopy). In practice, this small amount of red spruce is difficult to directly detect, but the geographic and elevational range of the red spruce became indicative of how to reliably split these two map classes. The presence of any red spruce in the canopy was diagnostic for FPHD rather than FPHS. On occasion, eastern white pine was sparse or even absent.

The FPHS map class generally presents as a mixed forest of eastern hemlock, with dark-purple fluffy conical crowns; of red spruce, with dark-red to purple pointy cones; and of eastern white pine, with a broad and diffusely branching dark-purple crown emergent (super canopy) from the hemlock.

The AA results indicate that FPHS was mapped with a users' accuracy of 67% (90% confidence interval of 47–86%) and a producers' accuracy of 74% (90% confidence interval of 54–93%). The AA discloses several instances where FPHS was mapped either too aggressively (to six map classes) or too conservatively (from four map classes). The majority of the users' errors come from an overly aggressive application among co-occurring red spruce forest map classes, while the producers' errors come from an overly conservative application among co-occurring mixed-conifer forest map classes.



An example of the FPHS map class showing a mixed canopy of eastern hemlock and red spruce below emergent eastern white pine. The lack of a shrub or herb layer is common in this map class.

FRWP – White Pine - Red Pine Forest

The White Pine - Red Pine Forest (FRWP) map class represents the *Pinus strobus - Pinus resinosa / Cornus canadensis* Forest Association (CEGL006253) in the USNVC. The forest association that makes up this map class occurs in the AT corridor from the Connecticut River in New Hampshire north to the terminus in Maine. The FRWP map class is rare within the corridor covering 24.9 ha (0.02% of APPA).

Codominated to dominated by both red pine (*Pinus resinosa*) and eastern white pine (*Pinus strobus*) and occasionally completely dominated by red pine, this map class only occurred below 430 m elevation within the AT corridor and was then most common below 300 m elevation.

The FRWP map class generally presents as a mixed conifer forest of red pine, with compact and spherical tan-pink to tan-red crowns and of eastern white pine, with broad and diffusely branching dark-purple crowns. Often, eastern hemlock (*Tsuga canadensis*), red spruce (*Picea rubens*), and mixed northern hardwoods were also present in the canopy, but never greater than 25% total canopy cover.

The AA results indicate that FRWP was mapped well with a users' accuracy of 100% and a producers' accuracy of 89%. The AA discloses one instance where FRWP was mapped too conservatively from the FPHS map class where the cover of red pine was underestimated.



An example of the FRWP map class showing a mixed canopy of red pine and eastern white pine. The thick duff layer shown in the example is characteristic in this map class.

WCNH – Calcareous Northern Hardwood Talus Woodland

The Calcareous Northern Hardwood Talus Woodland (WCNH) map class represents two associations in the USNVC—the *Acer saccharum - Tilia americana - Fraxinus americana* / *Ostrya virginiana* / *Geranium robertianum* Woodland (CEGL005058) and the *Acer saccharum - Fraxinus americana - Juglans cinerea* / *Staphylea trifolia* / *Adlumia fungosa* Forest (CEGL006577). The forest and woodland associations that make up this map class occur within the AT corridor at only three locations in New Jersey, Massachusetts, and Vermont. The WCNH map class is exceptionally rare within the corridor covering 9.1 ha (0.008% of APPA).

Based on vegetation plot data and conversations with ecologists, the WCNH map class was a "map known locations" map class, which means that only confirmed locations were mapped, but because of confusing plot data and similar signatures, the two associations were grouped into a single map class. For WCNH, that means four polygons were mapped with two adjacent to each other in New Jersey and one each in Massachusetts and Vermont. These locations were supported either by vegetation plots or by field reconnaissance visits prior to mapping. The sites generally present as open, mixed northern hardwood forests on steep slopes with talus or boulders often visible and the northern hardwoods having fluffy white, orange, tan, and pink crowns. This signature is similar to potential signatures in the FNAH map class; therefore, the possibility exists for other examples of WCNH on the landscape, but no others are known.

The WCNH map class was mapped very consistently. The AA process discovered no new instances of the WCNH map class, and no instances of WCNH were confused with a different map class.



Two examples of the WCNH map class showing the more open-canopied association CEGL005058 (left) and the more closed-canopy association CEGL006577 (right). Both show a northern hardwood canopy over talus or boulders.

WCRS – Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest

The Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (WCRS) map class represents the *Platanus occidentalis* - *Betula nigra* - *Salix* (*caroliniana*, *nigra*) Floodplain Forest Association (CEGL003896) in the USNVC. The forest association that makes up this map class only occurs within the AT corridor in larger floodplains from southern Virginia to central Pennsylvania. The WCRS map class is exceptionally rare within the corridor covering 1.0 ha (0.0009% of APPA).

This mixed hardwood floodplain forest is along the larger rivers of this section of the AT corridor and generally has a very short, very open canopy. Generally, this map class presents as a hardwood woodland or open forest with small, round, tan to yellow crowns of American sycamore (*Platanus occidentalis*) speckled over a short herb layer in the most active portion of the floodplain.

The AA results indicate that WCRS was mapped with a users' accuracy of 100% and a producers' accuracy of 50% (90% confidence interval of -4–104%). (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses one instance where WCRS was mapped too conservatively from the FFCR map class because of the underestimation of both American sycamore cover in the canopy and the amount of openness in the canopy.



An example of the WCRS map class showing an open, scrubby woodland of American sycamore in the active floodplain of the Potomac River in Virginia.

WDMP – Blue Ridge Mixed Pine Dry Woodland

The Blue Ridge Mixed Pine Dry Woodland (WDMP) map class represents two associations in the USNVC—the *Pinus virginiana* / *Vaccinium pallidum* / *Schizachyrium scoparium* - *Carex pensylvanica* Woodland (CEGL003624) and the *Pinus pungens* - *Pinus rigida* - (*Quercus prinus*) / *Kalmia latifolia* - *Vaccinium pallidum* Woodland (CEGL007097). This map class represents a mix of dry (yellow) pine woodland and open forest mixed with occasional dry oak within the AT corridor from Springer Mountain in Georgia north to southern Virginia. The WDMP map class is uncommon within the corridor covering 152.3 ha (0.1% of APPA).

The WDMP map class is defined by Virginia, Table Mountain, and pitch pine (*Pinus virginiana*, *P. pungens*, and *P. rigida*), commonly called yellow pine, dominated sites on hot and dry topographic positions. Often, hardwood tree species adapted to dry, acidic sites, such as red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), sourwood (*Oxydendrum arboreum*), and scarlet; and, chestnut oak (*Quercus coccinea* and *Q. prinus*) codominated, but never dominated, the canopy with the yellow pine. Occasionally present up to 1,220 m elevation, this map class was most common below 910 m elevation. The WDMP map class generally presents as an open canopy of dark-pink to purple small and tight-crowned conifers intermixed with white, tan, and, occasionally, orange and yellow fluffy-crowned hardwood trees.

The AA results indicate that WDMP was mapped with a users' accuracy of 69% (90% confidence interval of 55–84%) and a producers' accuracy of 89%. The AA discloses several instances where WDMP was mapped either too aggressively (to three map classes) or too conservatively (from two map classes). The users' errors come from an overly aggressive application among the co-occurring FCOM and WMDP map classes. The producers' errors come from an underestimation of recovery in the co-occurring FXVP map class, and an underestimation of recovery and yellow pine canopy cover in the co-occurring SXBG map class.



Two examples of the WDMP map class showing the Virginia pine dominated association CEGL003624 (left) and the mixed yellow pine dominated association CEGL007097 (right). Both examples show a mix of open and closed canopy.

WHOT – Hardwood - Oak Talus Woodland

The Hardwood - Oak Talus Woodland (WHOT) map class represents two associations in the USNVC—the *Alnus viridis* ssp. *crispa* - *Spiraea alba* / *Solidago macrophylla* Shrubland (CEGL006064) and the *Betula alleghaniensis* - *Quercus rubra* / *Polypodium virginianum* Woodland (CEGL006584). This map class primarily represents northern hardwood dominated talus slopes within the AT corridor from the Connecticut River in New Hampshire, to the northern terminus in Maine. The WHOT map class is rare within the corridor covering 46.2 ha (0.04% of APPA).

Originally only association CEGL006584 defined the WHOT map class, but the AA process discovered association CEGL006064 in several areas mapped as WHOT, so CEGL006064 was added to the map class.

The WHOT map class is defined by northern hardwood trees and scrub, generally yellow birch (*Betula alleghaniensis*), over talus and boulders on steep slopes. Occasionally, northern red oak (*Quercus rubra*) was present but rarely codominated. Confined to steep slopes below 1,000 m elevation, this map class generally presents an open canopy of pink, tan, and white-crowned, short- to medium-statured trees with talus and boulders visible through the canopy gaps.

The AA results indicate that WHOT was mapped with a users' accuracy of 79% (90% confidence interval of 63–95%) and a producers' accuracy of 86%. The AA discloses several instances where WHOT was mapped either too aggressively (to four map classes) or too conservatively (from three map classes). Both the users' and producers' errors are spread widely across co-occurring map classes indicating an occasional misestimation of oak canopy cover, total canopy cover, and canopy species composition.



Two examples of the WHOT map class showing the very rare association CEGL006064 (left) compared to the more common association CEGL006584 (right). Both examples show a northern hardwood canopy over rocky substrate on a steep slope.

WJPR – Jack Pine Heath Barrens

The Jack Pine Heath Barrens (WJPR) map class represents the *Pinus banksiana* / *Kalmia angustifolia* - *Vaccinium* spp. Woodland Association (CEGL006041) in the USNVC. The woodland association that makes up this map class only occurs within the AT corridor at one site in north-central New Hampshire. The WJPR map class is exceptionally rare within the corridor covering only 0.3 ha (0.0003% of APPA), making WJPR one of the rarest map classes within APPA.

Based on conversations with ecologists, the WJPR map class was a "map known locations" map class, which means that only confirmed locations were mapped. For WJPR, that means a single polygon is mapped in north-central New Hampshire on the steeply sloping, very exposed, south facing slope of Crawford Notch above the Saco River. Prior to AA, this location was supported only by conversations with ecologists. The site generally presents as a dry (yellow) pine dominated cliff face of conifers with dark-pink compact crowns over heath-covered rocky terrain. This far north, the jack pine (*Pinus banksiana*) is the only yellow pine possible.

The WJPR map class was mapped very consistently. The AA process discovered no new instances of the WJPR map class, and no instances of WJPR were confused with a different map class.



An example of the WJPR map class over the Saco River in north-central New Hampshire.

WMBH – Montane Basic Hardwood - Red-cedar Woodland

The Montane Basic Hardwood - Red-cedar Woodland (WMBH) map class represents the *Carya* (*glabra*, *alba*) - *Fraxinus americana* - (*Juniperus virginiana* var. *virginiana*) Woodland Association (CEGL003752) in the USNVC. The woodland association that makes up this map class only occurs within the AT corridor in northern Georgia on warm slopes over calcareous bedrock. The WMBH map class is rare within the corridor covering 40.3 ha (0.04% of APPA).

This dry, calcareous hardwood woodland map class is on south-facing slopes and exfoliating domes up to 1,340 m elevation within the AT corridor. Supporting a diverse array of herbaceous species, the canopy of WMBH can be similarly diverse with a mix of hickory (*Carya* spp.), white ash (*Fraxinus americana*), and occasionally eastern redcedar (*Juniperus virginiana* var. *virginiana*). Presenting as a short and open canopy of white, pink, and yellow hardwoods intermixed with the short, dense, dark-purple conical conifer crowns of eastern redcedar, the hardwood were always present in this map class and generally dominant; however, on occasion, the conifer did become dominant. In the most open examples, inclusions of the HALD map class were common.

The AA results indicate that WMBH was mapped well with a users' accuracy of 88% and a producers' accuracy of 100%. The AA discloses two instances where WMBH was mapped too aggressively to the FCOM and WMDP map classes because of misinterpretation of the dominant canopy species and their canopy cover.



An example of the WMBH map class showing a rich and diverse herbaceous layer mixed with an open canopy of, in this instance, hickory.

WMDP – Appalachian Mixed Pine - (Oak) Dry Woodland

The Appalachian Mixed Pine - (Oak) Dry Woodland (WMDP) map class represents the following four associations in the USNVC:

- *Pinus* (*pungens*, *rigida*) - *Quercus prinus* / (*Quercus ilicifolia*) / *Gaylussacia baccata* Woodland (CEGL004996),
- *Pinus virginiana* - *Pinus* (*rigida*, *echinata*) - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119),
- *Pinus virginiana* - (*Pinus rigida*, *Pinus pungens*) / *Schizachyrium scoparium* Forest (CEGL008500), and
- *Quercus prinus* - *Pinus virginiana* - (*Pinus pungens*) / *Schizachyrium scoparium* - *Dichanthelium depauperatum* Woodland (CEGL008540).

This map class represents a mix of dry (yellow) pine woodland and open forest mixed with occasional dry oak within the AT corridor Within the corridor, this map class represents a mix of dry (yellow) pine woodland and open forest mixed with occasional dry oak that rarely exists in southern Virginia and is becoming more common northward to east-central Pennsylvania. The WMDP map class is common within the corridor covering 961.3 ha (0.9% of APPA).

The WMDP map class is mapped to the known locations of associations CEGL007119 and CEGL008500 in Tennessee and North Carolina and then as the standard yellow pine woodland from southern Virginia north to east-central Pennsylvania.

The WMDP map class is defined by Virginia, Table Mountain, short leaf, and pitch pine (*Pinus virginiana*, *P. pungens*, *P. echinata*, and *P. rigida*), commonly called yellow pine, dominated sites on hot or dry and often steep topographic positions. Often, hardwood tree species adapted to dry, acidic sites, such as red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), sourwood (*Oxydendrum arboreum*), and scarlet; and, chestnut oak (*Quercus coccinea* and *Q. prinus*) codominated, but never dominated, the canopy with the yellow pine. Occasionally present at up to 1,040 m elevation, this map class was most common below 850 m elevation and, interestingly, would often be on north-facing step slopes with very shallow soils. The WMDP map class generally presents as an open canopy of dark-pink to purple small and tight-crowned conifers intermixed with white, tan, and, occasionally, orange and yellow fluffy-crowned hardwood trees.

The AA results indicate that WMDP was mapped with a users' accuracy of 93% and a producers' accuracy of 72% (90% confidence interval of 62–83%). The AA discloses several instances where WMDP was mapped either too aggressively (to three map classes) or too conservatively (from eight map classes). The users' errors are spread widely across co-occurring map classes indicating an occasional misestimation of yellow pine canopy cover, total canopy cover, and degree of disturbance. The producers' errors focus on two issues with the first being a consistent underestimation of recovery in the co-occurring FXVP map class and the second being a consistent misidentification of the dominant canopy species and their cover in the co-occurring WPOS and WDMP map classes.



Four examples of the WMDP map class showing associations CEGL004996 (upper left), CEGL007119 (upper right), CEGL008500 (lower left), and CEGL008540 (lower right). All examples show an open to closed canopy of yellow pine over a variety of different shrub and herb layers.

WPOS – Central Appalachian Pine - Oak Xeric Shale Woodland

The Central Appalachian Pine - Oak Xeric Shale Woodland (WPOS) map class represents two associations in the USNVC—the *Pinus virginiana* - *Quercus prinus* / *Quercus ilicifolia* / (*Hieracium greenii*, *Viola pedata*) Woodland (CEGL008525) and the *Quercus prinus* / *Quercus ilicifolia* / *Danthonia spicata* Woodland (CEGL008526). This map class represents a dry pine and dry oak woodland and open forest over shale within the AT corridor only in central Virginia. The WPOS map class is rare within the corridor covering 11.6 ha (0.01% of APPA).

Based on vegetation plot data and conversations with ecologists, the WPOS map class is a "map known locations" map class, which means that only confirmed locations are mapped. The primary reason that only confirmed locations are mapped is that insufficient data are available to reliably distinguish shale bedrock from all other bedrock. Consequently, four distinct locations are in central Virginia where FPOS is mapped based on the existing vegetation plot and field reconnaissance data. These locations generally present as chestnut oak (*Quercus prinus*) and Virginia pine (*Pinus virginiana*) woodlands on steeply sloping, warm-site exfoliating hillsides below 790 m elevation. The oak in the map class generally present as crisp and compact tan crown while the pine will have dark-pink to purple small and tight crowns.

The AA results indicate that WPOS was mapped with a users' accuracy of 43% (90% confidence interval of 5–81%) and a producers' accuracy of 75% (90% confidence interval of 27–123%). Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals. The AA discloses three instances where WPOS was mapped either too aggressively (to the FAOH and WMDP map classes) or too conservatively (from the FCWH map class). These errors likely result from the misidentification of the bedrock type and overestimation of Virginia pine canopy cover.



An example of the WPOS map class showing the Virginia pine dominated canopy over shale bedrock.

WSTS – Red Spruce Talus Slope Woodland

The Red Spruce Talus Slope Woodland (WSTS) map class represents the *Picea rubens* / *Ribes glandulosum* Woodland Association (CEGL006250) in the USNVC. The woodland association that makes up this map class occurs within the AT corridor from the Connecticut River in New Hampshire north to Mount Katahdin in Maine. The WSTS map class is rare within the corridor covering 23.8 ha (0.02% of APPA).

The WSTS map class is on steep slopes and hillsides below 1,000 m elevation where talus and boulders are at the surface in the AT corridor. Often exclusively dominated by red spruce (*Picea rubens*), which present as dark-red to purple pointy cones of similar size and height, this map class is generally an open and patchy woodland with large areas of open talus visible in the canopy gaps.

The AA results indicate that WSTS was mapped well with a users' accuracy of 100% and a producers' accuracy of 81%. The AA discloses two instances where WSTS was mapped too conservatively from the FMSF and WHOT map classes because of an underestimation of the openness of the canopy and an underestimation of red spruce canopy cover, respectively.



An example of the red spruce dominated woodland over bedrock that defines the WSTS map class.

WTRR – Traprock Ridge

The Traprock Ridge (WTRR) map class represents the *Juniperus virginiana - Fraxinus americana* / *Danthonia spicata - Poa compressa* Woodland Association (CEGL006002) in the USNVC. The woodland association that makes up this map class occurs within the AT corridor over calcareous bedrock from DEWA north to northwestern Connecticut. The WTRR map class is rare within the corridor covering 46.8 ha (0.04% of APPA).

This dry, calcareous hardwood woodland is on south-facing slopes and ridge lines up to 460 m elevation within the AT corridor. Supporting a diverse array of herbaceous species, the canopy of WTRR can be similarly diverse with a mix of hickory (*Carya* spp.), white ash (*Fraxinus americana*), and eastern redcedar (*Juniperus virginiana* var. *virginiana*). Presenting as a short and open canopy of white, yellow, and yellow-green hardwoods intermixed with the short, dense, dark-purple conical conifer crowns of eastern redcedar, this map class was distinct within its range.

The AA results indicate that WTRR was mapped with a users' accuracy of 71% (90% confidence interval of 36–107%) and a producers' accuracy of 100%. (Because of the rarity of this map within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses two instances where WTRR was mapped too aggressively to the FOHG and WROT map classes. These errors come from overestimation of eastern redcedar cover in the canopy and total canopy cover.



An example of the WTRR map class showing a rich and diverse herbaceous layer mixed with an open canopy of, in this instance, hickory.

FAMA – Appalachian Montane Alluvial Forest

The Appalachian Montane Alluvial Forest (FAMA) map class represents the *Platanus occidentalis* - *Liriodendron tulipifera* - *Betula* (*alleghaniensis*, *lenta*) / *Alnus serrulata* - *Leucothoe fontanesiana* Forest Association (CEGL004691) in the USNVC. This forest association only occurs in the AT corridor in the southern portion along rocky riparian zones at lower elevation (below 900 m elevation). The FAMA map class is rare within the corridor covering 11.6 ha (0.01% of APPA).

This mixed-species deciduous forest always is associated with riparian zones on rocky soils and generally is limited to a very narrow band along the waterway. Present only at the lower elevations, FAMA was confined to riparian zones below 600 m elevation along large streams and small rivers. Additionally, this map class often exists on riparian islands in these water ways. In the APPA imagery set, FAMA tended to appear as a mixed hardwood forest in long, narrow bands on the flats along riparian zones. In several instances, the band of FAMA, while present, was too narrow and small to warrant mapping.

The AA results indicate that FAMA was mapped with a users' accuracy of 100% and a producers' accuracy of 78% (90% confidence interval of 49–106%). The AA discloses one instance where FAMA was mapped too conservatively from one other map class. The map class was the SRBS map class, a riparian shrub map class that allows some tree cover.



Two examples of the FAMA map class showing an open understory (left) and a closed, densely shrubbed understory (right), both over thin, rocky soils.

FFAW – Ash - Willow Floodplain Forest

The Ash - Willow Floodplain Forest (FFAW) map class represents the following three associations in the USNVC:

- *Acer saccharum* - *Fraxinus* spp. - *Tilia americana* / Matteuccia struthiopteris - *Ageratina altissima* Floodplain Forest (CEGL006114),
- *Fraxinus pennsylvanica* - (*Juglans nigra*, *Platanus occidentalis*) Floodplain Forest (CEGL006575), and
- *Salix nigra* - (*Populus deltoides*) Floodplain Forest (CEGL006629).

The forest associations that make up this map class primarily represent ruderal hardwood floodplain forest in the AT corridor from northern New Jersey north to the Connecticut River in Vermont. The FFAW map class is rare within the corridor covering 34.1 ha (0.03% of APPA).

The FFAW map class was initially composed of only associations CEGL006575 and CEGL006629, but association CEGL006114 was discovered in this map class at five locations during the AA process. Initially, CEGL006114 was not recognized in the range of FFAW; however, after the AA, CEGL006114 was justified to be included in the map classes FFAW and FFTH. The AA indicated no other confusion between the other vegetation associations in FFTH and FFAW because CEGL006575 and CEGL006629 do not occur in the range of the FFTH map class.

This mixed hardwood tree species ruderal floodplain forest map class is dominated by young hardwood tree species growing in the active floodplain of low-gradient large streams and rivers below 270 m elevation. Generally, the FFAW map class presents as an open-canopied, young, hardwood forest with a mixed crown morphology of sizes and shapes ranging in color from white to tan to orange to pink. With FFAW always on flat ground directly adjacent to low-gradient streams and rivers, consistently and accurately splitting this map class from the surrounding upland hardwood map classes of FNAH and FXCH and the non-ruderal large-river floodplain forest map class of FMHF proved difficult. The upland-floodplain split was accomplished by viewing the aerial imagery three-dimensionally to look for slight elevation changes or the presences of a bench or levee in the floodplain to indicate a switch to the upland. The split with the non-ruderal FMHF map class was based on crown morphology, canopy closure, perceived degree of disturbance, and a general lack of silver maple (*Acer saccharinum*).

The AA results indicate that FFAW was mapped well with a users' accuracy of 80% and a producers' accuracy of 100%. The AA discloses three instances where FFAW was mapped too aggressively to both another co-occurring hardwood floodplain forest map class and to two upland hardwood forest map classes.




Two examples of the FFAW map class showing associations CEGL006575 (left) and CEGL006629 (right). Both examples show a mixed-species canopy floodplain forest generally lacking silver maple.

FFCR – Piedmont-Central Appalachian Rich Floodplain Forest

The Piedmont-Central Appalachian Rich Floodplain Forest (FFCR) map class represents the *Platanus occidentalis - Acer negundo - Juglans nigra* / *Asimina triloba* / *Mertensia virginica* Floodplain Forest Association (CEGL004073) in the USNVC. The forest association that makes up this map class only occurs in the AT corridor in larger floodplains from southern Virginia to central Pennsylvania. The FFCR map class is rare within the corridor covering 35.8 ha (0.03% of APPA).

This mixed hardwood floodplain forest is along the larger rivers of this section of the AT corridor and generally has a very tall canopy. Generally, the FFCR map class presents as a hardwood forest with a super canopy of eastern cottonwood (*Populus deltoides*), with very broad and tall, bright-pink crowns over a canopy of shorter, yet still broad and tall tan to yellow American sycamore (*Platanus occidentalis*) over a very dense and diverse short-tree, tall-shrub layer. The American sycamore signature is the most important signature for defining this map class.

The AA results indicate that FFCR was mapped well with a users' accuracy of 91% and a producers' accuracy of 100%. The AA discloses one instance where FFCR was mapped too aggressively to the WCRS map class, which is a co-occurring hardwood floodplain woodland map class.



An example of the FFCR map class showing a very thick understory of box elder with an emergent eastern cottonwood in the background.

FFHH – High-gradient Hardwood Floodplain Forest

The High-gradient Hardwood Floodplain Forest (FFHH) map class represents the *Acer saccharum* / *Ostrya virginiana* / *Brachyelytrum erectum* Floodplain Forest Association (CEGL006504) in the USNVC. The forest association that makes up this map class occurs in the AT corridor along low-elevation high-gradient streams from north of the Connecticut River in New Hampshire to the terminus in Maine. The FFHH map class is rare within the corridor covering 41.2 ha (0.04% of APPA).

This mixed northern hardwood tree species riparian map class is dominated by sugar maple (*Acer saccharum*) growing over rocky substrate in the active floodplain of high-gradient small streams below 490 m elevation. Generally, this map class presents as a hardwood forest with a mixed crown morphology of sizes and shapes ranging in color from white to tan to orange to pink. With FFHH always on flat ground directly adjacent to high-gradient streams and rivers, to consistently and accurately split this map class from the surrounding upland hardwood map classes of FNAH and FXNH, and the low-gradient floodplain forest map class of FFTH proved difficult. The upland-floodplain split was accomplished by viewing the aerial imagery three-dimensionally to look for slight elevation changes or the presence of a bench or levee in the floodplain to indicate a switch to the upland. The low- to high-gradient split was based on gauging the gradient of the stream using local topography and looking for areas of consistent riffling or whitewater to indicate a high-gradient stream.

The AA results indicate that FFHH was mapped with a users' accuracy of 79% (90% confidence interval of 63–95%) and a producers' accuracy of 95%. The AA discloses a few instances where FFHH was mapped either too aggressively (to the FTHS and FNAH map classes) or too conservatively (from the FAHS map class). The errors come from confusion with hardwood upland map classes because hydrology was gaged incorrectly as drier (users' error) or wetter (producers' error) than it was.



An example of the FFHH map class showing the active floodplain dominated by sugar maple.

FFTH – Terrace Hardwood Floodplain Forest

The Terrace Hardwood Floodplain Forest (FFTH) map class represents the *Acer saccharum* - *Fraxinus* spp. - *Tilia americana* / *Matteuccia struthiopteris* - *Ageratina altissima* Floodplain Forest Association (CEGL006114) in the USNVC. The forest association that makes up this map class only occurs in the AT corridor from north of the Connecticut River in New Hampshire to the terminus in Maine along low-elevation low-gradient rivers. The FFTH map class is exceptionally rare within the corridor covering 10.9 ha (0.0099% of APPA).

This mixed northern hardwood tree species riparian map class is dominated by northern hardwood tree species growing in the active floodplain of low-gradient large streams and rivers below 300 m elevation. Generally, this map class presents as a hardwood forest with a mixed crown morphology of sizes and shapes ranging in color from white to tan to orange to pink. With FFTH always on flat ground directly adjacent to low-gradient streams and rivers, to consistently and accurately split this map class from the surrounding upland hardwood map classes of FNAH and FXNH and the high-gradient floodplain forest map class of FFHH proved difficult. The upland-floodplain split was accomplished by viewing the aerial imagery three-dimensionally to look for slight elevation changes or the presence of a bench or levee in the floodplain to indicate a switch to the upland. The low- to high-gradient split was based on gauging the gradient of the stream using local topography and looking for large areas of smooth water to indicate a low-gradient stream.

As a complicating factor, association CELG006114 is also mapped in the FFAW map class because of because association CEGL006114 was discovered in FFAW at five locations during the AA process. Initially, CEGL006114 was not recognized in the range of FFAW; however, after the AA, CEGL006114 was justified to be included in FFTH and in FFAW. The AA indicated no other confusion between the other vegetation associations in FFTH and FFAW because associations CEGL006575 and CEGL006629 do not occur in the range of the FFTH map class.

The AA results indicate that FFTH was mapped with a users' accuracy of 86% and a producers' accuracy of 67% (90% confidence interval of 35–98%). The AA discloses three instances where FFTH was mapped either too aggressively (to the FTHS map class) or too conservatively (from two map classes). The users' errors come from an overly aggressive application among the FTHS map class while the producers' errors come from an overly conservative application with a co-occurring wetland forest (FAHS) and with a co-occurring hardwood floodplain forest (FMHF).



An example of the FFTH map class showing the active floodplain dominated by northern hardwood tree species over a consistent layer of ostrich fern (*Matteuccia struthiopteris*).

FMEF – Midwestern Silver Maple - Elm Floodplain Forest

The Midwestern Silver Maple - Elm Floodplain Forest (FMEF) map class represents the *Acer saccharinum - Fraxinus pennsylvanica - Ulmus americana* Floodplain Forest Association (CEGL002586) in the USNVC. This map class is limited to the AT corridor as FMEF crosses the floodplain of the Delaware River from Pennsylvania to New Jersey. The FMEF map class is exceptionally rare within the corridor covering 5.3 ha (0.005% of APPA).

This map class was taken directly from the DEWA vegetation mapping project map as explained in the mapping section. In the APPA project imagery, this map class presents the classic broadly branching (deliquescent) fluffy pink crowns characteristic of silver maple (*Acer saccharinum*) in the active floodplain of the Delaware River.

Because this map class was not directly mapped or modified by the APPA project, AA was not completed on FMEF. For information on the accuracy of the FMEF map class, consult Perles et al. (2007) on their classification and mapping of vegetation for the DEWA.

No visual example is available for the FMEF map class in the AT corridor.

FMHF – Silver Maple - Hardwood Floodplain Forest

The Silver Maple - Hardwood Floodplain Forest (FMHF) map class represents the following five floodplain forest associations in the USNVC:

- *Acer saccharinum* - *Ulmus americana* / *Onoclea sensibilis* Floodplain Forest (CEGL006001),
- *Acer saccharinum* - (*Populus deltoides*) / *Matteuccia struthiopteris* - *Laportea canadensis* Floodplain Forest (CEGL006147),
- *Acer saccharinum* / *Onoclea sensibilis* - *Boehmeria cylindrica* Floodplain Forest (CEGL006176),
- *Acer saccharinum* - *Acer negundo* / *Ageratina altissima* - Laportea canadensis - (*Elymus virginicus*) Floodplain Forest (CEGL006217), and
- *Acer saccharum* - *Fraxinus americana* / *Carpinus caroliniana* / *Podophyllum peltatum* Forest (CEGL006459).

This map class occurs in the AT corridor in the floodplains of small to large rivers from central Virginia north to the Penobscot River in Maine. The FMHF map class is rare within the corridor covering 97.0 ha (0.09% of APPA).

The FMHF map class represents maple (*Acer* spp.) and mixed hardwood dominated floodplain forest along the northern two-thirds of the AT corridor. Originally two map classes, one defined by silver maple (*Acer saccharinum*) and the other sugar maple (*Acer saccharum*), the AA process indicated consistent confusion between these two map classes necessitating the collapse into a single maple-defined floodplain forest map class. Generally dominated by a variable mix of hardwood tree species, the uniting characteristics for this map class are occurring in the active floodplain and lacking oak (*Quercus* spp.) and American sycamore (*Platanus occidentalis*). This map class presents as an open- to closed-canopy forest of mixed tree species with a variety of canopy shapes and colors, though the broadly branching (deliquescent) fluffy pink crowns characteristic of silver maple were commonly present.

The AA results indicate that FMHF was mapped well with a users' accuracy of 83% and a producers' accuracy of 92%. The AA discloses several instances where FMHF was mapped either too aggressively (to five map classes) or too conservatively (from two map classes). The errors for both the users' and producers' accuracy come from wide and rare confusion across a variety of different map classes with no consistent pattern.




Two examples of the FMHF map class showing association CEGL006217 (left), which is completely dominated by silver maple at this site, compared to association CEGL008459 (right), which is a much more mixed forest, but with obvious sugar maple in the canopy.

FPOF – Pin Oak Small River Floodplain Forest

The Pin Oak Small River Floodplain Forest (FPOF) map class represents the *Quercus palustris* - *Acer rubrum* / *Carex grayi* - *Geum canadense* Wet Forest Association (CEGL006185) in the USNVC. The forest association that makes up this map class only occurs in the AT corridor along the Wallkill River at the New York-New Jersey border and along the Housatonic River in Massachusetts. The FPOF map class is exceptionally rare within the corridor covering 4.4 ha (0.004% of APPA).

This mixed pin oak (*Quercus palustris*) - red maple (*Acer rubrum*) floodplain forest occurs on flat, wet ground on low-gradient and large rivers where impounded water can remain for an extended period. Generally, the FPOF map class presents as an open- to closed-pin oak dominated canopy, with the oaks having crisp, bright-red, and broad crowns, intermixed (generally less than 40% canopy cover) with other hardwood floodplain tree species.

The AA results indicate that FPOF was mapped with a users' accuracy of 60% (90% confidence interval of 14–106%) and a producers' accuracy of 100%. (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses two instances where FPOF was mapped too aggressively to the FXCH and FMHF map classes. Because data are scarce, reasons for these errors are difficult to determine; however, the errors likely are because of an overly aggressive application of FPOF in areas perceived to be oak-dominated floodplain forest.



An example of the FPOF map class showing the active floodplain dominated by pin oak and other floodplain hardwood tree species.

FAHS – Acidic Hardwood Swamp Forest

The Acidic Hardwood Swamp Forest (FAHS) map class represents the following six associations in the USNVC:

- *Quercus rubra - Betula alleghaniensis* / *Osmunda cinnamomea* Forest (CEGL006000),
- *Acer rubrum - Nyssa sylvatica - Betula alleghaniensis* / *Sphagnum* spp. Forest (CEGL006014),
- *Acer rubrum* / *Nemopanthus mucronatus - Vaccinium corymbosum* Forest (CEGL006220),
- *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. Forest (CEGL006279),
- *Acer rubrum* / *Alnus incana - Ilex verticillata* / *Osmunda regalis* Woodland (CEGL006395), and
- *Acer rubrum - Fraxinus* (*pennsylvanica*, *americana*) / *Lindera benzoin* / *Symplocarpus foetidus* Forest (CEGL006406).

This map class primarily represents a very diverse mix of hardwood tree swamp forests in the AT corridor from DEWA and north to the terminus in Maine. The FAHS map class is uncommon within the corridor covering 266.0 ha (0.2% of APPA).

The FAHS map class presents a complex mix of acidic swamp and wet forest resulting from map-class collapses that occurred post-mapping. The FAHS map class was initially conceived as an acidic hardwood swamp forest map class to cover all the acidic hardwood swamp forests from DEWA north. However, during the AA process consistent confusion between two additional map classes north of DEWA, representing associations CEGL006000 and CEGL006279. An additional layer of complexity results from rare occurrences of associations CEGL006014 and CEGL006406 in the FCAS map class and of CEGL006279 in the FCWH map class south of DEWA. For the confusion with FCWH, the layer of complexity is with an upland eastern hemlock (*Tsuga canadensis*)-eastern white pine (*Pinus strobus*) forests map class with rare wet pockets of the very rare CEGL006279.

The signature and landscape position of FAHS proved reliable because this map class is a basin or seepage swamp forest dominated by hardwood trees with occasional conifers. These hardwoods were some of the earliest to senesce in the project imagery; therefore, the detection of these hardwoods was reliable. Often, this map class would present as a diffuse, fuzzy canopy of yellow-, orange-, and red-crowned hardwood trees sometimes intermixed and sometimes only a single color. Conifers, especially red spruce (*Picea rubens*), were occasionally present towards the northern end of the AT corridor, but conifers were not required. The confusion with CEGL006279 likely results from dying or recently dead northern hemlock (*Tsuga canadensis*) appearing as leaf-off hardwood trees.

The AA results indicate that FAHS was mapped with a users' accuracy of 72% (90% confidence interval of 63–80%) and a producers' accuracy of 82%. The AA discloses several instances where FAHS was mapped either too aggressively (to 12 map classes) or too conservatively (from 7 map classes). None of the confusion was consistent to one map class, but broke into two major groups—confusion with upland hardwood map classes and confusion with wetland hardwood map classes.



Four examples of the FAHS map class showing associations CEGL006014 (upper left), CEGL006220 (upper right), CEGL006395 (lower left), and CEGL006406 (lower right). All examples show a hardwood swamp forest with varying degrees of canopy closure.

FCAS – Central Appalachian Swamp Forest

The Central Appalachian Swamp Forest (FCAS) map class represents the following four associations in the USNVC:

- *Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Swamp Forest (CEGL006014),
- *Acer rubrum* - *Fraxinus* (*pennsylvanica*, *americana*) / *Lindera benzoin* / *Symplocarpus foetidus* Swamp Forest (CEGL006406),
- *Acer rubrum* - *Nyssa sylvatica* / *Ilex verticillata* - Vaccinium fuscatum / *Osmunda cinnamomea* Seep Forest (CEGL007853), and
- *Acer rubrum* - *Fraxinus nigra* - *Betula alleghaniensis* / *Veratrum viride* - *Carex bromoides* Seep Forest (CEGL008416).

This map class primarily represents low-elevation hardwood tree swamp forests in the south-central portion of the AT corridor from southern Virginia north to the Delaware River in Pennsylvania. The FCAS map class is rare within the corridor covering 27.5 ha (0.02% of APPA).

The FCAS map class is defined by red maple (*Acer rubrum*) mixed with other hardwood tree species over a variety of deciduous shrub and herb species that are adapted to saturated soils. The signature and landscape position of FCAS proved reliable. The FCAS map class is generally in basin settings or in seepy areas along riparian zones at low elevation, with the highest example below 580 m elevation. The canopy generally presents as a mix of pink, yellow, orange, and white-crowned hardwood trees with diffuse canopies. Canopy closure ranged from open to closed.

The AA results indicate that FCAS was mapped with a users' accuracy of 59% (90% confidence interval of 36–81%) and a producers' accuracy of 77% (90% confidence interval of 54–100%). The AA discloses several instances where FCAS was mapped either too aggressively (to three map classes) or too conservatively (from two map classes). The errors come from confusion with hardwood upland map classes as hydrology was gaged incorrectly as wetter (users' error) or dryer (producers' error) than it was.



Four examples of the FCAS map class showing associations CEGL006014 (upper left), CEGL006406 (upper right), CEGL007853 (lower left), and CEGL008416 (lower right). All examples show an open- to closed-hardwood tree canopy over a variety of different wet shrub and herb layers.

FCMS – Red Spruce - Red Maple Acidic Swamp Forest

The Red Spruce - Red Maple Acidic Swamp Forest (FCMS) map class represents the *Picea rubens* - *Acer rubrum* / *Nemopanthus mucronatus* Swamp Forest Association (CEGL006198) in the USNVC. The forest association that makes up this map class occurs in the AT corridor from northern New Jersey north to the terminus in Maine. The FCMS map class is rare within the corridor covering 92.0 ha (0.08% of APPA).

This mixed hardwood-hardwood swamp map class is generally in basins below 800 m elevation. Presenting as a mixed (25–75% each) red spruce (*Picea rubens*) and red maple (*Acer rubrum*) swamp with a mostly closed canopy, this swamp forest is generally short statured with purple, conical red spruce mixed with yellow and orange, fuzzy-crowned red maple. Other conifer and hardwood species can be present in FCMS, but generally have less than 25% canopy cover. This map class, while very rare and restricted in the southern parts of its range, becomes much more common and wide spread in the northern parts of its range.

The AA results indicate that FCMS was mapped with both a users' and producers' accuracy of 74% (90% confidence interval of 66–82%). The AA discloses several instances where FCMS was mapped either too aggressively (to five map classes) or too conservatively (from two map classes). The majority of the errors come from confusion among co-occurring swamp forest and woodland map classes where conifer species was misjudged, conifer tree cover was misestimated, or hardwood tree cover was misestimated.



An example of the FCMS map class showing a short-statured, moderately-closed canopy dominated by a mix of northern hardwood tree species and red spruce over wetland shrubs and herbs.

FRHS – Rich Hardwood Swamp Forest

The Rich Hardwood Swamp Forest (FRHS) map class represents the following three associations in the USNVC:

- *Acer rubrum - Fraxinus nigra* - (*Larix laricina*) / *Rhamnus alnifolia* Swamp Forest (CEGL006009),
- *Betula alleghaniensis - Acer rubrum* - (*Tsuga canadensis*, *Abies balsamea*) / *Osmunda cinnamomea* Swamp Forest (CEGL006380), and
- *Acer rubrum - Fraxinus nigra* - (*Tsuga canadensis*) / *Tiarella cordifolia* Swamp Forest (CEGL006502).

This map class primarily represents a very diverse mix of hardwood trees of enriched swamp forests in the AT corridor from southern New York north to the terminus in Maine. The FRHS map class is uncommon within the corridor covering 153.6 ha (0.1% of APPA).

The FRHS map class represents a complex mix of enriched swamp and wet forest that is generally dominated by hardwood tree species; however, FRHS can be mixed with or even dominated by conifers, especially eastern hemlock (*Tsuga canadensis*), with eastern hemlock potentially dominant from New Hampshire northward. The landscape position of FRHS proved reliable because this map class exists as a basin or seepage swamp forest. The hardwood tree species in this map class were some of the earliest to senesce in the project imagery; therefore, the detection of this species and the associated conifers was reliable. Often, this map class presents as a diffuse, fuzzy canopy of yellow-, orange- and red-crowned hardwood trees sometimes intermixed and sometimes only a single color with the dark-red to purple conifers readily visible through the hardwood crowns.

The AA results indicate that FRHS was mapped with a users' accuracy of 53% (90% confidence interval of 36–71%) and a producers' accuracy of 56% (90% confidence interval of 38–73%). The AA discloses several instances where FRHS was mapped either too aggressively (to 10 map classes) or too conservatively (from 6 map classes). The majority of the users' errors come from an overly aggressive application among co-occurring upland mixed conifer-hardwood forest map classes, whereas the majority of the producers' errors come from an overly conservative application among co-occurring hardwood swamp forest map classes.

The 90% confidence interval for both the users' and producers' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a lower users' and producers' accuracy for the FRHS map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."



Four examples of the FRHS map class showing associations CEGL006009 with an open canopy and no eastern hemlock (upper left), CEGL006009 with a closed canopy and associated conifers (upper right), CEGL006380 with codominant eastern hemlock (lower left), and CEGL006502 with sparse conifers (lower right).

WMUM – Red Maple / Upright Sedge Wet Woodland

The Red Maple / Upright Sedge Wet Woodland (WMUM) map class represents the *Acer rubrum* / *Carex stricta* - *Onoclea sensibilis* Wet Woodland Association (CEGL006119) in the USNVC. This map class represents an open hardwood woodland swamp within the AT corridor in New Jersey and southern New York, with an outlying location in west-central New Hampshire. The WMUM map class is rare within the corridor covering 13.3 ha (0.01% of APPA).

The WMUM map class represents an open swamp woodland dominated by red maple (*Acer rubrum*) over an often thick herb layer dominated by upright sedge (*Carex stricta*). Examples of this map class were initially only known in New Jersey and southern New York, but during the mapping field reconnaissance, one additional disjunct occurrence of this association was discovered within the AT corridor in west-central New Hampshire.

The hardwood tree species in this map class were some of the earliest to senesce in the project imagery; therefore, the detection of this species and the associated upright sedge was reliable. Often, this map class presents as a diffuse, fuzzy canopy of yellow and white-crowned hardwood trees over the tussock-forming upright sedge that is readily visible through the open and sparse hardwood crowns.

The AA results indicate that WMUM was mapped with a users' accuracy of 88% and a producers' accuracy of 70% (90% confidence interval of 41–99%). The AA discloses three instances where WMUM was mapped either too aggressively (to the co-occurring FAHS map class when canopy openness was overestimated) or too conservatively (from the co-occurring FAHS and FPAF map classes when canopy openness was underestimated).



An example of the WMUM map class with the open red maple canopy, already senescing, over the nearly complete cover of upright sedge.

WNWF – Northern White-cedar Wooded Fen

The Northern White-cedar Wooded Fen (WNWF) map class represents the *Thuja occidentalis* - *Abies balsamea* / *Ledum groenlandicum* / *Carex trisperma* Swamp Woodland Association (CEGL006507) in the USNVC. The swamp woodland association that makes up this map class only occurs within the AT corridor in Maine. The WNWF map class is rare within the corridor covering 16.4 ha (0.01% of APPA).

The WNWF map class occurs at low elevation (below 670 m elevation) within the AT corridor on flat, wet ground and occasionally forms extensive complexes in association with other swamp map classes in depressional wetlands. This map class only occurs in Maine. Dominated by an open to very open canopy (10–25%, generally) of arborvitae (also known as northern white-cedar, *Thuja occidentalis*), this map class will often have extensive open areas dominated by herbs and short shrubs. The northern white-cedar in this map class generally present as short and soft, tannish-purple to mauve cone-shaped crowns over a flat and pink to orange herb and shrub layer.

The AA results indicate that WNWF was mapped with a users' accuracy of 90% and a producers' accuracy of 75% (90% confidence interval of 50–100%). The AA discloses several instances where WNWF was mapped either too aggressively (to the FNWS map class) or too conservatively (from three map classes). The majority of both the users' and producers' errors come from misestimation of northern white-cedar canopy cover in co-occurring wetland forest and woodland map classes.



An example of the WNWF map class showing a short and open canopy of northern white-cedar over a diverse mix of herbs and short shrubs.

WPAF – Pasture Fen

The Pasture Fen (WPAF) map class represents the *Juniperus virginiana* / *Dasiphora fruticosa* ssp. *floribunda* / *Carex flava* - *Carex tetanica* Fen Association (CEGL006357) in the USNVC. The association that makes up this map class only occurs within the AT corridor in New Jersey and New York. The WPAF map class is exceptionally rare within the corridor covering 2.3 ha (0.002% of APPA).

The WPAF map class occurs on flat or gently sloping, seepy ground with calcareous influence. The only examples present within the AT corridor were highly degraded by past land use and had closed canopies and degraded understories; therefore, the mappers relied on the distinctive and odd presence of eastern redcedar (*Juniperus virginiana*), with a dark-purple conical crown, in an otherwise wetland setting.

The AA results indicate that WPAF was mapped with a users' accuracy of 33% (90% confidence interval of -28–95%) and a producers' accuracy of 100%. (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses two instances where WPAF was mapped too aggressively to the FXTT and WMUM map classes. These errors likely result from an overestimation of hydrologic influence, recovery from past disturbance, and canopy cover of eastern redcedar at the sites.



An example of the WPAF map class showing a degraded wetland forest with eastern redcedar in the canopy.

FAWS – Inland Atlantic White-cedar Swamp Forest

The Inland Atlantic White-cedar Swamp Forest (FAWS) map class represents the *Chamaecyparis thyoides* - (*Tsuga canadensis*, *Betula alleghaniensis*) / *Clethra alnifolia* Swamp Forest Association (CEGL006189) in the USNVC. The forest association that makes up this map class only occurs within the AT corridor at one site in southern New York. The FAWS map class is exceptionally rare within the corridor covering 3.8 ha (0.003% of APPA).

Almost exclusively dominated by old and large Atlantic white cedar (*Chamaecyparis thyoides*) over saturated soils, this amazing forest represents a remnant of a once-common forest in the northeastern United States. Presenting a very unique signature of dark-purple evergreen crowns with a distinct rounded shape, this forest is unmistakable.

The FAWS map class was mapped very consistently. The AA process discovered no new instances of the FAWS map class, and no instances of FAWS were confused with a different map class.



An example of the FAWS map class showing the dominance of short-statured American beech with an open canopy of Atlantic white cedar allowing for a rich herb layer to develop.

FBSB – Black Spruce Open Bog Woodland

The Black Spruce Open Bog Woodland (FBSB) map class represents the *Picea mariana* / *Ledum groenlandicum* / *Carex trisperma* / *Sphagnum* spp. Open Bog Woodland Association (CEGL002485) in the USNVC. The open woodland swamp association that makes up this map class only occurs in the AT corridor north of the Connecticut River. The FBSB map class is rare within the corridor covering 40.4 ha (0.04% of APPA).

The FBSB map class is possible on any flat ground below 1,340 m elevation from the Connecticut River northward; the map class becomes more common further north along the AT corridor. This map class is defined by a short-statured open to closed canopy of black spruce (*Picea mariana*) over sphagnum moss (*Sphagnum* spp.). This map class generally presents as an open canopy of short conifers over a bog mat that has a distinctive flat orange appearance. Often, the conifers in this map class also have an open branching pattern, which suggests continually stressed tress because of poor growing conditions.

The AA results indicate that FBSB was mapped well with a users' accuracy of 67% (90% confidence interval of 49–106%) and a producers' accuracy of 100%. The AA discloses several instances where FBSB was mapped too aggressively to five map classes. Of these map classes, four are other co-occurring conifer swamps and one is a co-occurring conifer upland.



An example of the FBSB map class showing the open canopy dominated by black spruce over a floating mat of sphagnum moss and other acidophilic plants.

FHHS – Hemlock - Hardwood Swamp Forest

The Hemlock - Hardwood Swamp Forest (FHHS) map class represents the *Tsuga canadensis* - *Betula alleghaniensis* / *Ilex verticillata* / *Sphagnum* spp. Swamp Forest Association (CEGL006226) in the USNVC. The forest association that makes up this map class occurs in the AT corridor from northern New Jersey north to northcentral Massachusetts. The FHHS map class is rare within the corridor covering 25.7 ha (0.02% of APPA).

Codominated to dominated (25–75% canopy cover) by eastern hemlock (*Tsuga canadensis*) with a variable mix of northern hardwood tree species, this map class rarely occurred above 550 m elevation and was most common below 300 m elevation. The FHHS map class generally presents as a mixed hemlock-hardwood basin swamp with eastern hemlock, with dark-purple fluffy conical crowns and generally overtopped by northern hardwoods, with fuzzy crowns of white, tan, yellow, and pink. Occasionally, relying on ancillary leaf-off imagery was necessary to estimate the eastern hemlock cover in a forest because of overtopping hardwoods.

A complicating factor is that when this project initiated, eastern hemlock was healthy in the southern portion of the AT corridor. As the project progressed, however, various non-native insects nearly eliminated this species in the southern-most range of this map class, but left the species untouched in the northern portions.

The AA results indicate that FHHS was mapped with a users' accuracy of 50% (90% confidence interval of 24–76%) and a producers' accuracy of 78% (90% confidence interval of 49–106%). The AA discloses several instances where FHHS was mapped either too aggressively (to two map classes) or too conservatively (from two map classes). All the errors come with other co-occurring forest wetland map classes likely relating to both over and under estimation of hemlock canopy cover, especially with the FAHS map class.

The 90% confidence interval for the users' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower users' accuracy for the FHHS map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."



An example of the FHHS map class showing association CEGL006226 with an almost entirely hemlock canopy over a wetland herbaceous layer.

FMSS – Mixed Spruce Swamp Forest & Woodland

The Mixed Spruce Swamp Forest & Woodland (FMSS) map class represents two associations in the USNVC—the *Picea mariana* / (*Vaccinium corymbosum*, *Gaylussacia baccata*) / *Sphagnum* sp. Swamp Woodland (CEGL006098) and the *Picea rubens - Abies balsamea* / *Gaultheria hispidula* / *Osmunda cinnamomea* / *Sphagnum* spp. Swamp Forest (CEGL006312). The open woodland swamp associations that make up this map class occur in the AT corridor from northern-most Connecticut north to the terminus in Maine. The FMSS map class is uncommon within the corridor covering 186.4 ha (0.2% of APPA).

The FMSS map class can occur at almost any elevation or topographic position that can support a basin that perennially holds water, but FMSS is generally below 1,100 m elevation and then is most common below 915 m elevation. Less than MMU examples of this map class are common in the AT corridor and interface broadly with the FMSF, FMFS, and FLSF map classes. Presenting as a red spruce (*Picea rubens*) dominated depression in a generally conifer-driven landscape, the spruce in these depressions were generally small and short crowned with a darker-purple cast than the surrounding upland red spruce.

The AA results indicate that FMSS was mapped with a users' accuracy of 56% (90% confidence interval of 33–78%) and a producers' accuracy of 71% (90% confidence interval of 48–95%). The AA discloses several instances where FMSS was mapped either too aggressively (to three map classes) or too conservatively (from three map classes). The errors come from confusion with conifer upland map classes because hydrology was gaged incorrectly and with other conifer wetland map classes because conifer species and dominance were misinterpreted.

The 90% confidence interval for the users' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower users' accuracy for the FMSS map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."



Two examples of the FMSS map class showing association CEGL006312, having an open canopy over mixed shrubs (left) and open canopy over mixed herbs (right). Both examples are dominated by red spruce.

FNWS – Northern White-cedar Swamp Forest

The Northern White-cedar Swamp Forest (FNWS) map class represents two associations in the USNVC—the *Thuja occidentalis* / *Sphagnum* (*girgensohnii*, *warnstorfii*) Swamp Forest (CEGL006007) and the *Thuja occidentalis* - (*Picea rubens*) / *Tiarella cordifolia* Swamp Forest (CEGL006175). The swamp associations that make up this map class occur in the AT corridor only in Maine, with one disjunct location in central Vermont. The FNWS map class is uncommon within the corridor covering 142.0 ha (0.1% of APPA).

This map class occurs at low elevation (below 550 m elevation) within the AT corridor on flat, wet ground and occasionally forms extensive complexes in association with other swamp map classes in depressional wetlands. With one confirmed exception in central Vermont, this map class only occurs in Maine. Dominated by arborvitae (also known as northern white-cedar, *Thuja occidentalis*), this map class will often have other swamp conifers and northern hardwoods associated or even codominant (less than 50% canopy cover). The northern white-cedar in this map class generally present soft, tannish-purple to mauve cone-shaped crowns that often form a completely closed canopy.

The AA results indicate that FNWS was mapped well with a users' accuracy of 94% and a producers' accuracy of 83%. The AA discloses several instances where FNWS was mapped either too aggressively (to two map classes) or too conservatively (from five map class). The majority of both the users' and producers' errors come from confusion with co-occurring conifer dominated wetland forest and woodland map classes.



Two examples of the FNWS map class showing association CEGL006007 with sphagnum (left) and the somewhat drier association CEGL006175 with more development in the shrub and herb layer (right) under a northern white-cedar canopy.

FXAH – Appalachian Ruderal Hardwood Forest

The Appalachian Ruderal Hardwood Forest (FXAH) map class represents two associations in the USNVC—the *Liriodendron tulipifera* - *Acer rubrum* - *Robinia pseudoacacia* Ruderal Forest (CEGL007219) and the *Acer rubrum* var. *rubrum* - *Betula lenta* - *Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Ruderal Forest (CEGL008558). The forest associations that make up this map class primarily represent ruderal hardwood forest within the AT corridor from the Springer Mountain in Georgia north to the Virginia State Highway 16 crossing. The FXAH map class is common within the corridor covering 1,017.9 ha (0.9% of APPA).

Initially, mappers attempted to map the two associations in FXAH apart based on elevation and shrub cover, with association CEGL007219 being lower elevation with deciduous shrub and association CEGL008558 being higher elevation with evergreen shrub. Because leaf-off ancillary aerial imagery was unavailable for the entire range of this map class, splitting relied upon canopy gaps in the project imagery to ensure a consistent application of the mapping concepts. However, the AA process uncovered confusion between the two associations, with the result being the FXAH map class.

The FXAH map class presents a variable signature in the project imagery that is related to the conditions present when the site was colonized by trees, but in all instances this map class is a younger, very disturbed forest. The uniting factor is that these are ruderal forest stands dominated by a variety of hardwood tree species and not dominated (less than 50% canopy cover) by tuliptree (*Liriodendron tulipifera*). In general, the hardwoods in this map class present as small, short fuzzy crowns of white, yellow, orange, and pink (and occasionally leafless) intermixed with tuliptree with a pink (sometimes white, orange, or red) conical crown. Additionally, this map class can have associated (less than 25% canopy cover, each) ruderal oak (*Quercus* spp.) or ruderal pine (*Pinus* spp.), which provides a further level of confusion and complexity.

Potentially located on any landscape position below 1,520 m elevation, this map class occurred broadly across disturbed southern portion of the AT corridor.

The AA results indicate that FXAH was mapped with a users' accuracy of 85% and a producers' accuracy of 78% (90% confidence interval of 68–87%). The AA discloses several instances where FXAH was mapped either too aggressively (to six map classes) or too conservatively (from eight map classes). The majority of the users' errors come from an overly aggressive application among co-occurring oak forest map classes, while the producers' errors come from an overly conservative view of how much non-ruderal forests had recovered and an overly conservative estimate of the amount of hardwood tree cover in a ruderal shrub map class (SXBG).




Two examples of the FXAH map class showing the mixed ruderal hardwood forest canopy over sparse herb and deciduous shrub of association CEGL007219 (left) versus the mixed ruderal hardwood forest canopy over dense evergreen shrub of association CEGL008558 (right).

FXBL – Ruderal Black Locust Forest

The Ruderal Black Locust Forest (FXBL) map class represents the *Robinia pseudoacacia* Ruderal Forest Association (CEGL007279) in the USNVC. The forest association that makes up this map class only occurs within the AT corridor in the southern most portion and is generally associated with old agricultural areas. The FXBL map class is exceptionally rare within the corridor covering 2.5 ha (0.002% of APPA).

Dominated by a monotypic stand of black locust (*Robinia pseudoacacia*), the FXBL map class occurs on the borders of old fields where black locust is readily able to spread through root sprouting. This characteristic presented the mappers with a unique signature that appears as a mound of identical trees, with the tallest trees in the middle and progressively shorter trees as the edge of the stand is approached. Additionally, black locust has a unique, light and fuzzy signature caused by the small, diffuse leaves on the trees that senesce early in the fall. Black locust is very common in disturbed forests in the southern portion of the AT corridor and numerous instances of black locust clones existed in the area. However, only two black locust clones were large enough to map.

The AA results indicate that FXBL was mapped with both a users' and producers' accuracy of 80%. The AA discloses two instances where FXBL was mapped either too aggressively (to the FXAH map class when black locust canopy cover was overestimated) or too conservatively (from the SXBG map class when black locust canopy cover was underestimated).



An example of the FXBL map class showing the characteristically diffuse canopy of black locust over a ruderal herb layer.

FXCH – Central Appalachian Ruderal Hardwood Forest

The Central Appalachian Ruderal Hardwood Forest (FXCH) map class represents the following four associations in the USNVC:

- *Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana* - (*Robinia pseudoacacia*) Ruderal Forest (CEGL006599),
- *Ailanthus altissima* Ruderal Forest (CEGL007191),
- *Juglans nigra* / *Verbesina alternifolia* Ruderal Forest (CEGL007879), and
- *Betula lenta - Acer rubrum* / *Lycopodium annotinum - Dennstaedtia punctilobula* Ruderal Forest (CEGL008503).

The forest associations that make up this map class primarily represents ruderal hardwood forest within the AT corridor from the Virginia State Highway 16 crossing north to the Connecticut-Massachusetts border. The FXCH map class is very common within the corridor covering 6,744.5 ha (6.1% of APPA).

The FXCH map class presents one of the most variable signature in the project imagery. This signature is related to the highly variable conditions present when the site was recolonized by trees, but in all instances this map class is a very young, very disturbed forest. The uniting factor is that these are ruderal forest stands dominated by a variety of hardwood tree species and not dominated (less than 50% canopy cover) by tuliptree (*Liriodendron tulipifera*). In general, the hardwoods in this map class present as small, short fuzzy crowns of white, yellow, orange, and pink (and occasionally leafless) intermixed with tuliptree with a pink (sometimes white, orange, or red) conical crown. Additionally, this map class can have associated (less than 25% canopy cover, each) ruderal oak (*Quercus* spp.) or ruderal pine (*Pinus* spp.), which provides a further level of confusion and complexity.

Potentially located on any landscape position below 1,340 m elevation, this map class is broadly disturbed across the central portion of the AT corridor.

The AA results indicate that FXCH was mapped with a users' accuracy of 58% (90% confidence interval of 40–76%) and a producers' accuracy of 33% (90% confidence interval of 20–46%). The AA discloses many instances where FXCH was mapped either too aggressively (to 8 map classes) or too conservatively (from 15 map classes). Although both broad and deep, the errors in this map class represent a systemic difference in how this ruderal forest map class appeared in the project imagery versus how the map class appeared on the ground over this portion of the AT corridor. Lacking further investigation, these errors, while many, represent too variable a group of map classes to provide clear insight as to why the FXCH map class was mapped so poorly.

The 90% confidence interval for both the users' and producers' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a much lower users' and producers' accuracy for the FXCH map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."



Four examples of the FXCH map class showing associations CEGL006599 (upper left), CEGL007191 (upper right), CEGL007879 (lower left), and CEGL008503 (lower right). All examples show a highly ruderal canopy over a highly ruderal shrub and herb layer with evidence of active or recent disturbance.

FXHO – Southern & Central Appalachian Ruderal Hawthorn Forest

The Southern & Central Appalachian Ruderal Hawthorn Forest (FXHO) map class represents the *Crataegus punctata* - *Crataegus flabellata* Ruderal Forest Association (CEGL004184) in the USNVC. The forest association that makes up this map class occurs within the southern one-half of the AT corridor, but is only mapped in the southern-most portion because no mappable areas were discovered further north. Generally associated with old agricultural areas, this ruderal forest appears to be the result of historic grazing and fire suppression in high-elevation oak forests. The FXHO map class is rare within the corridor covering 17.7 ha (0.02% of APPA).

Dominated by a monotypic stand of hawthorn (*Crataegus* spp.), the FXHO map class does occasionally have a more mixed composition that includes some northern red oak (*Quercus rubra*) and yellow buckeye (*Aesculus flava*). Occurring at high elevation near or above 1,400 m, FXHO is often closely associated with the FROH map class. The appearance of this map class is very distinct. The hawthorns are almost always completely senesced, presenting circular, short, gray mounds or a patchwork of fuzzy, gray short-statured trees.

The FXHO map class was mapped very consistently. The AA process discovered no new instances of the FXHO map class, and no instances of FXHO were confused with a different map class.



Two examples of the FXHO map class showing the characteristic hawthorn canopy completely closed (left) and when hawthorn presents a more woodland or “orchard” appearance (right).

FXNH – Ruderal Northern Hardwood Forest & Woodland

The Ruderal Northern Hardwood Forest & Woodland (FXNH) map class represents two associations in the USNVC—the *Populus* (*tremuloides*, *grandidentata*) - *Betula* (*populifolia*, *papyrifera*) Ruderal Woodland (CEGL006303) and the *Acer saccharum* - *Betula* spp. - *Fagus grandifolia* Ruderal Forest (CEGL006628). The forest associations that make up this map class primarily represents ruderal northern hardwood forest within the AT corridor from the Connecticut-Massachusetts border north to the terminus in Maine. The FXNH map class is very common within the corridor covering 3,177.6 ha (2.9% of APPA).

The FXNH map class presents a variable signature in the project imagery. This signature is related to the conditions present when the site was recolonized by trees, but in all instances this map class is a younger forest. The uniting factor is that these are ruderal forest stands dominated by a variety of northern hardwood tree species. In general, the northern hardwoods in this map class present as small- to medium-fuzzy crowns of white, yellow, orange, and pink, though the trees are occasionally leafless. Additionally, this map class can have associated (less than 25% canopy cover, each) young northern red oak (*Quercus* rubra) or young conifers that include eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), red spruce (*Picea rubens*), and balsam fir (*Abies balsamea*), which provides a further level of confusion and complexity. The most difficult aspect of this map class was splitting it from the identical, yet non-ruderal, FNAH. This splitting was accomplished using canopy closure and age in combination with landscape cues such as remnant logging roads and log landing areas, which tend to persist on the landscape for a few decades.

Potentially located on any landscape position below 1,000 m elevation and then only common below 760 m elevation, the FXNH map class occurs broadly across disturbed landscapes. The map class, however, is most common in association with forestry practices.

The AA results indicate that FXNH was mapped with a users' accuracy of 94% and producers' accuracy of 61% (90% confidence interval of 49–74%). The AA discloses several instances where FXNH was mapped either too aggressively (to 2 map classes) or too conservatively (from 12 map classes). The users' errors come from an overly aggressive application among co-occurring non-ruderal hardwood forest map classes. The producers' errors are spread widely across the co-occurring non-ruderal oak, hardwood, and wetland forest map classes, indicating an overly conservative application of this ruderal forest map class across its range.

The 90% confidence interval for the producers' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower producers' accuracy for the FXNH map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."




Two examples of the FXNH map class showing associations CEGL006303 (left) and CEGL006628 (right). Both examples show a ruderal canopy over a native, if young, shrub and herb layer with evidence of active or recent disturbance.

FXOM – Northeastern Ruderal Oak - Red Maple Forest

The Northeastern Ruderal Oak - Red Maple Forest (FXOM) map class represents the *Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest Association (CEGL006506) in the USNVC. The forest association that makes up this map class primarily represents ruderal oak forest within the AT corridor from the Connecticut-Massachusetts border north to the terminus in Maine. The FXOM map class is very common within the corridor covering 938.9 ha (0.8% of APPA).

The FXOM map class presents a variable signature in the project imagery. This signature is related to the conditions present when the site was recolonized by trees, but in all instances this map class is a younger, more disturbed forest. The uniting factor is that these are ruderal forest stands codominated or dominated by young northern red oak (*Quercus rubra*), with crisp, bright-red or pink crowns that vary from small and compact on the youngest trees to large and broad on the oldest trees. Associated to codominant (25–50% canopy cover, each) with the northern red oak are young northern hardwood tree species, with small- to medium-fuzzy crowns of white, yellow, orange, and pink (and occasionally leafless) and eastern white pine (*Pinus strobus*), with dark-purple, broadly branching crowns.

The most difficult aspect of this map class was splitting it from the potentially identical, yet non-ruderal, FCNO. This splitting was accomplished using canopy closure and age in combination with landscape cues such as remnant logging roads and log landing areas, which tend to persist on the landscape for a few decades, and the amount of northern hardwood tree species and eastern white pine in the canopy, which tend to be sparse to absent in FNCO.

Only present below 700 m elevation within the AT corridor and then only common below 490 m elevation, this map class favors warm slopes and lowlands in the southern range of the map class and becomes restricted to the warm slopes and lowlands in the northern range of the map class.

The AA results indicate that FXOM was mapped with a users' accuracy of 66% (90% confidence interval of 49–82%) and a producers' accuracy of 79% (90% confidence interval of 63–95%). The AA discloses several instances where FXOM was mapped either too aggressively (to five map classes) or too conservatively (from five map classes). The users' error primarily comes from an overly aggressive estimation of oak canopy cover in ruderal hardwood forest map classes, whereas the producers' error is too widely spread and sparse to determine a consistent conclusion.




Two examples of the FXOM map class with both showing association CEGL006506 as a very young stand probably less than 30-years old (left) versus a more mature stand probably greater than 60-years old (right).

FXTT – Ruderal Tuliptree Forest

The Ruderal Tuliptree Forest (FXTT) map class represents two associations in the USNVC—the *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Ruderal Forest (CEGL007220) and the *Liriodendron tulipifera* - *Quercus* spp. Ruderal Forest (CEGL007221). The forest associations that make up this map class occur within the AT corridor from Springer Mountain in Georgia to north of the Hudson River crossing in New York; however, the associations are most common south of Pennsylvania. The FXTT map class is common within the corridor covering 2,200.3 ha (2.0% of APPA).

The FXTT map class presents a variable signature in the project imagery that is related to the conditions present when the site was colonized by tuliptree (*Liriodendron tulipifera*). This signature results in stands that range from even-aged greater than 200-year old groves of tuliptree to young, pole-stage mixed-species stands dominated by tuliptree. The uniting factor is that these stands are ruderal forest stands dominated by tuliptree. The signature and landscape position of tuliptree proved difficult to concisely constrain, but in general, tuliptree presented as a pink (sometimes white, orange, or red) conical (except in very large individuals where the crown becomes broken) tree. For FXTT this often meant an extensive area of pink conical trees all the same height and size. Additionally, FXTT was mapped primarily at lower elevations with the majority of sites less than 1,100 m elevation.

The AA results indicate that FXTT was mapped with a users' accuracy of 70% (90% confidence interval of 60–79%) and a producers' accuracy of 84% (90% confidence interval of 75–93%). The AA discloses several instances where FXTT was mapped either too aggressively (to 10 map classes) or too conservatively (from 7 map classes). The users' error primarily comes from an overly aggressive estimation of tuliptree canopy cover in co-occurring oak forest map classes, with a secondary cause of overly aggressive application among co-occurring ruderal mixed forest map classes. The producers' error is widely spread, but indicates a somewhat conservative estimation of both the cover of tuliptree and the degree of disturbance on the landscape.



Two examples of the FXTT map class showing a more mixed canopy with some shrub and herb layer (left) versus a more monotypic tuliptree canopy with little shrub and herb layer development (right).

FXER – Northeastern Ruderal Red-cedar Forest

The Northeastern Ruderal Red-cedar Forest (FXER) map class represents the *Juniperus virginiana* Ruderal Forest Association (CEGL006024) in the USNVC. The forest association that makes up this map class occurs within the AT corridor from southern Virginia north to northern Connecticut and is generally associated with old agricultural areas. The FXER map class is rare within the corridor covering 60.3 ha (0.05% of APPA).

Dominated or codominated by stands of eastern redcedar (*Juniperus virginiana*), the FXER map class occurs in abandoned fields likely subject to past grazing and can have an open to closed canopy (25–100% canopy cover). This characteristic presented the mappers with a unique signature of short, dense, dark-purple conical conifers often intermixed with sparse hardwood tree species and ruderal deciduous shrubs.

The AA results indicate that FXER was mapped with a users' accuracy of 70% (90% confidence interval of 54–87%) and a producers' accuracy of 100%. The AA discloses three instances where FXER was mapped too aggressively, but the majority of these instances are limited to a single map class, FXVP. These results are from an overly aggressive estimation of eastern redcedar canopy cover in the FXVP map class and from the potential misidentification of Virginia pine (*Pinus virginiana*) and eastern redcedar when Virginia pine canopy cover approached less than 60%.



An example of the FXER map class showing an open canopy of eastern redcedar over a ruderal herb and shrub layer.

FXSF – Successional Mixed Spruce - Fir - Hardwood Forest

The Successional Mixed Spruce - Fir - Hardwood Forest (FXSF) map class represents the *Picea rubens* - *Abies balsamea* - *Betula* spp. - *Acer rubrum* Forest Association (CEGL006505) in the USNVC. The forest association that makes up this map class occurs within the AT corridor from central Massachusetts north to the terminus, but is only common north of the White Mountains in New Hampshire. The FXSF map class is common within the corridor covering 2,250.0 ha (2.0% of APPA).

Dominated (greater than 50% canopy cover, together) by red spruce (*Picea rubens*) and balsam fir (*Abies balsamea*), this map class often approaches 100% conifer canopy, but can have associated or codominant (less than 50% canopy cover) northern hardwood tree species. South of the Connecticut River, this map class is confined to 550–790 m elevation, but this elevation profile widens north of the Connecticut River to –180–1,070 m elevation. This map class generally presents as red spruce, with dark-red to purple pointy cones of similar size and height and as balsam fir, with red and rounded crowns, interspersed with the fuzzy white, yellow, and pink crowns of northern hardwood tree species.

This canopy composition was potentially identical to the non-ruderal FTHS, FLSF, and FMSF map classes, so care was taken to split the ruderal FXSF out. This splitting was accomplished using canopy closure and age in combination with landscape cues such as remnant logging roads and log landing areas, which tend to persist on the landscape for a few decades, and the amount of northern hardwood tree species in the canopy, which tend to be more common in FXSF.

The AA results indicate that FXSF was mapped with a users' accuracy of 77% (90% confidence interval of 64–91%) and a producers' accuracy of 73% (90% confidence interval of 59–87%). The AA discloses several instances where FXSF was mapped either too aggressively (to six map classes) or too conservatively (from six map classes). Both the users' and producers' errors primarily comes from slight confusion between what is a ruderal forest and what is not a ruderal forest, with the errors widely spread among the co-occurring red spruce and balsam fir forest map classes.



Two examples of the FXSF map class showing a very young version (left) and a more mature version (right).

FXVP – Ruderal Virginia Pine Forest

The Ruderal Virginia Pine Forest (FXVP) map class represents the *Pinus virginiana* Ruderal Forest Association (CEGL002591) in the USNVC. The forest association that makes up this map class occurs within the AT corridor from Georgia north to northeastern Pennsylvania. The FXVP map class is uncommon within the corridor covering 149.5 ha (0.1% of APPA).

Dominated or codominated by stands of Virginia pine (*Pinus virginiana*), the FXVP map class occurs in areas likely subject to severe fire, clearcutting, or some other disturbance that allowed a single clade of Virginia pine to regenerate over a significant area. This characteristic presented the mappers with a unique signature of a dense, single-aged and single-height, dark-purple flat-crowned conifer canopy, often intermixed (generally less than 25% canopy cover, each) with sparse hardwood tree species with fluffy white, yellow, and orange crowns and dry-site oaks with crisp, narrow, tan and pink crowns.

The AA results indicate that FXVP was mapped with a users' accuracy of 71% (90% confidence interval of 56–86%) and a producers' accuracy of 73% (90% confidence interval of 58–88%). The AA discloses several instances where FXVP was mapped either too aggressively (to six map classes) or too conservatively (from three map classes). The users' error primarily comes from an overly aggressive estimation of the degree of disturbance in non-ruderal Virginia pine – mixed dry pine woodland map classes, while the producers' error primarily comes from an overly conservative estimation of Virginia pine cover in the co-occurring FXER map class.



An example of the FXVP map class showing a younger, single-age canopy of Virginia pine.

FXWP – Ruderal Eastern White Pine Forest

The Ruderal Eastern White Pine Forest (FXWP) map class represents the *Pinus strobus* Ruderal Forest Association (CEGL007944) in the USNVC. The forest association that makes up this map class occurs throughout the AT corridor. The FXWP map class is common within the corridor covering 888.8 ha (0.8% of APPA).

The FXWP map class ranges from codominance to complete dominance of eastern white pine (*Pinus strobus*) of a ruderal, but non-planted, nature. Generally, this map class presents as even-aged stands of mature eastern white pine covering a subcanopy of oaks and hardwoods because of the faster growth rate and taller stature of eastern white pine. Mature eastern white pine are readily distinguishable in the project imagery because of their large size and distinct branching pattern of perpendicular to the trunk branches.

The AA results indicate that FXWP was mapped with a users' accuracy of 91% and a producers' accuracy of 76% (90% confidence interval of 63–88%). The AA discloses several instances where FXWP was mapped either too aggressively (to two map classes) or too conservatively (from six map classes). The users' error primarily comes from an overly aggressive estimation disturbance in co-occurring non-ruderal eastern white pine-mixed hardwood forest map classes, while the producers' error primarily comes from an overly conservative estimation of both the cover of eastern white pine and the degree of disturbance in co-occurring mixed conifer forest map classes.



Two examples of the FXWP map class showing both a more monotypic even-aged eastern white pine canopy (left) versus a more mixed canopy still dominated by ruderal eastern white pine (right).

HAWM – Alpine Herbaceous Wet Meadow

The Alpine Herbaceous Wet Meadow (HAWM) map class represents the *Trichophorum caespitosum* - *Carex scirpoidea* - *Carex bigelowii* Alpine Snowbed Association (CEGL006424) in the USNVC. This wet herbaceous alpine map class occurs within the AT corridor in the alpine zone in New Hampshire and Maine. The HAWM map class is exceptionally rare within the corridor covering 6.3 ha (0.006% of APPA).

The HAWM map class is defined by a very short and dense herbaceous layer on saturated ground with less than 25% shrub cover in the alpine zone (above 1,280 m elevation for this map class). The HAWM map class presents as a lumpy grey, tan, and pink herbaceous field with evident soil saturation on generally flat ground intermixed with areas of bleached-out sparsely vegetated rock and small patches of darker shrub heath.

The AA results indicate that HAWM was mapped well with a users' accuracy of 100% and a producers' accuracy of 83%. The AA discloses one instance where HAWM was mapped too conservatively from the SMCK map class where alpine herb cover and hydrologic influence were both underestimated.



An example of the HAWM map class on Mount Washington in New Hampshire showing the typical combination of mixed wet herbaceous areas and shallow open water.

HBAM – Bigelow's Sedge Alpine Meadow

The Bigelow's Sedge Alpine Meadow (HBAM) map class represents the *Carex bigelowii* Alpine Meadow Association (CEGL006081) in the USNVC. This herbaceous alpine map class occurs within the AT corridor in the alpine zone in New Hampshire and Maine. The HBAM map class is rare within the corridor covering 33.9 ha (0.03% of APPA).

The HBAM map class is defined by a very short and flat herbaceous layer on dry ground with less than 25% shrub cover in the alpine zone (above 1,520 m elevation for this map class). The HBAM map class presents as a flat light- to dark-tan herbaceous field on dry sites with intermixed areas of bleached-out sparsely vegetated rock and small patches of darker shrub heath and krummholz.

The AA results indicate that HBAM was mapped with a users' accuracy of 63% (90% confidence interval of 42–84%) and a producers' accuracy of 100%. The AA discloses two instances where HBAM was mapped too aggressively to the SAHM and VAFB map classes. The majority of the users' errors come from an overly aggressive estimation of alpine herb cover in the alpine shrub map class SAHM.



An example of the HBAM map class on Mount Washington in New Hampshire showing the typical combination of mixed sedge-dominated uplands with interspersed areas of sparsely vegetated rock.

HMSF – Northern Appalachian Alpine Bulrush Cliff

The Northern Appalachian Alpine Bulrush Cliff (HMSF) map class represents the *Trichophorum caespitosum* - *Calamagrostis pickeringii* Alpine Snowbed Association (CEGL006423) in the USNVC. This wet herbaceous alpine map class occurs within the AT corridor only in the alpine zone in New Hampshire and Maine. The HMSF map class is exceptionally rare within APPA covering 3.5 ha (0.003% of APPA).

The HMSF map class is defined by a very short and dense herbaceous layer on saturated ground with less than 25% shrub cover on steep to very steep slopes in the alpine zone (above 1,370 m elevation for this map class). This map class presents as a very flat, tan to ruddy-brown herbaceous layer on steep slopes intermixed with areas of bleached-out, sparsely vegetated rock and small patches of darker shrub heath.

The AA results indicate that HMSF was mapped with a users' accuracy of 50% (90% confidence interval of -33–133%) and a producers' accuracy of 100%. (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses one instance where HMSF was mapped too aggressively to the SAHM map class where wetland herbaceous cover and hydrology were overestimated.



An example of the HMSF map class on Mount Katahdin in Maine showing the wet herbaceous alpine fen on a very steep slope.

SAHM – Alpine Heath Meadow

The Alpine Heath Meadow (SAHM) map class represents two associations in the USNVC—the *Vaccinium uliginosum - Harrimanella hypnoides - Loiseleuria procumbens* Dwarf-shrubland (CEGL006155) and the *Vaccinium uliginosum - Rhododendron lapponicum* / *Juncus trifidus* Dwarf-shrubland (CEGL006298). This mixed evergreen alpine dwarf-shrub map class occurs within the AT corridor only in the alpine zone in New Hampshire and Maine. The SAHM map class is uncommon within the corridor covering 191.0 ha (0.2% of APPA).

The SAHM map class is defined by a very short and dense canopy of evergreen alpine dwarf shrubs and trees only a few centimeters tall on rocky terrain in the alpine zone. The alpine zone is not a specific elevation cut for this map class, but varies by mountain range and topographic position with the zone starting near 920 m elevation on some ranges and near 1,280 m elevation on other ranges. The SAHM map class presents as a very flat and compact shrubland of mixed grey, tan, and dull pink with large areas of bleached-out sparsely vegetated rock and small patches of dark-purple conifer krummholz intermixed.

The AA results indicate that SAHM was mapped well with a users' accuracy of 94% and a producers' accuracy of 82%. The AA discloses several instances where SAHM was mapped either too aggressively (to two map classes) or too conservatively (from two map classes). The users' error is too widely spread and sparse to determine a consistent conclusion, while the producers' error primarily comes from an overly conservative estimation of shrub cover in the HBAM map class.



An example of the SAHM map class on Mount Washington in New Hampshire showing association CEGL006155 intermixed with association CEGL006298.

SCTH – Cold Air Talus Heathland

The Cold Air Talus Heathland (SCTH) map class represents the *Picea mariana* / *Ledum groenlandicum* - *Empetrum nigrum* / *Cladina* spp. Dwarf-shrubland Association (CEGL006268) in the USNVC. This mixed evergreen alpine dwarf-shrub map class occurs within the AT corridor only in the alpine zone at one location in the White Mountains of New Hampshire. The SCTH map class is exceptionally rare within the corridor covering 1.6 ha (0.002% of APPA).

Based on vegetation plot data and conversations with ecologists, the SCTH map class was a "map known locations" map class, which means that only confirmed locations were mapped. For SCTH, that means two polygons were mapped next to each other in the White Mountains of New Hampshire on a steeply sloping, sheltered, talus slope. This location was supported by a vegetation plot prior to mapping and, because of its remoteness, was not visited during the mapping field reconnaissance.

The SCTH map class presents as a very flat, pink and red shrubland intermixed with large areas of bleached-out talus and small patches of dark-purple conifer krummholz.

The SCTH map class was mapped very consistently. The AA process discovered no new instances of the SCTH map class, and no instances of SCTH were confused with a different map class.



An example of the SCTH map class showing a very steep slope dominated by dwarf shrubs and trees over talus.

SSSB – Subalpine Slope Bog

The Subalpine Slope Bog (SSSB) map class represents the *Kalmia angustifolia* - *Chamaedaphne calyculata* / *Rubus chamaemorus* / *Cladina* spp. Dwarf-shrubland Association (CEGL006425) in the USNVC. This mixed evergreen dwarf-shrub swamp map class occurs within the AT corridor only in the alpine zone in New Hampshire and Maine. The SSSB map class is exceptionally rare within the corridor covering 0.8 ha (0.0007% of APPA).

The SSSB map class is defined by a very short canopy of primarily evergreen shrubs rooting on a saturated mat of sphagnum (*Sphagnum* spp.) moss. Present only in seepage areas on slopes in the alpine zone above 1,040 m elevation, this map class presents a characteristic flat orange to pink signature on slopes otherwise dominated by conifers.

The SSSB map class was mapped very consistently. The AA process discovered no new instances of the SSSB map class, and no instances of SSSB were confused with a different map class.



An example of the SSSB map class showing a wet slope surrounded by a conifer forest in the alpine zone.

SWAR – Windswept Alpine Ridge

The Windswept Alpine Ridge (SWAR) map class represents the *Diapensia lapponica* Dwarf-shrubland Association (CEGL006322) in the USNVC. This mixed evergreen alpine dwarf-shrub map class only occurs within the AT corridor in New Hampshire and Maine in the alpine zone. The SWAR map class is exceptionally rare within the corridor covering 5.3 ha (0.005% of APPA).

This map class is defined by an exceptionally short and dense covering of the evergreen pincushion plant (*Diapensia lapponica*), which is never greater than a few centimeters tall, on very exposed and rocky topographic positions above 1,340 m elevation. The SWAR map class presents as a bright-pink to red, nearly flat vegetation draping over the terrain on exposed ridge lines. Generally, the area consists of significant areas of open ground and rock and, occasionally, some taller patches of other alpine shrub map classes.

The SWAR map class was mapped very consistently. The AA process discovered no new instances of the SWAR map class, and no instances of SWAR were confused with a different map class.



An example of the SWAR map class on Mount Washington in New Hampshire showing association CEGL006322 intermixed with association CEGL006298.

SWEB – Black Crowberry Wet Alpine Bog

The Black Crowberry Wet Alpine Bog (SWEB) map class represents the *Empetrum nigrum* - *Vaccinium uliginosum* - *Vaccinium oxycoccos* / *Rubus chamaemorus* Dwarf-shrubland Association (CEGL006140) in the USNVC. This mixed evergreen dwarf-shrub swamp map class only occurs within the AT corridor in New Hampshire and Maine in acidic basin settings at high elevation. The SWEB map class is exceptionally rare within the corridor covering 1.8 ha (0.002% of APPA).

The SWEB map class is defined by a very short and dense canopy of primarily evergreen shrubs rooting on a saturated mat of sphagnum (*Sphagnum* spp.) moss. Present only in seepage basins above 1,000 m elevation, this map class presents a characteristic flat to lumpy orange signature with areas of open water often present and an obvious rise in the elevation of the vegetation towards the edge of the basin.

The AA results indicate that SWEB was mapped well with a users' accuracy of 100% and a producers' accuracy of 83%. The AA discloses one instance where SWEB was mapped too conservatively from the SDBF map class because of a misinterpretation of which dwarf shrub species dominated the bog.



An example of the SWEB map class on Saddleback Mountain in Maine.

HALD – Appalachian Low-Elevation Granitic Dome

The Appalachian Low-Elevation Granitic Dome (HALD) map class represents the *Selaginella rupestris* - *Schizachyrium scoparium* - *Hypericum gentianoides* - *Bulbostylis capillaris* Herbaceous Vegetation Association (CEGL007690) in the USNVC. This herbaceous association only occurs within the AT corridor in the southern most portion on rocky, granitic dome; despite the name, this map class may occur anywhere below 1,350 m elevation. The HALD map class is exceptionally rare within the corridor covering 5.3 ha (0.005% of APPA).

This mixed-species herbaceous map class is always associated with very thin (to absent) soils over monolithic granite on a slope too steep to allow substantial soil formation. These conditions prevented the development of much vegetation beyond small patches, with cracks or depressions surrounded by lichens. This combination of characteristics presented mappers with a unique signature of very steep, very sparsely-vegetated areas, with a generally washed-out, overexposed signature because of the reflectance of the rocky surfaces.

The HALD map class was mapped very consistently. The AA process discovered no new instances of the HALD map class, and no instances of HALD were confused with a different map class.



Two examples of the HALD map class showing a moderately well-vegetated site (left) and a much more sparsely-vegetated site (right).

HBGF – Graminoid & Forb Bald

The Graminoid & Forb Bald (HBGF) map class represents four associations in the USNVC:

- *Carex pensylvanica* Grassland (CEGL004094),
- *Danthonia compressa* - (*Sibbaldiopsis tridentata*) Grassland (CEGL004242),
- *Saxifraga michauxii* - *Carex misera* - *Oclemena acuminata* - *Solidago glomerata* Grassland (CEGL004277), and
- *Saxifraga michauxii* - *Carex misera* - *Danthonia spicata* - *Krigia montana* Grassland (CEGL004279).

The herbaceous associations that make up this map class occur only within the AT corridor in the southern portion at the highest elevations and are limited to three natural balds—the Whitetop Mountain area (southern Virginia), the Carvers Gap - Roan Mountain area (Tennessee/North Carolina), and Big Bald (Tennessee/North Carolina). The herbaceous areas at Grayson Highlands State Park (Virginia) present a special case because these areas mimic the species in the HBGF map class associations, but the areas are specifically anthropogenic in origin. The HBGF map class is rare within the corridor covering 65.4 ha (0.06% of APPA).

The HBGF map class is highly constrained by elevation and land-use history. This map class naturally occurs only at the highest elevations, known only to area above 1,500 m elevation. Project ecologists put the additional constraint on this map class of only occurring at the three natural balds locations within the AT corridor to remove potential confusion with all other high-elevation herbaceous vegetation. Generally, the HBGF map class favored southern exposures at the top of the highest peaks within the corridor and appeared as tan to light-pink, very short-statured herbaceous vegetation. Small patches of shrubs were common within this map class, especially in areas lacking recent management.

The AA results indicate that HBGF was mapped well with both a users' and producers' accuracy of 97%. The AA discloses three instances where HBGF was mapped either too aggressively (to the SBAB map class) or too conservatively (from the SHBT map class). The errors come from a misestimation of herb cover in the co-occurring SBAB (overestimation) and SHBT (underestimation) map class.



Four examples of the HBGF map class showing the general interface between the highest-elevation forest and herbaceous vegetation, along with the active-management needed to maintain these associations (upper left), the Appalachian Trail heading through the bald on Whitetop Mountain in Virginia (upper right), the potential for shrubs (here, blackberry species [*Rubus* spp.]) mixing in with the herbaceous vegetation (lower left), and a close-up of the vegetation on Whitetop Mountain in Virginia (lower right).

HCAB – Central Appalachian Wooded Herbaceous Barrens

The Central Appalachian Wooded Herbaceous Barrens (HCAB) map class represents two associations in the USNVC—the *Juniperus virginiana* - *Fraxinus americana* / *Carex pensylvanica* - *Cheilanthes lanosa* Open Woodland (CEGL006037) and the *Fraxinus americana* / *Physocarpus opulifolius* / *Carex pensylvanica* - *Allium cernuum* - (*Phacelia dubia*) Wooded Grassland (CEGL008529). This herbaceous map class exists only within the AT corridor in central Virginia. The HCAB map class is rare within the corridor covering 15.5 ha (0.01% of APPA).

This map class is defined by areas of open sloping bedrock with sparse herbaceous vegetation and even sparser woody vegetation. Generally, the HCAB map class presents as open exposed bedrock slopes on warm aspects below 1,070 m elevation, with patches of brown and grey vegetation following cracks in the rock and the occasional pink shrub.

The AA results indicate that HCAB was mapped well with a users' accuracy of 90% and a producers' accuracy of 100%. The AA discloses one instance where HCAB was mapped too aggressively to the WMDP map class where exposed rock and herbaceous cover were overestimated.



An example of the HCAB map class showing the exposed bedrock with intermixed patches of primarily herbaceous vegetation (association CEGL008529 in this instance).

HHGB – High-Elevation Greenstone Barrens

The High-Elevation Greenstone Barrens (HHGB) map class represents the *Diervilla lonicera* - *Solidago simplex* var. *randii* - *Deschampsia flexuosa* - *Hylotelephium telephioides* - *Saxifraga michauxii* Grassland Association (CEGL008536) in the USNVC. This herbaceous barrens map class occurs in the AT corridor only in Virginia on greenstone bedrock (Catoctin Formation). The HHGB map class is exceptionally rare within the corridor covering 3.8 ha (0.003% of APPA).

The HHGB map class is defined by a very short and flat herbaceous layer on very thin soils over greenstone bedrock, with less than 25% shrub cover above 880 m elevation on dry ground. This map class presents as a primarily rock-dominated area with patches of short, light-tan and pink herbaceous vegetation with intermixed sparse shrubs and scrubby oaks (*Quercus* spp.).

The AA results indicate that HHGB was mapped with a users' accuracy of 60% (90% confidence interval of 14–106%) and a producers' accuracy of 100%. (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses two instances where HHGB was mapped too aggressively to the WMDP and SXCN map classes where herbaceous cover and the presence of greenstone were overestimated.



An example of the HHGB map class showing the very short herbaceous vegetation over the greenstone bedrock.

HLMO – Low- to Mid-Elevation Little Bluestem - Poverty Oatgrass Outcrop Opening

The Low- to Mid-Elevation Little Bluestem - Poverty Oatgrass Outcrop Opening (HLMO) map class represents the *Schizachyrium scoparium* - *Danthonia spicata* - *Carex pensylvanica* / *Cladonia* spp. Grassland Association (CEGL006544) in the USNVC. This herbaceous openings map class occurs in the AT corridor from New Jersey north into Vermont. The HLMO map class is exceptionally rare within the corridor covering 9.6 ha (0.009% of APPA).

The HLMO map class is defined by a very short and flat herbaceous layer on thin soils or in the cracks of acidic bedrock with less than 25% shrub cover. Often on warm aspects, this map class is also typically located on very steep slopes below 700 m elevation. This map class presents as a primarily rock-dominated area, with patches of short, light-tan and ruddy-brown herbaceous vegetation growing in cracks along with intermixed sparse shrubs and scrubby oaks (*Quercus* spp.).

The AA results indicate that HLMO was mapped with a users' accuracy of 100% and a producers' accuracy of 63% (90% confidence interval of 28–97%). (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses one instance where HLMO was mapped too conservatively from the VEAC map class where herbaceous cover was underestimated.



An example of the HLMO map class showing the very short herbaceous vegetation over bedrock with sparse and scrubby shrubs and trees.

SBAA – Southern Appalachian Alder Bald

The Southern Appalachian Alder Bald (SBAA) map class represents the *Alnus viridis* ssp. *crispa* / *Carex pensylvanica* Shrubland Association (CEGL003891) in the USNVC. The shrub association that makes up this map class only occurs on one mountain in the southern portion of the AT corridor—Roan Mountain on the Tennessee-North Carolina border above 1,700 m elevation. This location is the only know location for this vegetation type in the corridor. The SBAA map class is exceptionally rare within the corridor covering 8.7 ha (0.008% of APPA). More of this association occurs outside the corridor on Roan Mountain.

The SBAA map class is defined by the dominance of mountain alder (*Alnus viridis* ssp. *crispa*). In restored examples, mountain alder becomes very dominant, whereas in unrestored versions, the map class often is significantly invaded by other woody species such as blackberry (*Rubus* spp.), blueberry (*Vaccinium* spp.), and laurel (*Rhododendron* spp.). Mountain alder presented a unique and readily identifiable signature of pale grey-green in the project imagery. This signature proved very easy to identify, especially when compared to the very different signatures of blackberry, blueberry, and laurel.

The AA results indicate that SBAA was mapped with a users' accuracy of 100% and a producers' accuracy of 71% (90% confidence interval of 36–107%). (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses one instance where SASB was mapped too conservatively from the SBAH map class where mountain alder cover was underestimated.



Two examples of the SBAA map class showing recently restored, primarily dominated mountain alder (left) and mountain alder significantly invaded by other woody species and being restored with the use of goats protected by dogs (right).

SBAB – Southern Appalachian Blackberry Bald

The Southern Appalachian Blackberry Bald (SBAB) map class represents the *Rubus allegheniensis* - *Rubus canadensis* / *Carex pensylvanica* Shrubland Association (CEGL003892) in the USNVC. The shrub association that makes up this map class is a naturally occurring, blackberry-dominated (*Rubus* spp.) shrub bald present at high elevation within the AT corridor in the southern portion only on the three natural balds—the Whitetop Mountain area (southern Virginia), the Carvers Gap - Roan Mountain area (Tennessee/North Carolina), and Big Bald (Tennessee/North Carolina). The SBAB map class is exceptionally rare within the corridor covering 5.9 ha (0.005% of APPA).

This map class is defined by shrub dominance, specifically blackberry above 1,500 m elevation on natural balds. Often, the SBAB map class was present as less than MMU patches within the matrix HBGF map class on natural balds. Generally, SBAB presented as a flat, dark-tan to brownish-red area in the tan to light-pink, very short-statured herbaceous vegetation that defines the HBGF map class. This signature was sufficiently distinct from other common shrub map classes at this elevation to allow for the consistent mapping of SBAB.

The AA results indicate that SBAB was mapped well with a users' accuracy of 100% and a producers' accuracy of 83%. The AA discloses one instance where SBAB was mapped too conservatively from the HBGF map class where blackberry cover was underestimated.



Two examples of the SBAB map class showing a blackberry-dominated site (left) compared to a mixed shrub-herb site (right).

SBAH – Southern Appalachian Heath Bald

The Southern Appalachian Heath Bald (SBAH) map class represents the *Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium* Shrubland Association (CEGL007876) in the USNVC. The shrub association that makes up this map class only occurs at the highest elevation within the AT corridor in North Carolina and Tennessee. The SBAH map class is rare within the corridor covering 30.1 ha (0.03% of APPA).

The SBAH map class is defined by the diverse mix of evergreen and deciduous shrub, especially sandmyrtle (*Leiophyllum buxifolium*); the presence of exposed rock; and the highly limited range elevational range of above 1,490 m elevation. This combination of factors and the distinct short and dense red signature of sandmyrtle around bleached-out bare rock, made for generally consistent mapping.

The AA results indicate that SBAH was mapped with both a users' and producers' accuracy of 64% (90% confidence interval of 40–89%). The AA discloses several instances where SBAH was mapped either too aggressively (to three map classes) or too conservatively (from four map classes). The users' error primarily comes from an overly aggressive application among co-occurring high-elevation shrub map classes, whereas the producers' error primarily comes from an overly conservative estimation of shrub cover in co-occurring high-elevation spruce-fir map classes.



Two examples of the SBAH map class showing the short shrubland covering a very steep mountain side in GRSM (left) versus a close-up view (right).

SBCH – Southern Appalachian Catawba Rosebay Heath Bald

The Southern Appalachian Catawba Rosebay Heath Bald (SBCH) map class represents the *Rhododendron catawbiense* Shrubland Association (CEGL003818) in the USNVC. This primarily evergreen shrub map class generally occurs throughout the southern portion of the AT corridor above 1,400 m elevation. The SBCH map class is rare within the corridor covering 26.9 ha in the corridor (0.02% of APPA).

The SBCH map class is defined by the combination of evergreen shrub dominance, specifically Catawba rhododendron (*Rhododendron catawbiense*), and high elevation, which excludes other evergreen shrub map classes. Often, deciduous trees and shrubs were mixed in with the Catawba rhododendron; however, determining the dominance of this map class was relatively easy because of the vibrant-red signature of rhododendron.

The AA results indicate that SBCH was mapped with a users' accuracy of 63% (90% confidence interval of 40–86%) and a producers' accuracy of 100%. The AA discloses several instances where SBCH was mapped too aggressively (to five map classes). The users' error primarily comes from an overly aggressive application of the SBCH map class among co-occurring high-elevation shrub map classes.



Two examples of the SBCH map class showing the dense rhododendron from below (left) and the solid rhododendron canopy from above with several additional shrub and short-tree species mixed in (right).

SBDH – Southern Appalachian Deciduous Heath Bald

The Southern Appalachian Deciduous Heath Bald (SBDH) map class represents the *Menziesia pilosa* - *Vaccinium* (*erythrocarpum*, *simulatum*, *corymbosum*) - *Sorbus americana* Shrubland Association (CEGL004819) in the USNVC. The shrub association that makes up this map class only occurs within the AT corridor on the Mount Rogers - Whitetop massif of the southern Virginia Blue Ridge above 1,450 m elevation. The SBDH map class is rare within the corridor covering 25.9 ha (0.02% of APPA).

The SBDH map class is defined by the diverse mix of acid-tolerant shrub, especially minniebush (*Menziesia pilosa*); the presence of exposed rock; and the highly limited range. These factors combined well with the distinct raised brown signature of minniebush and blueberry (*Vaccinium* spp.) around bleached-out bare rock.

The AA results indicate that SBDH was mapped well with a users' accuracy of 93% and a producers' accuracy of 82%. The AA discloses three instances where SBDH was mapped either too aggressively (to the FABF map class) or too conservatively (from the SBCH and SHBT map classes). The users' error is caused by an overly aggressive estimation of shrub cover in the FABF map class, whereas the producers' error is caused by and overly conservative application among co-occurring high-elevation shrub map classes.



Two examples of the SBDH map class on Mount Rogers in Virginia showing the mix of shrubs on a boulder field (left) and covering a solid rock knob (right).

SBGB – Blueberry Granite Barrens

The Blueberry Granite Barrens (SBGB) map class represents the *Vaccinium angustifolium* - *Sorbus americana* / *Sibbaldiopsis tridentata* Dwarf-shrubland Association (CEGL005094) in the USNVC. This shrub map class is within the AT corridor on bedrock at mid-elevations in New Hampshire and Maine. The SBGB map class is rare within the corridor covering 13.9 ha (0.01% of APPA).

The SBGB map class is defined by areas of open and sparsely vegetated bedrock with distinct areas of short shrubland dominated by lowbush blueberry (*Vaccinium angustifolium*). Present between 240 and 820 m elevation, this map class is usually on warm and exposed topographic positions. Generally, SBGB presents as areas of sometimes extensive unvegetated bedrock interspersed with areas of orange and pink, flat and short shrubland.

The AA results indicate that SBGB was mapped with a users' accuracy of 50% (90% confidence interval of 15–85%) and a producers' accuracy of 100%. (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses two instances where SBGB was mapped too aggressively to the WHOT and SMCK map classes, with the users' errors primarily comes from an overly aggressive application of SBGB in the elevation range where SBGB and SMCK co-occur.



An example of the SBGB map class showing a patch associated with open granite, with lowbush blueberry growing in the crevices.

SBOB – Ridgetop Bear Oak Barrens

The Ridgetop Bear Oak Barrens (SBOB) map class represents the *Quercus ilicifolia - Prunus pumila* Shrubland Association (CEGL006121) in the USNVC. This shrub map class is within the AT corridor on bedrock at mid-elevations from New Jersey to northern Massachusetts. The SBOB map class is rare within the corridor covering 41.9 ha (0.04% of APPA).

The SBOB map class is defined by a tall shrubland dominated by bear oak (*Quercus ilicifolia*) with areas of open and sparsely vegetated bedrock interspersed. Existing between 300 and 670 m elevation, this map class usually occurs on warm and exposed topographic positions. Generally, this map class presents as areas of sometimes extensive tan to orange, dense and tall shrubland interspersed with areas of unvegetated bedrock and occasional tall, dark-purple pitch pine (*Pinus rigida*).

The AA results indicate that SBOB was mapped well with a users' accuracy of 94% and a producers' accuracy of 100%. The AA discloses one instance where SBOB was mapped too aggressively to the FXOM map class where young regenerating oak were mistaken for SBOB.



An example of the SBOB map class showing the dense and tall bear oak with sparse pitch pine.

SCAB – Central Appalachian Blueberry Dwarf-shrubland

The Central Appalachian Blueberry Dwarf-shrubland (SCAB) map class represents the *Vaccinium* (*angustifolium*, *myrtilloides*, *pallidum*) Central Appalachian Dwarf-shrubland Association (CEGL003958) in the USNVC. This shrub map class is within the AT corridor on bedrock at mid-elevations in northern New Jersey and southern New York. The SCAB map class is rare within the corridor covering 27.9 ha (0.03% of APPA).

This map class is defined by a dense and very short shrub layer dominated by blueberry (*Vaccinium* spp.) intermixed with areas of bedrock. Existing between 300 and 550 m elevation, this map class is usually on warm and exposed topographic positions. Generally, SCAB presents as areas of very short and flat tan to orange to pink shrub intermixed with crisp, bright-northern red oak (*Quercus* spp.) and areas of sometimes extensive sparsely vegetated bedrock.

The SCAB map class was mapped very consistently. The AA process discovered no new instances of the SCAB map class, and no instances of SCAB were confused with a different map class.



An example of the SCAB map class showing a very short blueberry shrubland mixed with open bedrock and a few oak.

SCHB – Central Appalachian Heath Barrens

The Central Appalachian Heath Barrens (SCHB) map class represents the *Kalmia latifolia* - *Gaylussacia baccata* - *Vaccinium* (*angustifolium*, *pallidum*) - *Menziesia pilosa* Shrubland Association (CEGL003939) in the USNVC. The shrub association that makes up this map class only occurs within the AT corridor over a very limited range in northern Virginia. The SCHB map class is exceptionally rare within the corridor covering 3.9 ha (0.004% of APPA).

The SCHB map class is defined by the diverse mix of evergreen and deciduous shrub, the presence of exposed rock, the geographic constraint of northern Virginia, and the limited elevational range of above 1,000 m elevation. This combination of factors and the mix of dull-tan deciduous shrub next to bright-red evergreen shrub around bleached-out bare rock, made for generally consistent mapping.

The AA results indicate that SCHB was mapped with a users' accuracy of 75% (90% confidence interval of 27–123%) and a producers' accuracy of 100%. (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses one instance where SCHB was mapped too aggressively to the SHOB map class because of a misinterpretation of the dominant shrub species and underlying bedrock composition.



An example of the SCHB map class showing the mixed evergreen and deciduous short shrubs next to substantial sparsely vegetated rock outcrops.

SHBT – High-Elevation Blackberry Thicket

The High-Elevation Blackberry Thicket (SHBT) map class represents the *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland Association (CEGL003893) in the USNVC. This shrubland is a blackberry-dominated (*Rubus* spp.) ruderal map class throughout the AT corridor from the Springer Mountain in Georgia north to the Virginia State Highway 16 crossing. The SHBT map class is rare within the corridor covering 38.6 ha (0.03% of APPA).

This map class is defined by shrub dominance, specifically blackberry, at below 1,370 m elevation and not in association with natural balds. Most commonly, the SHBT map class was present where extensive soil modification had occurred, which is believed to have resulted from grazing, landslides, or severe fire. Additionally, patches of SHBT were often associated with forest openings. Generally, SHBT presented as a flat, dark-tan to brownish-red area, very similar or identical to the SBAB signature. However, location and land-use history were used to split the two apart.

The AA results indicate that SHBT was mapped well with a users' accuracy of 83% and a producers' accuracy of 87%. The AA discloses several instances where SHBT was mapped either too aggressively (to three map classes) or too conservatively (from three map classes). The errors are widely spread, but either relate to misestimation of shrub cover (both over and under) or to misidentification of shrub species.



Two examples of the SHBT map class showing a patch associated with fir die-off (left) and a patch associated with a modified high-elevation grassland (right).

SHOB – High-Elevation Outcrop Barrens (Black Chokeberry Igneous / Metamorphic Type)

The High-Elevation Outcrop Barrens (Black Chokeberry Igneous / Metamorphic Type) (SHOB) map class represents the *Photinia melanocarpa* - *Gaylussacia baccata* / *Carex pensylvanica* Shrubland Association (CEGL008508) in the USNVC. The shrub association that makes up this map class only occurs within the AT corridor over a very limited range in northern Virginia. The SHOB map class is exceptionally rare within the corridor covering 2.4 ha (0.002% of APPA).

The SHOB map class is defined by the diverse mix of deciduous shrubs, the presence of exposed rock, the limited geographic range in northern Virginia, and the limited elevational range of above 850 m elevation. This combination of factors and the dull-tan deciduous shrub, lack of evergreen shrub, and intermixed bleached-out bare rock, made for generally consistent mapping. In most occurrences of this map class, short oak (*Quercus* spp.) were scattered about with crisp, tan to pink canopies.

The AA results indicate that SHOB was mapped well with a users' accuracy of 100% and a producers' accuracy of 80%. The AA discloses one instance where SHOB was mapped too conservatively from the SCHB map class because of an overly conservative estimation of deciduous shrub cover.



An example of the SHOB map class (foreground) showing the short deciduous shrubs with intermixed sparsely vegetated rock outcrops.

SMBT – Mixed Shrub Bald & Thicket

The Mixed Shrub Bald & Thicket (SMBT) map class represents two associations in the USNVC—the *Kalmia latifolia - Rhododendron catawbiense* - (*Gaylussacia baccata*, *Pieris floribunda*, *Vaccinium corymbosum*) Shrubland (CEGL003814) and the *Rhododendron maximum* Upland Shrubland (CEGL003819). This mixed evergreen-deciduous shrub map class generally occurs between 1,100 and 1,600 m elevation and is present throughout the southern portion of the APPA project. The SMBT map class is rare within the AT corridor covering 33.9 ha (0.03% of APPA).

Initially, these two associations were mapped apart based on the mix of species and degree of disturbance, but the AA indicated consistent confusion between the two associations and they were collapsed into a single map class. The SMBT map class is defined by the combination of evergreen and deciduous shrubs and mid- to high-elevation. This generally excludes the map class from the other shrub classes, though examples dominated by only mountain laurel (*Kalmia latifolia*), great laurel (*Rhododendron maximum*), or Catawba rosebay (*Rhododendron catawbiense*) exist and added some level of confusion in mapping. Often, deciduous trees were mixed in with the shrubs, but because of the vibrant-red signature of the evergreen shrubs mixed with the dull to leaf-off signature of the deciduous shrubs, the map class was easy to determine.

The AA results indicate that SMBT was mapped with a users' accuracy of 78% (90% confidence interval of 59–97%) and a producers' accuracy of 58% (90% confidence interval of 40–77%). The AA discloses several instances where SMBT was mapped either too aggressively (to three map classes) or too conservatively (from five map classes). The majority of these errors fall into either a misestimation of canopy cover (both over and under) or a misidentification of the dominant shrub species. A final source of error was an overly conservative application of SMBT in the more disturbed SXBG map class.

The 90% confidence interval for the producers' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower producers' accuracy for the SMBT map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."




Two examples of the SMBT map class showing the solid mixed-shrub canopy from above with several short-tree species mixed in (left) and the dense evergreen shrub stems from below (right).

SMCK – Mixed Conifer Krummholz

The Mixed Conifer Krummholz (SMCK) map class represents two associations in the USNVC—the (*Picea mariana*, *Abies balsamea*) / *Kalmia angustifolia* - *Ledum groenlandicum* Dwarf-shrubland (CEGL006031) and the *Picea mariana* - *Abies balsamea* / *Sibbaldiopsis tridentata* Shrubland (CEGL006038). This mixed conifer alpine shrubland map class occurs in the AT corridor only at the higher elevations in New Hampshire and Maine. The SMCK map class is uncommon within the corridor covering 450.1 ha (0.4% of APPA).

The SMCK map class is defined by a very short and dense canopy of black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*) less than 2 m tall (and often less than 20 cm tall) because of the extreme climate and shallow soil. Although this combination of characteristics becomes progressively more common at higher elevation, extreme conditions bring the SMCK map class down to 670 m elevation in a few instances within the AT corridor. Conifer cover ranged from 25% (often in association with other alpine shrub and herb map classes) to 100% (often as SMCK intergrades with lower elevation conifer forest map classes).

The SMCK map class presents as a very flat and compact shrubland of dark-purple conifer trees. These trees can be intermixed with large areas of bleached-out, sparsely vegetated rock; grey, tan, and pink alpine shrub vegetation; and small patches of dark-purple conifer greater than 2 m tall.

The AA results indicate that SMCK was mapped well with a users' accuracy of 93% and a producers' accuracy of 88%. The AA discloses several instances where SMCK was mapped either too aggressively (to two map classes) or too conservatively (from two map classes). The users' errors come from an overly aggressive estimation of shrub cover among co-occurring alpine herb and sparsely vegetated map classes, while the producers' errors come from a misidentification of dominant shrub species in co-occurring shrub map classes.



Two examples of the SMCK map class comparing a very short version (left) versus a very tall version (right).

HXCM – Cultivated Grassland

The Cultivated Grassland (HXCM) map class represents the *Lolium* (*arundinaceum*, *pratense*) Ruderal Grassland Association (CEGL004048) in the USNVC. This herbaceous association only occurs within the AT corridor in the southern portion on occasionally-managed herbaceous fields below 915 m elevation. The HXCM map class is rare within the corridor covering 22.5 ha (0.02% of APPA).

This mixed-species herbaceous map class requires continual management to prevent succession into woody vegetation and, generally, is closely associated with human-dominated landscapes. Additionally, the species composition between HXCM and HXFM is otherwise indistinguishable in the project imagery, but is elevation dependent; therefore, an elevation-cutoff of 915 m was used to split the two map classes. This map class presented mappers with a bright-pink or red signature of managed herbaceous fields associated with human-dominated landscapes, which often meant square or rectangular areas in otherwise forested landscapes.

The AA results indicate that HXCM was mapped well with a users' accuracy of 93% and a producers' accuracy of 100%. The AA discloses one instance where HXCM was mapped too aggressively (to the FXAH map class) because of an overly aggressive estimation of total herbaceous cover.



Two examples of the HXCM map class showing an herb-dominated managed area without mowing (left) and with mowing (right).

HXFM – Grazed Montane Grassland / Fire Meadow

The Grazed Montane Grassland / Fire Meadow (HXFM) map class represents the *Phleum pratense* - *Bromus pubescens* - *Helenium autumnale* Ruderal Meadow Association (CEGL004018) in the USNVC. This herbaceous association only occurs in the AT corridor in the southern portion of the corridor on occasionally-managed herbaceous fields above 915 m elevation. The HXFM map class is uncommon within the corridor covering 362.7 ha (0.3% of APPA).

This mixed-species herbaceous map class requires occasional management to prevent succession into woody vegetation and, generally, is closely associated with human-dominated landscapes or indicative of past human management that has been since abandoned. Additionally, the species composition between HXFM and HXCM is otherwise indistinguishable in the project imagery, but is elevation dependent; therefore, an elevation-cutoff of 915 m was used to split the two map classes. This map class presented mappers with a bright-pink or red signature of managed herbaceous fields associated with human-dominated landscapes or indications of prior extensive human management, which often meant square or rectangular areas in otherwise forested landscapes.

The AA results indicate that HXFM was mapped well with a users' accuracy of 97% and a producers' accuracy of 91%. The AA discloses two instances where HXFM was mapped either too aggressively (to the SHBT map class where herbaceous cover and disturbance were overestimated) or too conservatively (from the SXBG map class where herbaceous cover was underestimated).



Two examples of the HXFM map class showing herb-dominated areas at higher elevations without mowing (left) and with grazing (right).

HXNE – Northeastern Ruderal Grassland

The Northeastern Ruderal Grassland (HXNE) map class represents the following three associations in the USNVC:

- *Andropogon virginicus* var. *virginicus* Ruderal Grassland (CEGL004044),
- *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Ruderal Meadow (CEGL006107), and
- *Schizachyrium scoparium* - (*Andropogon virginicus*) - *Solidago* spp. Ruderal Meadow (CEGL006333).

This herbaceous map class occurs within the AT corridor in disturbed uplands from southern Virginia north to the terminus in Maine. The HXNE map class is common within the corridor covering 1,086.8 ha (1.0% of APPA).

This map class is defined by open, ruderal, and often actively managed herbaceous areas of a highly variable composition with sparse shrubs and trees (less than 25% cover, each). The HXNE map class presents a highly variable signature of very short to tall herbaceous uplands of white, tan, brown, orange, pink, and red, with sparse shrubs and trees. In many instances, evidence of mowing, haying, or grazing were visible, and the square corners, straight edges, and fences indicative of past management also were visible.

The AA results indicate that HXNE was mapped well with a users' accuracy of 96% and a producers' accuracy of 94%. The AA discloses three instances where HXNE was mapped either too aggressively (to the HXSC map class where upland herb species were overestimated) or too conservatively (from the SXCN and SXHE map classes where herbaceous cover was underestimated).



Two examples of the HXNE map class showing a heavily grazed and graminoid-dominated association CEGL006107 (left) compared to a rarely managed forb-dominated association CEGL006107 (right).

SXBG – Ruderal Blackberry - Greenbrier Shrub Thicket

The Ruderal Blackberry - Greenbrier Shrub Thicket (SXBG) map class represents the *Rubus* (*argutus*, *trivialis*) - *Smilax* (*glauca*, *rotundifolia*) Ruderal Shrubland Association (CEGL004732) in the USNVC. The ruderal shrub association that makes up this map class within the AT corridor primarily represents highly disturbed lands regenerating into shrub and short trees from Springer Mountain in Georgia north to the Virginia State Highway 16 crossing. The SXBG map class is rare within the corridor covering 94.7 ha (0.09% of APPA).

The SXBG map class is a highly variable mix of native and non-native ruderal herb, shrub, and tree species with at least 25% shrub cover and less than 25% tree cover, though trees were only counted as trees if they were taller than 5 m. Both deciduous and evergreen shrubs were allowed in the map class. Originally applied to managed rights-of-way, such as power-line corridors, the concept was expanded to include abandoned agriculture, forestry activities, and other landscape modifications that interrupt natural succession.

The SXBG map class presents a highly variable signature in the project imagery that is related to the conditions present when the site was recolonized by shrubs, but in all instances this map class is in very disturbed areas. The uniting factor is that these are ruderal shrub stands dominated by a variety of shrub species and not dominated (less than 50% cover) by native evergreen heath shrubs such as great laurel (*Rhododendron maximum*), Catawba rhododendron (*Rhododendron catawbiense*), or mountain laurel (*Kalmia latifolia*).

Potentially located on any landscape position below 1,590 m elevation, this map class occurs broadly across disturbed sections of the AT corridor.

The AA results indicate that SXBG was mapped with a users' accuracy of 50% (90% confidence interval of 33–67%) and a producers' accuracy of 100%. The AA discloses five instances where SXBG was mapped too aggressively. The errors mainly divide into two group. The first group is from misestimation of ruderal shrub cover in co-occurring ruderal forest (underestimation) and ruderal herbaceous (overestimation) map classes. The second group is from overestimation of deciduous shrub cover in the co-occurring SMBT map class.

The 90% confidence interval for the producers' accuracy remains below the standard. Decisions with APPA staff resulted in accepting a slightly lower producers' accuracy for the SXBG map class instead of merging more map classes together to boost accuracy results. Information on this decision is in "Appendix K: Accuracy Assessment Reconciliation."




Two examples of the SXBG map class showing a location repeatedly returned to an herb or shrub condition by active management (left) and a location maturing from a shrubland into a young ruderal forest (right).

SXCN – Central & Northern Ruderal Shrubland

The Central & Northern Ruderal Shrubland (SXCN) map class represents two associations in the USNVC—the *Elaeagnus umbellata - Cornus racemosa - Rosa multiflora - Juniperus virginiana* Ruderal Shrubland (CEGL006451) and the *Gaylussacia baccata - Vaccinium pallidum - Vaccinium corymbosum* Shrubland (CEGL006622). The ruderal shrub associations that make up this map class in the AT corridor primarily represent highly disturbed lands regenerating into shrub and short trees from the Virginia State Highway 16 crossing north to the southern foothills of the White Mountains in New Hampshire. The SXCN map class is common within the corridor covering 566.9 ha (0.5% of APPA).

The SXCN map class is a highly variable mix of native and non-native ruderal herb, shrub, and tree species with at least 25% shrub cover and less than 25% tree cover, though trees were only counted as trees if they were taller than 5 m. Both deciduous and evergreen shrubs were allowed in the map class. Originally applied to managed rights-of-way, such as power-line corridors, the concept was expanded to include abandoned agriculture, forestry activities, and other landscape modifications that interrupt natural succession.

As a potentially confusing factor, both the SXCN and SXHE map classes contain association CEG006622; however, the map classes do not overlap geographically. In SXCN, rare examples of association CEGL006622 exist south of the Delaware River in Pennsylvania, whereas in SXHE, association CEGL006622 occurs from New Hampshire north.

The SXCN map class presents a highly variable signature in the project imagery that is related to the conditions present when the site was recolonized by shrubs, but in all instances this map class is in very disturbed areas. The uniting factor is that these are ruderal shrub stands dominated by a variety of shrub species.

Potentially located on any landscape position below 1,340 m elevation, this map class occurs broadly across disturbed sections of the AT corridor and becomes much more common below 610 m elevation.

The AA results indicate that SXCN was mapped well with a users' accuracy of 92% and a producers' accuracy of 89%. The AA discloses several instances where SXCN was mapped either too aggressively (to the HXNE map class) or too conservatively (from three map classes). The majority of both the users' and producers' errors come from misestimation of ruderal shrub cover in co-occurring ruderal forest and ruderal herbaceous map classes.




Two examples of the SXCN map class showing a location repeatedly returned to an herb or shrub condition by active management (left) and a location maturing from a shrubland into a young ruderal forest (right).

SXHE – Successional Heath Shrubland

The Successional Heath Shrubland (SXHE) map class represents the *Gaylussacia baccata* - *Vaccinium pallidum* - *Vaccinium corymbosum* Shrubland Association (CEGL006622) in the USNVC. The ruderal shrub association that makes up this map class within the AT corridor primarily represents disturbed lands regenerating into heath shrub north of the southern foothills of the White Mountains in New Hampshire. The SXHE map class is common within the corridor covering 25.4 ha (0.02% of APPA).

The SXHE map class is a mix of native ruderal heath shrubs with at least 25% shrub cover and less than 25% tree cover, though trees were only counted as trees if they were taller than 5 m. Both deciduous and evergreen heath shrubs were allowed in the map class. Originally applied to managed rights-of-way, such as power-line corridors, the concept was expanded to include forestry activities and other landscape modifications that interrupt natural succession.

As a potentially confusing factor, both the SXHE and SXCN map class contain association CEG006622; however, the map classes do not overlap geographically. In SXCN, rare examples of association CEGL006622 exist south of the Delaware River in Pennsylvania, whereas in SXHE, association CEGL006622 occurs from New Hampshire north.

The SXHE map class presents as a consistent crisp, bright-red (for evergreen) and dull pink (for deciduous) low shrubland intermixed with tan herbaceous areas and the occasional tree.

Present on dry and warm position below 1,040 m elevation, this map class occurs broadly across disturbed sections of the AT corridor and is more common below 490 m elevation.

The AA results indicate that SXHE was mapped with a users' accuracy of 73% (90% confidence interval of 51–95%) and a producers' accuracy of 100%. The AA discloses three instances where SXHE was mapped too aggressively (to co-occurring ruderal map classes because of because of either the misestimation of ruderal shrub cover or the misestimation of heath cover in the non-heath ruderal SXCN map class).



An example of the SXHE map class showing a power-line right-of-way dominated by blueberry (*Vaccinium* spp.) and other heath shrubs.

SXKV – Ruderal Kudzu Vineland

The Ruderal Kudzu Vineland (SXKV) map class represents the *Pueraria montana* var. *lobata* Vine-Shrubland (CEGL003882) vegetation association in the USNVC. This vining woody vegetation map class occurs and is mapped in approximately the southern one-third of the AT corridor. The SXKV map class is exceptionally rare within the corridor covering 1.5 ha (0.001% of APPA).

The kudzu vine (*Pueraria montana* var. *lobata*) is a highly-invasive non-native woody vine that is widely dispersed across the landscape and poses a significant management challenge. In the very few instances where areas of kudzu were of MMU size, the vegetation was a mat-forming monoculture that smothered all other vegetation. This characteristic provided the mappers with a very consistent, vibrant red signature that looked like a sheet was draped over the landscape of hills, trees, and shrubs. Many more examples of this map class exist outside the AT corridor.

The SXKV map class was mapped very consistently. The AA process discovered no new instances of the SXKV map class, and no instances of SXKV were confused with a different map class.



An example of the SXKV map class showing a kudzu-smothered landscape.

SXMW – Ruderal Mixed Wet Shrub Swamp

The Ruderal Mixed Wet Shrub Swamp (SXMW) map class represents two associations in the USNVC—the *Salix nigra* / *Phalaris arundinacea* - *Apocynum cannabinum* Wet Shrubland (CEGL006065) and the *Cornus* (*amomum*, *sericea*) - *Viburnum dentatum* - *Rosa multiflora* Ruderal Shrub Swamp (CEGL006576). The ruderal shrub associations that make up this map class within the AT corridor primarily represent wetlands regenerating to shrub and short trees from central Pennsylvania north to the southern foothills of the Green Mountains in Vermont. The SXMW map class is rare within the corridor covering 20.3 ha (0.02% of APPA).

The SXMW map class is a highly variable mix of native and non-native ruderal herb, shrub, and tree species adapted to wetlands with at least 25% shrub cover and less than 25% tree cover, though trees were only counted as trees if they were taller than 5 m. Occasionally associated with old agricultural practices, this map class was more common in relation to rights-of-way.

The SXMW map class presents a highly variable mix of low white, tan, and pink fuzzy shrubs intermixed with tan and pink ruderal wetland herbaceous vegetation and occasional patches of wet ground or open water. This map class is generally in a basin setting; however, the map class can also occur in highly disturbed floodplain and backwater settings.

The AA results indicate that SXMW was mapped with a users' accuracy of 70% (90% confidence interval of 41–99%) and a producers' accuracy of 88%. The AA discloses two instances where SXHE was mapped either too aggressively (to the co-occurring HXSC ruderal map classes because of the overestimation of ruderal shrub cover) or too conservatively (from the co-occurring SAST because of the underestimation of disturbance in this non-ruderal wet shrubland).



Two examples of the SXMW map class showing association CEGL006065 (left) and association CEGL006576 (right). Both examples show the patchwork of ruderal wetland shrub and herb that define this map class.

HCRB – Central Appalachian Herbaceous Riverbank

The Central Appalachian Herbaceous Riverbank (HCRB) map class represents the following four associations in the USNVC:

- *Carex torta* Riverbed Vegetation (CEGL004103),
- *Verbesina alternifolia* - *Elymus riparius* - *Solidago gigantea* - (*Teucrium canadense*) Riverbar Wet Meadow (CEGL006480),
- *Eupatorium serotinum* - *Polygonum* (*lapathifolium*, *punctatum*, *pensylvanicum*) Riverbar Wet Meadow (CEGL006481), and
- *Eragrostis hypnoides* - *Ludwigia palustris* - *Lindernia dubia* - *Cyperus squarrosus* Riverbar Wet Meadow (CEGL006483).

The herbaceous associations that make up this map class occur within the AT corridor only along the Potomac and Shenandoah Rivers near the West Virginia-Maryland border. The HCRB map class is exceptionally rare within the corridor covering 0.4 ha (0.0003% of APPA), making HCRB one of the rarest map classes within APPA.

Based on vegetation plot data and conversations with ecologists, the HCRB map class was a “map known locations” map class, which means that only confirmed locations were mapped. For HCRB, that means two polygons were mapped around the confluence of the Shenandoah and Potomac Rivers. This location was supported by vegetation plots prior to mapping. The map class generally presents as an area of tall pink and tan herbaceous vegetation with sparse shrubs and short trees (less than 25% cover, each) within the active riparian zone.

The HCRB map class was mapped very consistently. The AA process discovered no new instances of the HCRB map class, and no instances of HCRB were confused with a different map class.



An example of the HCRB map class showing the open and sparse canopy over a diverse mix of herbaceous floodplain species.

HCRM – Common Rush Marsh

The Common Rush Marsh (HCRM) map class represents the *Juncus effusus* Marsh Association (CEGL004112) in the USNVC. This wet herbaceous map class occurs in the AT corridor only in disturbed wetlands in Connecticut and Vermont. The HCRM map class is exceptionally rare within the corridor covering 1.9 ha (0.002% of APPA).

The HCRM map class is defined by open, disturbed wetlands where common rush (*Juncus effusus*) dominates (greater than 50% cover). Because small areas can easily be dominated by common rush, less than MMU patches of this map class are likely in any disturbed wetland setting, especially in areas with ongoing American beaver (*Castor canadensis*) activity. As a concurrent and confusing factor, less than MMU examples of this association occur in the XBMV map class as part of the 20 wetland herb and shrub associations that define XBMV.

The HCRM map class generally presents as a flat, light- to bright-pink herbaceous field on regularly inundated areas and along the margins deeper water.

The AA results indicate that HCRM was mapped with a users' accuracy of 75% (90% confidence interval of 27–123%) and a producers' accuracy of 100%. (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses one instance where HCRM was mapped too aggressively to the HXSC map class because of an overly aggressive estimation of common rush cover.



An example of the HCRM map class showing an extensive area dominated by common rush within a more mixed wetland.

HECM – Eastern Cattail Marsh

The Eastern Cattail Marsh (HECM) map class represents the *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Eastern Marsh (CEGL006153) in the USNVC. This wet herbaceous map class occurs within the AT corridor in wetlands from New Jersey north into Maine. The HECM map class is rare within the corridor covering 25.6 ha (0.02% of APPA).

The HECM map class is defined by wetlands where cattail (*Typha* spp.) dominates (greater than 50% cover, often greater than 90% cover). Because small areas can easily be dominated by cattail, less than MMU patches of this map class are likely in any disturbed wetland setting, especially in areas with ongoing American beaver (*Castor canadensis*) activity. As a concurrent and confusing factor, less than MMU examples of this association occur in the XBMV map class as part of the 20 wetland herb and shrub associations that define XBMV.

The HECM map class generally presents as a tall, lumpy, dull- to bright-tan herbaceous wetland with dark patches of open water and occasional wetland shrubs mixed in.

The AA results indicate that HECM was mapped well with a users' accuracy of 93% and a producers' accuracy of 100%. The AA discloses one instance where HECM was mapped too aggressively to the HXSC map class because of an overly aggressive estimation of cattail cover.



An example of the HECM map class showing an extensive area dominated by cattail wedged between deep open water and the upland forest.

HGFM – Graminoid & Forb Wet Meadow & Marsh

The Graminoid & Forb Wet Meadow & Marsh (HGFM) map class represents the following five associations in the USNVC:

- *Carex utriculata* - *Carex lacustris* - (*Carex vesicaria*, *Carex stricta*) Wet Meadow (CEGL002257),
- *Calamagrostis canadensis* - *Carex* spp. Laurentian & Northeast Wet Meadow (CEGL005448),
- *Pontederia cordata* - *Peltandra virginica* - *Sagittaria latifolia* Marsh (CEGL006191),
- *Bidens cernua* - *Verbena hastata* - *Polygonum* spp. Marsh (CEGL006446), and
- *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow (CEGL006519).

The wet herbaceous associations that make up this map class occur within the AT corridor from New Jersey north to the terminus in Maine. The HGFM map class is rare within the corridor covering 58.0 ha (0.05% of APPA).

The HGFM map class is defined by mixed graminoid and forb marshes with no clearly dominant species in the herb layer and by sparse wetland shrubs and trees (less than 25% cover, each). Initially, mappers attempted to parse the graminoid-dominated marsh from forb-dominated marsh; however, because AA indicated consistent confusion between the two marshes, they were joined.

Because the associations within this map class represent such a diverse array of herbaceous vegetation, the associations often intermixed, especially in areas with ongoing American beaver (*Castor canadensis*) activity. As a concurrent and confusing factor, less than MMU examples of these five associations occur in the XBMV map class as part of the 20 wetland herb and shrub associations that define XBMV.

Generally, the HGFM map class presents as an open herbaceous marsh with medium-height and often lumpy vegetation in a patch matrix of grey, tan, pink, and red, with occasional areas of open water or meandering streams and sparse wetland shrubs and trees.

The AA results indicate that HGFM was mapped well with a users' accuracy of 87% and a producers' accuracy of 82%. The AA discloses several instances where HGFM was mapped either too aggressively (to three map classes) or too conservatively (from three map classes). The users' error primarily comes from an overly aggressive application of HGFM among co-occurring herbaceous wetland map classes, whereas the producers' error primarily comes from an overly conservative estimation of mixed herbaceous cover and habitat recovery in the ruderal HXSC map class.



Four examples of the HGFM map class showing associations CEGL002257 (upper left), CEGL005448 (upper right), CEGL006519 (lower left), and CEGL006446 (lower right). In each case, the marsh is a diverse mix of herbaceous wetland vegetation.

HMSM – Mixed Sedge Fen & Wet Meadow

The Mixed Sedge Fen & Wet Meadow (HMSM) map class represents two associations in the USNVC—the *Myrica gale* - *Chamaedaphne calyculata* / *Carex* (*lasiocarpa*, *utriculata*) - *Utricularia* spp. Fen (CEGL006302) and the *Carex stricta* - *Carex vesicaria* Wet Meadow (CEGL006412). The wet low-shrub and herbaceous associations that make up this map class occur within the AT corridor from New Jersey north to the terminus in Maine. The HMSM map class is rare within the corridor covering 26.9 ha (0.02% of APPA).

The HMSM map class is defined by mixed sedge (*Carex* spp.) and low-shrub marshes that may or may not have greater than 25% shrub cover below the sedges. Because the shrub layer can be completely covered by the overarching sedges, separating these two associations became impossible, especially in areas with ongoing American beaver (*Castor canadensis*) activity. As a concurrent and confusing factor, less than MMU examples of association CEGL006412 occur in the XBMV map class as part of the 20 wetland herb and shrub associations that define XBMV, whereas association CEGL006302 does not, because CEGL006302 only occurs in the AT corridor north of the range of XBMV.

Generally, the HMSM map class presents as an open herbaceous marsh with medium-height and mostly flat and soft-looking vegetation in a patchy mix of grey, tan, and pink, with occasional patches of open water or meandering streams and sparse wetland shrubs and trees.

The AA results indicate that HMSM was mapped well with a users' accuracy of 100% and a producers' accuracy of 83%. The AA discloses three instances where HMSM was mapped too conservatively. In all cases, these errors result from an overly conservative estimation of total sedge cover.



Two examples of the HMSM map class showing association CEGL006302 with low shrubs hidden under tall sedges (left) and association CEGL006412 with a dense sea of sedge (right).

HRGS – Graminoid & Scour Riverbank

The Graminoid & Scour Riverbank (HRGS) map class represents the following three associations in the USNVC:

- *Triantha glutinosa* - *Carex garberi* Riverscour Wet Meadow (CEGL006142),
- *Prunus pumila* / *Andropogon gerardii* - *Sorghastrum nutans* Riverscour Wet Meadow (CEGL006518), and
- *Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. Riverbed Vegetation (CEGL006536).

The herbaceous associations that make up this map class only occur within the AT corridor along large streams and rivers in Maine. The HRGS map class is exceptionally rare within the corridor covering 2.3 ha (0.002% of APPA).

This map class is defined by narrow bands of herbaceous vegetation in the active riparian zone of large streams and small rivers, with sparse shrubs and trees. The HRGS map class generally presents as an area of tall tan, orange, and pink herbaceous vegetation (less than 25% cover of shrubs and short trees, each) within the active riparian zone.

The HRGS map class was mapped very consistently. The AA process discovered no new instances of the HRGS map class, and no instances of HRGS were confused with a different map class.



An example of the HRGS map class showing association CEGL006536.

HTSM – Southern New England Threeway Sedge Fen

The Southern New England Threeway Sedge Fen (HTSM) map class represents the *Dulichium arundinaceum* / *Sphagnum* spp. Fen Association (CEGL006131) in the USNVC. This wet herbaceous map class only occurs within the AT corridor in one wetland in Massachusetts. The HTSM map class is exceptionally rare within the corridor covering 0.1 ha (0.0001% of APPA), making HTSM one of the rarest map classes within APPA.

Based on vegetation plot data and conversations with ecologists, the HTSM map class was a "map known locations" map class, which means that only confirmed locations were mapped. For HTSM, that means a single polygon was mapped in central Massachusetts in a beaver-impacted wetland. This location was supported by a field reconnaissance visit prior to mapping. Though well below the standard MMU, this site was deemed sufficiently unique to warrant mapping.

The HTSM map class is defined by very low and diffuse wetlands where three-way sedge (*Dulichium arundinaceum*) dominates (greater than 50% cover). Because small areas can easily be dominated by three-way sedge, less than MMU patches of this map class are likely in any disturbed wetland setting, especially in areas with ongoing American beaver (*Castor canadensis*) activity. As a concurrent and confusing factor, less than MMU examples of this association occur in the XBMV map class as part of the 20 wetland herb and shrub associations that define XBMV.

The HTSM map class presents as a very flat greenish-tan to gold wet herbaceous field along the margin of a larger wetland.

The AA results indicate that HTSM was mapped with a users' accuracy of 100% and a producers' accuracy of 50% (90% confidence interval of -33–133%). (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses one instance where HTSM was mapped too conservatively from the SLBS map class where a mappable area of HTSM was discovered. As a "map known locations" map class, the discovery of an additional example of the HTSM map class indicates that additional examples are likely within the corridor.



An example of the HTSM map class showing a wetland margin dominated by three-way sedge.

HWBS – Water-willow Rocky Bar and Shore

The Water-willow Rocky Bar and Shore (HWBS) map class represents the *Justicia americana* Riverbed Vegetation (CEGL004286) in the USNVC. This herbaceous riparian vegetation map class is within the AT corridor from eastern most West Virginia to southern Pennsylvania. The HWBS map class is exceptionally rare within the corridor covering 2.3 ha (0.002% of APPA).

This map class is defined by dense beds of American water-willow (*Justicia americana*) along the edges and in the active channel of large streams and rivers. The HWBS map class generally presents as open to dense beds of bright-red herbaceous vegetation in the active riparian zone, often with patches of dark, open water or channels of flowing water present in the vegetation.

The HWBS map class was mapped very consistently. The AA process discovered no new instances of the HWBS map class, and no instances of HWBS were confused with a different map class.



An example of the HWBS map class showing a dense bed of American water-willow along the Potomac River in Maryland.

HXCR – Eastern Ruderal Common Reed Marsh

The Eastern Ruderal Common Reed Marsh (HXCR) map class represents the *Phragmites australis* ssp. *australis* Eastern Ruderal Marsh Association (CEGL004141) in the USNVC. This wet herbaceous map class occurs within the AT corridor in disturbed wetlands from eastern Pennsylvania north to the Connecticut River in Vermont. The HXCR map class is rare within the corridor covering 31.9 ha (0.03% of APPA).

The HXCR map class is defined by open, disturbed wetlands where European common reed (*Phragmites australis* ssp. *australis*) dominates (greater than 50% cover, often greater than 90% cover). Because small areas can easily be dominated by European common reed, less than MMU patches of this map class are likely in any disturbed wetland setting, especially in areas with ongoing American beaver (*Castor canadensis*) activity. As a concurrent and confusing factor, less than MMU examples of this association occur in the XBMV map class as part of the 20 wetland herb and shrub associations that define XBMV.

The HXCR map class generally presents as a very tall and clonal, light-tan to bright-pink herbaceous wetland. Often, patches in wetlands have a distinctive circular shape.

The AA results indicate that HXCR was mapped well with a users' accuracy of 88% and a producers' accuracy of 82%. The AA discloses several instances where HXCR was mapped either too aggressively (to the HXSC map class) or too conservatively (from three map classes). The majority of both the users' and producers' errors come from misestimation of European common reed cover.



An example of the HXCR map class showing an extensive area dominated by European common reed.

HXSC – Ruderal Steeplebush - Reed Canarygrass Marsh

The Ruderal Steeplebush - Reed Canarygrass Marsh (HXSC) map class represents two associations in the USNVC—the *Phalaris arundinacea* Eastern Ruderal Marsh (CEGL006044) and the *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland (CEGL006571). This mixed herbaceous and shrub wetland vegetation map class is within the AT corridor from southern Virginia north to the terminus in Maine. The HXSC map class is rare within the corridor covering 83.2 ha (0.08% of APPA).

As a concurrent and confusing factor, less than MMU examples of association CEGL006571 occur in areas with ongoing American beaver (*Castor canadensis*) activity in the XBMV map class as part of the 20 wetland herb and shrub associations that define XBMV. The vegetation in association CEGL006044 does not occur in XBMV because CEGL006044 only occurs in the AT corridor south of the range of XBMV.

The HXSC map class is defined by ruderal wetlands with only occasional inundation where reed canarygrass (*Phalaris arundinacea*) dominates or can codominate with ruderal wetland shrubs. Generally, the HXSC map class presents as dense tan to pink "wormy" wetland herbaceous vegetation with evident wetter pockets intermixed. The shrub layer, when present, was mostly invisible under the over-arching herbaceous layer, but occasional emergent shrubs and sparse trees (less than 25% cover) are possible.

The AA results indicate that HXSC was mapped with a users' accuracy of 84% and a producers' accuracy of 78% (90% confidence interval of 67–88%). The AA discloses several instances where HXSC was mapped either too aggressively (to three map classes) or too conservatively (from seven map classes). The users' error primarily comes from by an overly aggressive of disturbance in the HGFM map class, while the producers' error primarily comes from an overly conservative application of HXSC among other co-occurring ruderal herb and shrub map classes.



Two examples of the HXSC map class showing association CEGL006044 where a wet ruderal field is completely dominated by reed canarygrass (left) and association CEGL006571 where a mix of wetland is a mix of herbaceous and shrub vegetation (right).

SABR – Southern Appalachian Bog (Rhododendron Type)

The Southern Appalachian Bog (Rhododendron Type) (SABR) map class represents the *Rhododendron maximum* / *Sphagnum* spp. Seepage Shrubland Association (CEGL003849) in the USNVC. This evergreen shrub swamp map class occurs within the AT corridor only in the southern most portion in Georgia. The SABR map class is exceptionally rare within the corridor covering 0.7 ha (0.0007% of APPA).

The SABR map class is defined by dense great laurel (*Rhododendron maximum*) over wet and flat or concave ground, with a stream channel or other indicators of moisture used to refine the mapping; therefore, SABR, generally is excluded from the other evergreen shrub classes. Generally, this map class presents as vibrant-red evergreen shrubs mixed with white or yellow to completely senesced hardwood trees in a topographic basin.

The AA results indicate that SABR was mapped with a users' accuracy of 100% and a producers' accuracy of 50% (90% confidence interval of -4–104%). (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses one instance where SABR was mapped too conservatively from the SMBT map class because of the underestimation of the hydrologic influence.



An example of the SABR map class showing the solid great laurel canopy over wet ground.

SASB – Southern Appalachian Shrub Bog (Long Hope Valley Type)

The Southern Appalachian Shrub Bog (Long Hope Valley Type) (SASB) map class represents the *Rhododendron* (*maximum*, *catawbiense*) - *Ilex collina* - *Salix sericea* / *Eriophorum virginicum* Seepage Shrubland Association (CEGL003913) in the USNVC. This evergreen shrub swamp map class occurs within the AT corridor only in southern Virginia. The SASB map class is exceptionally rare within the corridor covering 3.1 ha (0.003% of APPA).

This map class is defined by an open canopy of evergreen shrub over wet and flat or concave ground, with abundant wet herbaceous openings. This map class is confined to the AT corridor in the area around Grayson Highlands State Park in southern Virginia above 1,300 m elevation. Generally, this map class presents as vibrant-red evergreen shrubs mixed with areas of tan and orange, low and flat herbaceous vegetation in a topographic basin.

The AA results indicate that SASB was mapped with a users' accuracy of 100% and a producers' accuracy of 71% (90% confidence interval of 36–107%). (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses two instances where SASB was mapped too conservatively from the SBCH and SHBT map classes where hydrologic influence was underestimated.



An example of the SASB map class showing the open evergreen shrub canopy surrounded by wetland herbs.

SAST – Alder Shrub Thicket & Swamp

The Alder Shrub Thicket & Swamp (SAST) map class represents two associations in the USNVC—the *Alnus incana* Shrub Swamp (CEGL002381) and the *Alnus incana* - *Cornus* (*amomum*, *sericea*) / *Clematis virginiana* Shrub Swamp (CEGL006062). This deciduous wet shrub swamp map class occurs over the northern one-half of the AT corridor from New Jersey north to the terminus in Maine. The SAST map class is uncommon within the corridor covering 149.1 ha (0.1% of APPA).

The SAST map class is defined by an open to closed canopy of gray alder (*Alnus incana*) over wet ground in basin or riparian settings below 790 m elevation and then only common below 550 m elevation. Although association CEGL002381 is generally a basin swamp and association CEGL006062 is generally a riparian swamp, the two types were often intermixed with no clear line in the imagery to distinguish them, especially in areas with ongoing American beaver (*Castor canadensis*) activity. As a concurrent and confusing factor, less than MMU examples of these two associations occur in the XBMV map class as part of the 20 wetland herb and shrub associations that define XBMV.

Generally, the SAST map class presents as a basin or riparian swamp dominated by a short to tall fluffy tannish-pink to bright-pink deciduous shrub with hardwood and conifer trees sparsely intermixed. Shrub cover was generally over 75%, but occasionally was as low as 25%, with larger areas of herbaceous wetland vegetation, dead and downed trees, and open water intermixed.

The AA results indicate that SAST was mapped well with a users' accuracy of 97% and a producers' accuracy of 83%. The AA discloses several instances where SAST was mapped either too aggressively (to the SXWM map class) or too conservatively (from three map classes), and in all instances, SAST relates to the misestimation of grey alder cover.



Two examples of the SAST map class showing the more basin-based association CEGL002381 (left) and the more riparian-based association CEGL006062 (right).

SBBT – Blueberry Peatland Thicket

The Blueberry Peatland Thicket (SBBT) map class represents two associations in the USNVC—the *Vaccinium corymbosum* / *Sphagnum* spp. Acidic Peatland (CEGL006190) and the *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Acidic Peatland (CEGL006371). This deciduous wet shrub swamp map class occurs within the AT corridor in acidic basin settings from northern Pennsylvania to central Massachusetts. The SBBT map class is uncommon within the corridor covering 13.9 ha (0.01% of APPA).

The SBBT map class is defined by an open to closed canopy of highbush blueberry (*Vaccinium corymbosum*) over wet ground in basin settings below 600 m elevation and then only common below 490 m elevation. This map class can be somewhat ruderal in appearance, especially in areas with ongoing American beaver (*Castor canadensis*) activity. As a concurrent and confusing factor, less than MMU examples of these two associations occur in the XBMV map class as part of the 20 wetland herb and shrub associations that define XBMV.

Generally, the SBBT map class presents as a basin swamp dominated by short to tall, fluffy tan or orange deciduous shrubs, with hardwood trees sparsely intermixed. Shrub cover was generally over 75%, but occasionally as low as 25%, with larger areas of flat, tan-colored herbaceous wetland vegetation.

The AA results indicate that SBBT was mapped well with a users' accuracy of 88% and a producers' accuracy of 100%. The AA discloses one instance where SBBT was mapped too aggressively to the HGFM map class where highbush blueberry cover was overestimated.



Two examples of the SBBT map class showing a more closed canopy version of association CEGL006190 (left) versus a more open canopy version of association CEGL006371 (right). Note the dominance of highbush blueberry in both shrublands.

SDBF – Dwarf-shrub Peatland

The Dwarf-shrub Peatland (SDBF) map class represents two associations in the USNVC—the *Kalmia angustifolia* - *Chamaedaphne calyculata* - (*Picea mariana*) / *Cladina* spp. Acidic Peatland (CEGL006225) and the *Rhododendron canadense* - *Chamaedaphne calyculata* Acidic Peatland (CEGL006514). This mixed evergreen dwarf-shrub swamp map class occurs within the AT corridor in acidic basin settings in New Hampshire and Maine. The SDBF map class is exceptionally rare within the corridor covering 1.5 ha (0.001% of APPA).

The SDBF map class is defined by a very short and dense canopy of evergreen shrubs rooting on a floating mat of sphagnum (*Sphagnum* spp.) moss. Present only in seepage basins below 975 m elevation, this map class presents a characteristic flat, orange signature with areas of open water often present and an obvious rise in the elevation of the vegetation towards the edge of the basin. Many examples of this map class below the 0.25 ha MMU were encountered during the field reconnaissance, but only four locations were large enough to map.

The AA results indicate that SDBF was mapped with a users' accuracy of 33% (90% confidence interval of -28–95%) and producers' accuracy of 100%. (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses two instances where SDBF was mapped too aggressively to the SWEB and SSLF map classes because of an overly aggressive application of this map class among co-occurring dwarf-shrub swamp map classes.



An example of the SDBF map class showing a dwarf shrubland on a floating mat of Sphagnum moss with intermixed dwarf trees.

SLBS – Swamp-Loosestrife & Buttonbush Shrub Swamp

The Swamp-Loosestrife & Buttonbush Shrub Swamp (SLBS) map class represents two associations in the USNVC—the *Decodon verticillatus* Shrub Swamp (CEGL005089) and the *Cephalanthus occidentalis - Decodon verticillatus* Shrub Swamp (CEGL006069). This deciduous wet shrub swamp map class is within the AT corridor from northern Pennsylvania to southern New York. The SLBS map class is exceptionally rare within the corridor covering 1.0 ha (0.001% of APPA).

The SLBS map class is defined by an open to closed canopy of common buttonbush (*Cephalanthus occidentalis*) over water in basin or riparian settings. Although association CEGL006069 is generally confined to shallower water than association CEGL005089, the two intermixed in a mosaic that made parsing the associations impossible, especially in areas with ongoing American beaver (*Castor canadensis*) activity. As a concurrent and confusing factor, less than MMU examples of these two associations occur in the XBMV map class as part of the 20 wetland herb and shrub associations that define XBMV.

Generally, the SLBS map class presents as a basin swamp dominated by a tall and diffuse shrub layer, with a grey and red mottled appearance over open water. Shrub cover was generally over 75%, but occasionally as low as 25%, with larger open water areas intermixed.

The AA results indicate that SLBS was mapped with a users' accuracy of 67% (90% confidence interval of 5–128%) and a producers' accuracy of 100%. (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses one instance where SLBS was mapped too aggressively to the HTSM map class because of an overestimation of shrub cover.



An example of the SLBS map class showing a very thick shrub layer of buttonbush of association CEGL006069. At the time this image was captured, the basin was dry because of a drought.

SNAS – Northern Appalachian High-Elevation Seepage Shrubland

The Northern Appalachian High-Elevation Seepage Shrubland (SNAS) map class represents the *Prunus virginiana - Acer spicatum - Ribes triste* / *Angelica atropurpurea - Heracleum maximum* Seepage Shrubland Association (CEGL006583) in the USNVC. This deciduous wet shrub map class occurs within the AT corridor only at high-elevation below the alpine zone in New Hampshire and Maine. The SNAS map class is exceptionally rare within the corridor covering 3.4 ha (0.003% of APPA).

Limited to two distinct areas in the Green Mountains in Vermont and to one area in the White Mountains in New Hampshire, this map class is defined by a medium to tall deciduous shrub canopy over a lush herbaceous layer. Present only in seepage areas on moderate slopes below 1,220 m elevation, this map class presents a characteristic greyish-tan signature. In the project imagery, the shrub layer was completely senesced with the bare branches of the shrubs evident in the imagery.

The SNAS map class was mapped very consistently. The AA process discovered no new instances of the SNAS map class, and no instances of SNAS were confused with a different map class.



An example of the SNAS map class showing a wet slope surrounded by a conifer forest below the alpine zone.

SRBS – Rocky Bar and Shore (Alder - Yellowroot Type)

The Rocky Bar and Shore (Alder - Yellowroot Type) (SRBS) map class represents the *Alnus serrulata* - *Xanthorhiza simplicissima* Wet Shrubland Association (CEGL003895) in the USNVC. This deciduous wet shrub swamp map class occurs over the northern one-half of the AT corridor from New Jersey north to the terminus in Maine. The SRBS map class is exceptionally rare within the corridor covering 1.8 ha (0.002% of APPA).

The SRBS map class is defined by an open to closed canopy of hazel alder (*Alnus serrulata*) in riparian settings. Generally, the SRBS map class presents as an open riparian shrubland with short to tall, fluffy tannish-pink to bright-pink deciduous shrub surrounded by mixed herbaceous floodplain and, potentially, as rocks and cobble. Shrub cover was generally over 50%, but occasionally as low as 25%, with larger areas of herbaceous riparian vegetation and rock and cobble.

The AA results indicate that SRBS was mapped with a users' accuracy of 50% (90% confidence interval of -4–104%) and a producers' accuracy of 100%. (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses one instance where SRBS was mapped too aggressively because of an overly aggressive estimation of shrub cover in the riparian forest FAMA map class.



An example of the SRBS map class showing an open, riparian shrubland.

SSLF – Sweetgale - Leatherleaf Fen

The Sweetgale - Leatherleaf Fen (SSLF) map class represents two associations in the USNVC—the *Myrica gale - Spiraea alba - Chamaedaphne calyculata* Fen (CEGL006512) and the *Chamaedaphne calyculata / Eriophorum virginicum / Sphagnum rubellum* Acidic Peatland (CEGL006513). This mixed evergreen shrub swamp map class occurs within the AT corridor in acidic basin settings from northern Massachusetts north to the terminus in Maine. The SSLF map class is rare within the corridor covering 69.9 ha (0.06% of APPA).

The SSLF map class is mapped in only two locations south of the Connecticut River based on field data, but SSLF is common north of the Connecticut River. Located below 1,150 m elevation, this map class is most common below 610 m elevation. This map class is defined by a short and dense canopy of evergreen and deciduous shrubs with the evergreen leatherleaf (*Chamaedaphne calyculata*) being the most characteristic. This map class presents a characteristic lumpy pink signature in basin swamps, often intermixed with flat, tan wetland herbs, and in open water. In lacustrine settings this map class will often form a ring between the open water and the upland.

The AA results indicate that SSLF was mapped well with a users' accuracy of 85% and a producers' accuracy of 97%. The AA discloses several instances where SSLF was mapped either too aggressively (to five map classes) or too conservatively (from the SDBF map class). The majority of the users' errors come from a misestimation of shrub cover (both over and under), while producers' errors come from confusion with SDBF where the specific percent cover of acidic swamp shrub species was misestimated.



An example of the SSLF map class showing a leatherleaf-dominated wet shrub swamp that is characteristic of association CEGL006513.

SSNB – Southern New England Bog

The Southern New England Bog (SSNB) map class represents the *Chamaedaphne calyculata* - (*Gaylussacia dumosa*) - *Decodon verticillatus* / *Woodwardia virginica* Acidic Peatland Association (CEGL006008) in the USNVC. This mixed evergreen shrub swamp map class occurs within the AT corridor in acidic basin settings from northern Massachusetts north to the terminus in Maine. The SSNB map class is exceptionally rare within the corridor covering 2.5 ha (0.002% of APPA).

The SSNB map class is mapped in two disjunct groups within the AT corridor—one group in southern New York and the other group in central Vermont. In both instances, the mapping is based on field notes and vegetation plot data with an expansion of the "map known locations" concept. In both locations, this map class is in a lacustrine environment along the shore at the wetland-upland interface. The SSNB map class is defined by a short- to medium-height dense canopy of evergreen and deciduous shrubs, with the evergreen leatherleaf (*Chamaedaphne calyculata*) being the most characteristic. This map class presents a characteristic lumpy dark-pink signature, often intermixed with flat, tan wetland herbs, and in open water.

The AA results indicate that SSNB was mapped well with a users' accuracy of 80% and a producers' accuracy of 100%. The AA discloses one instance where SSNB was mapped too aggressively because of the overestimation of leatherleaf cover in the HXSC map class.



An example of the SSNB map class showing a leatherleaf-dominated wet shrub swamp.

HAFV – Aquatic Floating Vegetation

The Aquatic Floating Vegetation (HAFV) map class represents two associations in the USNVC—the *Nuphar advena* - *Nymphaea odorata* Aquatic Vegetation (CEGL002386) and the *Elodea canadensis* - *Potamogeton* spp. Eastern Aquatic Vegetation (CEGL006431). This herbaceous aquatic vegetation map class is within the AT corridor from central Pennsylvania north to the terminus in Maine. The HAFV map class is rare within the corridor covering 81.2 ha (0.07% of APPA).

The HAFV map class is defined by open water with floating and submerged aquatic vegetation covering greater than 1%. Because association CEGL002386 can occur above association CEGL006431 in the water column, the two intermix in a mosaic that left parsing the associations impossible, especially in areas with ongoing American beaver (*Castor canadensis*) activity. As a concurrent and confusing factor, less than MMU examples of these two associations occur in the XBMV map class as part of the 20 wetland herb and shrub associations that define XBMV.

Generally, the HAFV map class presents as open water with patches of tan, pink, and red floating and submerged vegetation covering at least 1% of the area. Although 1% vegetation cover seems low, this level of vegetation indicates substantial additional vegetation is present.

The AA results indicate that HAFV was mapped well with a users' accuracy of 100% and a producers' accuracy of 90%. The AA discloses two instances where HAFV was mapped too conservatively from the HGFM and SSFL map classes where the cover of vegetation was underestimated.



Two examples of the HAFV map class showing the floating emergent vegetation of association CEGL002386 (left) and the submerged vegetation of association CEGL006431 (right) that will often intermix.

HEDP – Eastern North America Duckweed Pond

The Eastern North America Duckweed Pond (HEDP) map class represents the *Lemna* spp. Eastern North American Aquatic Vegetation Association (CEGL005451) in the USNVC. This floating herbaceous map class occurs within the AT corridor only in ponds in Virginia. The HEDP map class is exceptionally rare within the corridor covering 0.6 ha (0.0006% of APPA).

This map class is defined by ponds covered in the small floating plant, duckweed (*Lemna* spp.). The HEDP map class presents as a completely flat, light-pink to magenta layer painted directly on to the surface of the water, with small areas of dark open water intermixed.

Initially, mappers were not provided with a vegetation association for this map class and, therefore, made HEDP a park-special vegetation map class. Because park-special map classes are not tested during AA, this map class was not added to the AA process in Virginia. Following the completion of AA in Virginia, a vegetation association, CEGL005451, was provided for this map class bringing HEDP in line with other AA-tested map classes, although too late to complete AA on the HEDP map class. As such, HEDP was never tested for accuracy.

No visual example is available for the HEDP map class.

HEVP – Eastern Woodland Vernal Pool

The Eastern Woodland Vernal Pool (HEVP) map class represents the Eastern Woodland Vernal Pool Association (CEGL006453) in the USNVC. This wooded herbaceous map class is only mapped within the AT corridor as a legacy map class within DEWA in New Jersey. The HEVP map class is exceptionally rare within APPA covering 0.3 ha (0.0003% of APPA), making HEVP one of the rarest map classes within APPA.

This map class is a legacy map class only occurring in the DEWA portion of APPA where the original DEWA mapping was used without modification. For the remainder of the AT corridor, HEVP was not mapped, because no reliable way was devised to map or test this map class. By definition, this map class contains seasonally flooded pools under a closed forest canopy.

Because the DEWA polygons were not mapped as part of this project and because the DEWA polygons were tested during the DEWA AA, no AA sites were placed within the DEWA boundary of the AT corridor. Because the occurrence of this map class is within the DEWA portion of APPA, an AA was not completed on this map class.



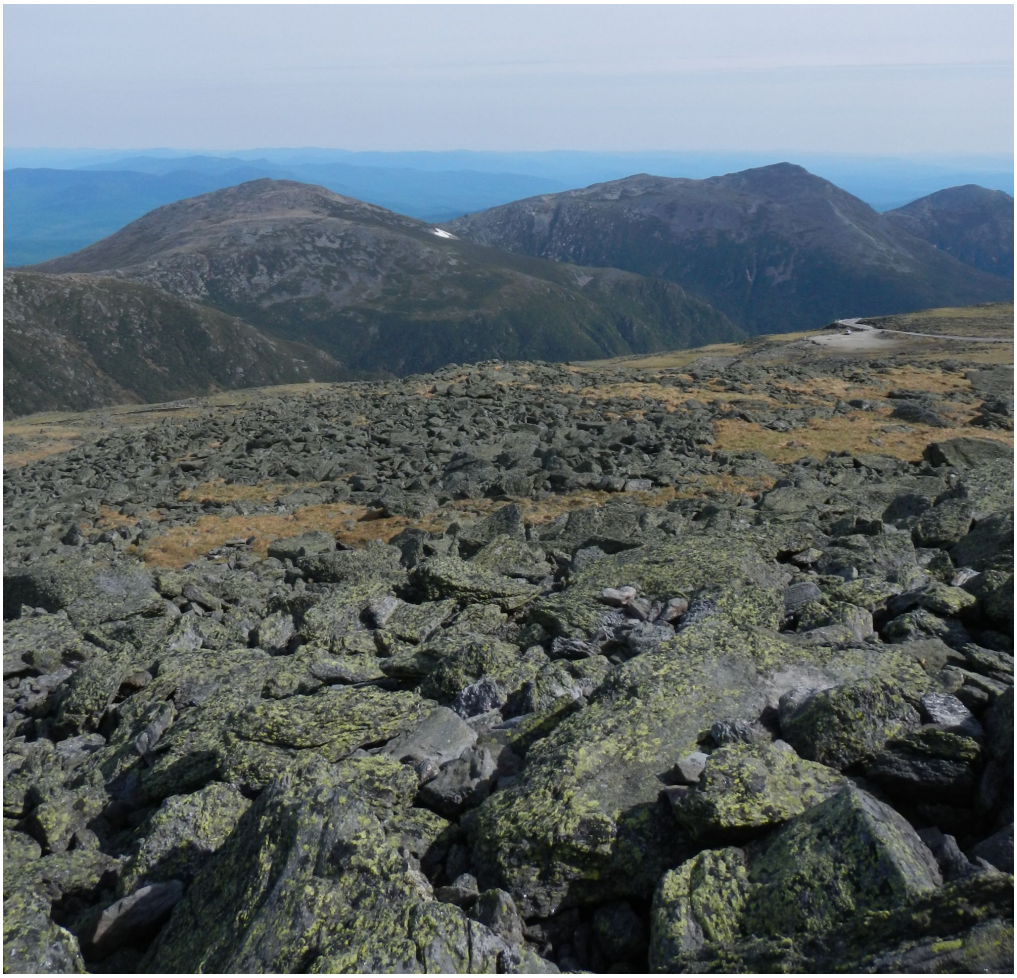
An example of HEVP map class showing association CEGL006453 in southeastern New York showing the seasonal flooded pool, now dry with wetland indicators (note the moss line on the boulder, image right), under a closed forest canopy.

VAFB – Alpine Fell-field & Bald

The Alpine Fell-field & Bald (VAFB) map class represents two associations in the USNVC—the *Arctoparmelia centrifuga* - *Rhizocarpon geographicum* Nonvascular Vegetation (CEGL006420) and the *Vaccinium uliginosum* / *Sibbaldiopsis tridentata* Sparse Vegetation (CEGL006533). This sparse vegetation map class occurs within the AT corridor only in the alpine zone and other exposed broken rocky areas in New Hampshire and Maine. The VAFB map class is rare within the corridor covering 91.3 ha (0.08% of APPA).

The VAFB map class is defined by extensive areas of broken rock interspersed with occasional patches of vegetation. Generally occurring above 1,220 m elevation, some examples exist down to nearly 610 m elevation. The VAFB map class presents as an open area of broken boulders and talus with a very bright, washed out signature, with small inclusions of other map classes, especially in the alpine zone, covering less than 10% of the area.

The AA results indicate that VAFB was mapped well with a users' accuracy of 100% and a producers' accuracy of 91%. The AA discloses three instances where VAFB was mapped too conservatively from co-occurring alpine map classes because of the underestimation of rock cover.



An example of the VAFB map class (foreground) on Mount Washington in New Hampshire.

VBAC – Near-Boreal Alkaline Cliff

The Near-Boreal Alkaline Cliff (VBAC) map class represents the *Carex scirpoidea* Alkaline Cliff Sparse Vegetation Association (CEGL006526) in the USNVC. Within the AT corridor, this sparse vegetation map class occurs only on the side of Sugarloaf Mountain in Maine. The VBAC map class is exceptionally rare within the corridor covering 7.6 ha (0.007% of APPA).

Based on vegetation plot data and conversations with ecologists, the VBAC map class was a "map known locations" map class, which means that only confirmed locations were mapped. For VBAC, that means four polygons were mapped next to each other on the west flank of Sugarloaf Mountain in Maine on a steep south facing slope. This location was supported by a vegetation plot (which was potentially displaced) prior to mapping and, because of its remoteness, was not visited during the mapping field reconnaissance.

This map class is defined by a sheer cliff face of dark-colored alkaline exposed bedrock interwoven with patches of vegetation. The VBAC map class presents as an open area of dark bedrock with small patches of light-pink herbaceous vegetation and gray-pink conifers.

The AA results indicate that VBAC was mapped well with a users' accuracy of 83% and a producers' accuracy of 100%. The AA discloses one instance where VBAC was mapped too aggressively to the WHOT map class because of an overestimation of bedrock cover.



An example of the VBAC map class (foreground) on Sugarloaf Mountain in Maine.

VCAB – Central Appalachian Acidic Boulderfield

The Central Appalachian Acidic Boulderfield (VCAB) map class represents the *Lasallia* (*papulosa*, *pensylvanica*) - *Dimelaena oreina* - (*Melanelia culbersonii*) Nonvascular Vegetation Association (CEGL004142) in the USNVC. Within the AT corridor, this sparse vegetation map class occurs on talus and boulder fields from central Virginia north to southern New Jersey. The VCAB map class is rare within the corridor covering 18.3 ha (0.02% of APPA).

This map class is defined by extensive areas of broken acidic rock with patches of vegetation sparsely interwoven. Possible at any elevation, this map class is most common below the crests of ridges and along steep slopes. The VCAB map class presents as an open area of broken boulders and talus with a very bright, washed out signature, with small inclusions of other map classes covering less than 10% of the area.

The VCAB map class was mapped very consistently. The AA process discovered no new instances of the VCAB map class, and no instances of VCAB were confused with a different map class.



An example of the VCAB map class showing an extensive talus field with almost no vegetation.

VCMB – Central Appalachian Mafic Boulderfield

The Central Appalachian Mafic Boulderfield (VCMB) map class represents the *Lasallia papulosa* - *Stereocaulon glaucescens* - *Chrysothrix chlorina* Nonvascular Vegetation Association (CEGL004143) in the USNVC. Within the AT corridor, this sparse vegetation map class was limited to a very small area in the northern portion of SHEN in Virginia. The VCMB map class is exceptionally rare within the corridor covering 0.8 ha (0.0007% of APPA).

Based on vegetation plot data and conversations with ecologists, the VCMB map class was a "map known locations" map class, which means that only confirmed locations were mapped. For VCMB, that means three polygons were mapped in the northern portion of SHEN. These locations were supported by a vegetation plot, geology data, and mapping field reconnaissance prior to mapping (Young et al. 2009).

This map class is defined by extensive areas of broken mafic rock interwoven with occasional patches of vegetation. The VCMB map class presents as an open area of broken boulders and talus with a very bright, washed out signature, with small inclusions of other map classes covering less than 10% of the area.

The VCMB map class was mapped very consistently. The AA process discovered no new instances of the VCMB map class, and no instances of VCMB were confused with a different map class.



An example of the VCMB map class showing an extensive talus field with almost no vegetation.

VEAC – Eastern Temperate Acidic Cliff

The Eastern Temperate Acidic Cliff (VEAC) map class represents the *Juniperus virginiana* / *Corydalis sempervirens* Cliff Sparse Vegetation Association (CEGL006422) in the USNVC. Within the AT corridor, this sparse vegetation map class occurs on acidic bedrock outcrops from northern Pennsylvania to southern New York. The VEAC map class is exceptionally rare within the corridor covering 4.2 ha (0.004% of APPA).

This map class is defined by extensive areas of solid bedrock interwoven with occasional patches of vegetation. The VEAC map class presents as an open area of solid, very-bright bedrock with a washed out signature; with small, bright-pink vegetated areas in the cracks and fissures of the bedrock covering less than 10% of the area.

The AA results indicate that VEAC was mapped with a users' accuracy of 40% (90% confidence interval of -6–86%) and a producers' accuracy of 100%. (Because of the rarity of this map class within the AT corridor, the number of potential AA sites were restricted; thus, resulting in a wide range in confidence intervals.) The AA discloses one instance where VEAC was mapped too aggressively to the co-occurring HLMO map classes because of an overestimation of bedrock cover.



An example of the VEAC map class (foreground) on Bear Mountain in New York with some minor inclusions of more heavily vegetated map classes.

VNBC – Northern Appalachian Barrens & Cliff

The Northern Appalachian Barrens & Cliff (VNBC) map class represents the *Polypodium* (*virginianum*, *appalachianum*) Cliff Sparse Vegetation Association (CEGL006528) and the *Polypodium* (*virginianum*, *appalachianum*) / Lichens Nonvascular Vegetation Association (CEGL006534) in the USNVC. Within the AT corridor, this sparse vegetation map class occurs only on exposed solid bedrock in New Hampshire and Maine. The VNBC map class is rare within the corridor covering 12.4 ha (0.01% of APPA).

This map class is defined by extensive areas of solid bedrock interwoven with occasional patches of vegetation. Generally occurring below 920 m elevation, some examples exist up to nearly 1,340 m elevation. The VNBC map class presents as an open area of solid, very-bright bedrock with a washed out signature; with small, bright-pink vegetated areas in the cracks and fissures of the bedrock covering less than 10% of the area.

The AA results indicate that VNBC was mapped with a users' accuracy of 100% and a producers' accuracy of 75% (90% confidence interval of 44–106%). The AA discloses two instances where VNBC was mapped too conservatively from the FNAH and WHOT map classes. These errors were because of an underestimation of bedrock cover.



An example of the VNBC map class (foreground) with some inclusions of more heavily vegetated map classes above.

VNRR – Northern Riverscour Rock Outcrop

The Northern Riverscour Rock Outcrop (VNRR) map class represents the *Andropogon gerardii* - *Campanula rotundifolia* - *Solidago simplex* Riverscour Sparse Vegetation Association (CEGL006284) in the USNVC. Within the AT corridor, this sparse vegetation map class occurs only in northern Connecticut along the Housatonic River. The VNRR map class is exceptionally rare within the corridor covering 1.3 ha (0.001% of APPA).

Based on vegetation plot data and conversations with ecologists, the VNRR map class was a "map known locations" map class, which means that only confirmed locations were mapped. For VNRR, that means three polygons directly adjacent to one another were mapped in the active floodplain of the Housatonic River in Connecticut. This location was supported by mapping field reconnaissance prior to mapping.

This map class is defined by extensive areas of sparsely vegetated bedrock in the active floodplain with areas of open flowing water. The VNRR map class presents as an open area of bedrock with a very bright, washed out signature, with many pockets of water and rivulets and as the occasional area of sparse vegetation, with small inclusions of other map classes covering less than 10% of the area.

The VNRR map class was mapped very consistently. The AA process discovered no new instances of the VNRR map class, and no instances of VNRR were confused with a different map class.



An example of the VNRR map class showing the water-scoured bedrock, with small areas of open water and sparse vegetation in cracks and fissures.

XBMV – Beaver Meadow Vegetation Complex

The Beaver Meadow Vegetation Complex (XBMV) map class is a park-special vegetation map class and represents vegetation of wetlands impacted by active or historic American beaver (*Castor canadensis*) habitation. This map class includes a mosaic of less than MMU examples of the following 20 wetland herb and shrub associations in the USNVC:

- *Carex utriculata* - *Carex lacustris* - (*Carex vesicaria*, *Carex stricta*) Wet Meadow (CEGL002257),
- *Alnus incana* Shrub Swamp (CEGL002381),
- *Nuphar advena* - *Nymphaea odorata* Aquatic Vegetation (CEGL002386),
- *Juncus effusus* Marsh (CEGL004112),
- *Phragmites australis* ssp. *australis* Eastern Ruderal Marsh (CEGL004141),
- *Decodon verticillatus* Shrub Swamp (CEGL005089),
- *Calamagrostis canadensis* - *Carex* spp. Laurentian & Northeast Wet Meadow (CEGL005448),
- *Phalaris arundinacea* Eastern Ruderal Marsh (CEGL006044),
- *Alnus incana* - *Cornus* (*amomum*, *sericea*) / *Clematis virginiana* Shrub Swamp (CEGL006062),
- *Cephalanthus occidentalis* - *Decodon verticillatus* Shrub Swamp (CEGL006069),
- *Dulichium arundinaceum* / *Sphagnum* spp. Fen (CEGL006131),
- *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Eastern Marsh (CEGL006153),
- *Vaccinium corymbosum* / *Sphagnum* spp. Acidic Peatland (CEGL006190),
- *Pontederia cordata* - *Peltandra virginica* - *Sagittaria latifolia* Marsh (CEGL006191),
- *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Acidic Peatland (CEGL006371),
- *Carex stricta* - *Carex vesicaria* Wet Meadow (CEGL006412),
- *Elodea canadensis* - *Potamogeton* spp. Eastern Aquatic Vegetation (CEGL006431),
- *Bidens cernua* - *Verbena hastata* - *Polygonum* spp. Marsh (CEGL006446),
- *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow (CEGL006519), and
- *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland (CEGL006571).

This park-special vegetation map class occurs in the AT corridor from southern New York north to the Connecticut River in Vermont. This park-special map class is rare within the corridor covering 27.0 ha (0.02% of APPA).

This map class is defined by areas with ongoing American beaver activity as defined by lodges and dams. The presentation of this map class is highly variable, but in all instances, evidence of active or historic American beaver influence and a mosaic of less than MMU patches of the different vegetation associations listed above were required for this map class. Patches of open water and

meandering streams were common. Areas of greater than MMU vegetation occurring in these wetland were mapped separately.

Because the XBMV map class was specifically designed to map USNVC vegetation associations with a particular concept in mind, XBMV was tested during the AA, unlike other park-special vegetation map classes. The concept of the map class was not built into the vegetation key, but rather each data sheet from an AA site in an XBMV polygon was reviewed for issues with classification relating from less than MMU vegetation patches and evidence of American beaver activity. If these issues were present, then the scenario was considered a match, and in all XBMV AA sites, one or both of these conditions were met.



An example of a recently dewatered beaver pond showing the classic mosaic of less than MMU examples of different remnant and recovering wetland herb and shrub associations.

XCMC – Constructed Wetland Ruderal Vegetation Complex

The Constructed Wetland Ruderal Vegetation Complex (XCMC) map class is a park-special vegetation map class and represents vegetation of created and managed wetlands at the Liberty Marsh in the Wallkill River National Wildlife Refuge along the New Jersey-New York border within the AT corridor. This park-special map class is rare within the corridor covering 40.1 ha (0.04% of APPA).

This map class is defined by areas of created wetland specifically and actively managed for wildlife. Because of this management, the vegetation within the marsh varies seasonally and yearly and would readily classify to different USNVC vegetation associations at different times of the year. This precluded reliable classification during the mapping field reconnaissance. Additionally, because of the active management, the determination was made with near certainty that the classification would differ by the time AA was completed.

Because the XCMC map class is a park-special vegetation map class, XCMC was not assessed for accuracy.



An example of the Liberty Marsh complex and the XCMC map class at the Wallkill River National Wildlife Refuge along the New Jersey-New York border.

XPLM – Palmerton Smelter Ecological Restoration Area

The Palmerton Smelter Ecological Restoration Area (XPLM) map class is a park-special vegetation map class and represents vegetation for the area undergoing ecological restoration within the AT corridor from the from the smelting pollution near Palmerton, Pennsylvania. This park-special map class is rare within the corridor covering 40.1 ha (0.04% of APPA).

The boundary of the XPLM map class is defined by the severe ecological disturbance and ongoing remediation and ecological restoration occurring on the ridgeline south of Palmerton, Pennsylvania. Because of the degree, severity, and randomness of the disturbance in this area, classification of the vegetation was impossible. No existing USNVC vegetation associations for APPA presented any usable options for classification of this area.

Because the XPLM map class is a park-special vegetation map class, XPLM was not assessed for accuracy.



An example of the XPLM map class on the heavily disturbed and often denuded ridgetop south of Palmerton, Pennsylvania.

XPRO – Potomac River Outcrops

The Potomac River Outcrops (XPRO) map class is a park-special vegetation map class and represents vegetation of vegetated bedrock outcrops in the Potomac River within the AT corridor along the Maryland-Virginia border. This park-special map class is exceptionally rare within the corridor covering 1.7 ha (0.002% of APPA).

This map class is defined by areas of exposed and vegetated bedrock in the main channel of the Potomac River. Exposed to repeated flooding and scour, this map class is a mosaic of small patches of aquatic, riparian, and sparse upland vegetation. Ecologists were unable to access these sites prior to the AA, so no classification was ever developed and lacking a classification, these sites could not be tested during the AA. To maintain the map class and this unique and mappable vegetation, mappers determined that these sites (four are mapped) should be represented by a park-special vegetation map class until sufficient data exist to classify them.

Because the XPRO map class is a park-special vegetation map class, XPRO was not assessed for accuracy.



An example of the XPRO map class on an area of vegetated river rock outcrop in the Potomac River along the Maryland-Virginia border.

XRBL – Recently Burned Landscape

The Recently Burned Landscape (XRBL) map class is a park-special vegetation map class and represents vegetation of area disturbed by intense fire within the AT corridor directly prior to the acquisition of aerial imagery; this map class only occurs in central Virginia. This park-special map class is exceptionally rare within the corridor covering 10.9 ha (0.0098% of APPA).

This map class is defined by areas of recently charred landscape that had not yet begun to regenerate in any meaningful manner precluding classification. Only two separate instances of this map class were encountered within the AT corridor, with both instances in central Virginia.

Because the XRBL map class is a park-special vegetation map class, XRBL was not assessed for accuracy.



An example of a recently and intensely burned hillside within the AT corridor where vegetation regeneration remains insufficient to accurately classify the vegetation beyond the XRBL map class.

CHAV – Herbaceous Agricultural Vegetation

The Herbaceous Agricultural Vegetation (CHAV) map class represents fields planted to agricultural crops. This map class is primarily present in the lower elevations of the AT corridor. This cultural map class is uncommon within the corridor covering 372.6 ha (0.3% of APPA).

This map class is defined by areas planted and managed for agricultural crops. During the field reconnaissance effort, corn, soybeans, wheat, and oats were noted with each crop presenting a different signature in the mapping imagery. What ties this map class together is the consistent presentation of a monoculture of similar-aged plants occurring in rows, which denotes active agriculture. Many fields within the AT corridor rotate between row crops, hay, and fallow fields, so all fields were mapped per their presentation at the date of imagery. Consequently, areas mapped as CHAV could now be HXCM or HXNE and vice-versa, depending on where in the fallow-planted cycle the field is.

Because the CHAV map class is a cultural vegetation map class, CHAV was not assessed for accuracy.



Two examples of the CHAV map class showing different aspects of this map class with a freshly-plowed field west of Carlisle, Pennsylvania, (left) and an oat field south of Mount Moosilauke in New Hampshire (right).

CMCP – Eastern North American Temperate Forest Plantation

The Eastern North American Temperate Forest Plantation (CMCP) map class represents managed forests planted to a monoculture of conifer trees. This map class is present throughout the AT corridor, sometimes in large blocks. This cultural map class is uncommon within the corridor covering 168.8 ha (0.2% of APPA).

This map class is defined by areas of conifer actively managed to produce timber, which includes plantations of red pine (*Pinus resinosa*), eastern white pine (*Pinus strobus*), hemlock (*Tsuga canadensis*), Norway spruce (*Picea abies*), and various combinations of these plantations. These areas likely include areas that are no longer actively managed but maintain the visual aspects of active management.

Because the CMCP map class is a cultural vegetation map class, CMCP was not assessed for accuracy.



Two examples of the CMCP map class showing a hemlock plantation in Connecticut (left) and a eastern white pine plantation in Vermont (right).

CNHP – Native Northern Hardwood Plantation

The Native Northern Hardwood Plantation (CNHP) map class represents managed forests planted to native hardwood tree species. Only two instances of this map class were mapped within the AT corridor, with the first instance in southern Virginia and the second instance in western Massachusetts. This cultural map class is exceptionally rare within the corridor covering 2.1 ha (0.002% of APPA).

This map class is defined by areas of hardwood trees actively managed to produce timber or as nursery stock.

Because the CNHP map class is a cultural vegetation map class, CNHP was not assessed for accuracy.

No visual example is available for the CNHP map class.

CORC – Tropical & Temperate Fruit Orchard

The Tropical & Temperate Fruit Orchard (CORC) map class represents trees planted to produce fruit. Although the official name includes a broad array of tree species, the examples within the AT corridor are temperate in location with only two instances of this map class. The first instance is in west central Connecticut and the second instance in west central Massachusetts. This cultural map class is exceptionally rare within the corridor covering 1.9 ha (0.002% of APPA).

This map class is defined by areas of hardwood tree planted in rows and actively managed to produce fruit.

Because the CORC map class is a cultural vegetation map class, CORC was not assessed for accuracy.



An example of one of the two orchards mapped within the AT corridor that define the CORC map class. This example contains apples and cherries.

CSFP – Native Northern Spruce-Fir Plantation

The Native Northern Spruce-Fir Plantation (CSFP) map class represents native conifer trees planted for use as timber, Christmas trees, or nursery stock. This map class is only in northeastern Tennessee within the AT corridor. This cultural map class is exceptionally rare within the corridor covering 4.8 ha (0.004% of APPA).

This map class is defined by areas of native conifer trees, often Fraser fir (*Abies fraseri*), planted in rows and actively managed to produce Christmas trees or nursery stock.

Because the CSFP map class is a cultural vegetation map class, CSFP was not assessed for accuracy.



An example of the CSFP map class showing planted Fraser fir at a Christmas tree farm.

CVNY – Tropical & Temperate Grape Vineyard

The Tropical & Temperate Grape Vineyard (CVNY) map class represents vines planted to produce fruit. Although the official name could include a broad array of vine species, the examples within the AT corridor are temperate in location and limited to grapes (Vitus spp.), with only one instance of this map class, located in western Virginia. This cultural map class is exceptionally rare within the corridor covering 1.2 ha (0.001% of APPA).

This map class is defined by areas of vines planted in rows on trellises and actively managed to produce fruit.

Because the CVNY map class is a cultural vegetation map class, CVNY was not assessed for accuracy.

No visual example is available for the CVNY map class.

CBRN – Barren Land

The Barren Land (CBRN) map class represents unvegetated lands disturbed by human activity. This map class is widely scattered within the AT corridor. This cultural map class is rare within the corridor covering 24.9 ha (0.02% of APPA).

This map class is defined by areas actively undergoing development or modification that leaves large areas denuded of vegetation (which will not be planted to a crop). The CBRN landscape is generally transitory in nature because it is being actively modified for some sort of human activity, such as construction. Several instances of new areas of CBRN that were not captured in the project aerial imagery were noted during the field reconnaissance process. Likewise, instances of CBRN captured in the aerial imagery but had already been revegetated or converted to more intense uses were noted.

Because the CBRN map class is a cultural vegetation map class, CBRN was not assessed for accuracy.



An example of the CBRN map class showing an area undergoing significant recent human activity, in this case, mining and landfilling.

CDVH – Developed Area - High Intensity

The Developed Area - High Intensity (CDVH) map class represents unvegetated lands where impervious surfaces account for 80–100% of the total cover. This map class is widely scattered within the AT corridor. This cultural map class is uncommon within the corridor covering 223.7 ha (0.2% of APPA).

This map class is defined by developed areas where people reside or work in high numbers. This map class is generally permanent in nature, though management choices to reduce impervious surface coverage could be initiated.

Because the CDVH map class is a cultural vegetation map class, CDVH was not assessed for accuracy.



Two examples of the CDVH map class showing different aspects of this map class with the Waterville Power Station in North Carolina (left) and the Bear Mountain Bridge in New York (right).

CDVL – Developed Area - Low Intensity

The Developed Area - Low Intensity (CDVL) map class represents areas primarily dominated by single-family housing units, smaller roads, some types of parking, and paved pathways that still maintain open vegetated areas where impervious surfaces account for 20–49% of the total cover. This map class is widely scattered within the AT corridor. This cultural map class is common within the corridor covering 574.4 ha (0.5% of APPA).

This map class is defined by areas where people reside, work, or recreate, but open space is still maintained. This map class is generally permanent in nature, though management choices to reduce impervious surface coverage could be initiated. Because the CDVL map class is a cultural vegetation map class, CDVL was not assessed for accuracy.



Two examples of the CDVL map class showing different aspects of this map class with a substation and power lines near Falls Village, Connecticut (left) and Hosner Mountain Road and power-line corridor in New York (right).

CDVM – Developed Area - Medium Intensity

The Developed Area - Medium Intensity (CDVM) map class represents areas primarily dominated by constructed materials or paved surfaces that still maintain some open vegetated areas where impervious surfaces account for 50–79% of the total cover. This map class is widely scattered within the AT corridor. This cultural map class is common within the corridor covering 629.1 ha (0.6% of APPA).

This map class is defined by significantly developed areas. This map class is generally permanent in nature, though management choices to reduce impervious surface coverage could be initiated.

Because the CDVM map class is a cultural vegetation map class, CDVM was not assessed for accuracy.





Two examples of the CDVM map class showing different aspects of this map class with abandoned light-industry along the Trail near Unionville, New York (left) and the Mount Washington Cog Railway in New Hampshire (right).

CDVO – Developed Area - Open Space

The Developed Area - Open Space (CDVO) map class represents areas consisting mostly of vegetation in the form of maintained lawns, but also have a mixture of some constructed materials where impervious surfaces account for less than 20% of the total cover. This map class is widely scattered within the AT corridor. This cultural map class is uncommon within the corridor covering 511.2 ha (0.46% of APPA).

This map class is defined by areas where people primarily recreate with abundant maintained open space. This map class is generally permanent in nature, though management choices to reduce impervious surface coverage could be initiated.

Because the CDVO map class is a cultural vegetation map class, CDVO was not assessed for accuracy.



Two examples of the CDVO map class showing different aspects of this map class with a picnic area at Bear Lake State Park in New York (left) and a cemetery along the Trail near Dartmouth, New Hampshire (right).

ZOSR – Open Water Stream & River

The Open Water Stream & River (ZOSR) map class represents unvegetated streams and rivers. Streams and rivers with an open canopy are possible along any portion of the AT corridor from Georgia to Maine. This open water map class is common within the corridor covering 558.4 ha (0.5% of APPA).

This map class is defined by streams and rivers large enough to not be completely covered by overarching vegetation. Wetland vegetation—aquatic and emergent—may be present (usually in shallow waters close to shorelines), but the vegetation should contribute less than 1% cover; however, small areas (less than MMU) of wetland vegetation having greater than 10% cover—including herbaceous vegetation, shrubs, and trees—may be present. Because of the very low reflectivity of water, this map class generally presents as a very dark and usually linear feature. In instances of shallow or clear water the riverbed is often visible.

Because the ZOSR map class is an open water map class, ZOSR was not assessed for accuracy.



Two examples of the ZOSR map class comparing the Cooper Brook in Maine (left) to the Hudson River in New York (right).

ZOWL – Open Water Lake

The Open Water Lake (ZOWL) map class represents unvegetated lakes larger than 8 ha. Lakes larger than 8 ha are possible along any portion of the AT corridor from Georgia to Maine. This open water map class is common within the corridor covering 937.1 ha (0.8% of APPA), though the majority of this area is comprised of a few large waterbodies in Maine.

This map class is defined by areas of generally non-flowing open water over 8 ha in area that have less than 1% cover of wetland or aquatic vegetation. Wetland vegetation—aquatic and emergent—may be present (usually in shallow waters close to shorelines), but the vegetation should contribute less than 1% cover; however, small areas (less than MMU) of wetland vegetation having greater than 10% cover—including herbaceous vegetation, shrubs, and trees—may be present. Because of the very low reflectivity of water, this map class generally presents as a very dark and completely flat area. When wetland vegetation is distinct from the immediate surroundings, wetland vegetation types occurring in patches less than the size of the standard MMU were mapped.

Because the ZOWL map class is an open water map class, ZOWL was not assessed for accuracy.



An example of the ZOWL map class as represented by Church Pond in Maine. Church Pond is actually well over 8 ha in area despite its moniker.

ZOWP – Open Water Pond

The Open Water Pond (ZOWP) map class represents unvegetated lakes smaller than 8 ha. Ponds smaller than 8 ha are possible along any portion of the AT corridor from Georgia to Maine. This open water map class is rare within the corridor covering 90.7 ha (0.08% of APPA).

This map class is defined by areas of generally non-flowing open water under 8 ha in area that have less than 1% cover of wetland or aquatic vegetation. Wetland vegetation—aquatic and emergent—may be present (usually in shallow waters close to shorelines), but the vegetation should contribute less than 1% cover; however, small areas (less than MMU) of wetland vegetation having greater than 10% cover—including herbaceous vegetation, shrubs, and trees—may be present. Because of the very low reflectivity of water, this map class generally presents as a very dark and completely flat area. When wetland vegetation is distinct from the immediate surroundings, wetland vegetation types occurring in patches less than the size of the standard MMU were mapped.

Because the ZOWP map class is an open water map class, ZOWP was not assessed for accuracy.



An example of the ZOWP map class as represented by Lake of the Clouds on Mount Washington in New Hampshire. Lake of the Clouds is actually well under 8 ha in area despite its moniker.

Table F–2. Map-classification listing, sorted alphabetically by map-class code, used for the Appalachian National Scenic Trail vegetation mapping project.

Map-Class Code	Map-Class Name
CBRN	Barren Land
CDVH	Developed Area - High Intensity
CDVL	Developed Area - Low Intensity
CDVM	Developed Area - Medium Intensity
CDVO	Developed Area - Open Space
CHAV	Herbaceous Agricultural Vegetation
CMCP	Eastern North American Temperate Forest Plantation
CNHP	Native Northern Hardwood Plantation
CORC	Tropical & Temperate Fruit Orchard
CSFP	Native Northern Spruce-Fir Plantation
CVNY	Tropical & Temperate Grape Vineyard
FABF	Southern Appalachian Boulderfield Forest (Currant & Rockcap Fern Type)
FAHS	Acidic Hardwood Swamp Forest
FAMA	Appalachian Montane Alluvial Forest
FAMO	Appalachian Mixed Oak Forest
FAOH	Central Appalachian Oak - Hickory Forest
FARB	Southern Appalachian Hardwood Rich Boulderfield Forest
FAWS	Inland Atlantic White-cedar Swamp Forest
FBGP	Southern Appalachian Beech Gap
FBHH	Blue Ridge Hemlock - Northern Hardwood Forest
FBSB	Black Spruce Open Bog Woodland
FCAB	Central Appalachian High-Elevation Boulderfield Forest
FCAO	Central Appalachian Oak Forest
FCAS	Central Appalachian Swamp Forest
FCHH	Central Appalachian Hemlock - Hardwood Forest
FCHO	Central Appalachian Hemlock - Chestnut Oak Forest
FCHP	Central Appalachian Hardwood - White Pine Forest
FCHW	Central Appalachian Hardwood Forest & Woodland
FCMS	Red Spruce - Red Maple Acidic Swamp Forest
FCNO	Central & Northern Oak Forest
FCOH	Chestnut Oak / Heath Forest
FCOM	Chestnut Oak - Mixed Oak Forest
FCRO	Central Appalachian Northern Red Oak Forest
FCWH	Central Appalachian White Pine - Hemlock Forest
FFAW	Ash - Willow Floodplain Forest
FFCR	Piedmont-Central Appalachian Rich Floodplain Forest
FFFS	Fraser Fir / Shrub Forest
FFHH	High-gradient Hardwood Floodplain Forest
FFTH	Terrace Hardwood Floodplain Forest
FHHO	Hemlock - Hardwood - Oak Forest
FHHS	Hemlock - Hardwood Swamp Forest
FHNH	Hemlock - Northern Hardwood Forest
FHSH	Hemlock - Spruce - Hardwood Forest
FHWO	White Pine - Hemlock - Oak Forest
FLSF	Low-Elevation Spruce - Fir Forest
FMCO	Appalachian Sugar Maple - Chinquapin Oak Limestone Forest
FMEF	Midwestern Silver Maple - Elm Floodplain Forest
FMFB	Montane Balsam Fir - Birch Forest
FMHF	Silver Maple - Hardwood Floodplain Forest

Table F–2 (continued). Map-classification listing, sorted alphabetically by map-class code, used for the Appalachian National Scenic Trail vegetation mapping project.

Map-Class Code	Map-Class Name
FMSF	Montane Spruce - Fir Forest
FMSS	Mixed Spruce Swamp Forest & Woodland
FNAH	Northern Appalachian Hardwood Forest
FNWS	Northern White-cedar Swamp Forest
FOHG	Oak - Hickory Forest & Woodland
FOTM	Oak - Tuliptree - Maple Forest
FPHD	Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest
FPHS	White Pine - Hemlock - Red Spruce Forest
FPOF	Pin Oak Small River Floodplain Forest
FRHS	Rich Hardwood Swamp Forest
FROH	High-Elevation Red Oak Forest
FRVL	Southern Appalachian Limestone Rich Cove Forest
FRWP	White Pine - Red Pine Forest
FSAH	Southern Appalachian Hardwood Forest
FSCO	Lower New England High Slope Chestnut Oak Forest
FSFD	Red Spruce - Fraser Fir Forest (Deciduous Shrub Type)
FSFE	Red Spruce - Fraser Fir Forest (Evergreen Shrub Type)
FSHH	Red Spruce - Northern Hardwood Forest (Herb Type)
FSHS	Spruce - Hardwood / Shrub Forest
FSMC	Sugar Maple - Chinquapin Oak / Sedge Forest
FTHS	Transitional Northern Hardwood - Red Spruce Forest
FXAH	Appalachian Ruderal Hardwood Forest
FXBL	Ruderal Black Locust Forest
FXCH	Central Appalachian Ruderal Hardwood Forest
FXER	Northeastern Ruderal Red-cedar Forest
FXHO	Southern & Central Appalachian Ruderal Hawthorn Forest
FXNH	Ruderal Northern Hardwood Forest & Woodland
FXOM	Northeastern Ruderal Oak - Red Maple Forest
FXSF	Successional Mixed Spruce - Fir - Hardwood Forest
FXTT	Ruderal Tuliptree Forest
FXVP	Ruderal Virginia Pine Forest
FXWP	Ruderal Eastern White Pine Forest
HAFV	Aquatic Floating Vegetation
HALD	Appalachian Low-Elevation Granitic Dome
HAWM	Alpine Herbaceous Wet Meadow
HBAM	Bigelow's Sedge Alpine Meadow
HBGF	Graminoid & Forb Bald
HCAB	Central Appalachian Wooded Herbaceous Barrens
HCRB	Central Appalachian Herbaceous Riverbank
HCRM	Common Rush Marsh
HECM	Eastern Cattail Marsh
HEDP	Eastern North America Duckweed Pond
HEVP	Eastern Woodland Vernal Pool
HGFM	Graminoid & Forb Wet Meadow & Marsh
HHGB	High-Elevation Greenstone Barrens
HLMO	Low- to Mid-Elevation Little Bluestem - Poverty Oatgrass Outcrop Opening
HMSF	Northern Appalachian Alpine Bulrush Cliff
HMSM	Mixed Sedge Fen & Wet Meadow
HRGS	Graminoid & Scour Riverbank

Table F–2 (continued). Map-classification listing, sorted alphabetically by map-class code, used for the Appalachian National Scenic Trail vegetation mapping project.

Map-Class Code	Map-Class Name
HTSM	Southern New England Threeway Sedge Fen
HWBS	Water-willow Rocky Bar and Shore
HXCM	Cultivated Grassland
HXCR	Eastern Ruderal Common Reed Marsh
HXFM	Grazed Montane Grassland / Fire Meadow
HXNE	Northeastern Ruderal Grassland
HXSC	Ruderal Steeplebush - Reed Canarygrass Marsh
SABR	Southern Appalachian Bog (Rhododendron Type)
SAHM	Alpine Heath Meadow
SASB	Southern Appalachian Shrub Bog (Long Hope Valley Type)
SAST	Alder Shrub Thicket & Swamp
SBAA	Southern Appalachian Alder Bald
SBAB	Southern Appalachian Blackberry Bald
SBAH	Southern Appalachian Heath Bald
SBBT	Blueberry Peatland Thicket
SBCH	Southern Appalachian Catawba Rosebay Heath Bald
SBDH	Southern Appalachian Deciduous Heath Bald
SBGB	Blueberry Granite Barrens
SBOB	Ridgetop Bear Oak Barrens
SCAB	Central Appalachian Blueberry Dwarf-shrubland
SCHB	Central Appalachian Heath Barrens
SCTH	Cold Air Talus Heathland
SDBF	Dwarf-shrub Peatland
SHBT	High-Elevation Blackberry Thicket
SHOB	High-Elevation Outcrop Barrens (Black Chokeberry Igneous / Metamorphic Type)
SLBS	Swamp-Loosestrife & Buttonbush Shrub Swamp
SMBT	Mixed Shrub Bald & Thicket
SMCK	Mixed Conifer Krummholz
SNAS	Northern Appalachian High-Elevation Seepage Shrubland
SRBS	Rocky Bar and Shore (Alder - Yellowroot Type)
SSLF	Sweetgale - Leatherleaf Fen
SSNB	Southern New England Bog
SSSB	Subalpine Slope Bog
SWAR	Windswept Alpine Ridge
SWEB	Black Crowberry Wet Alpine Bog
SXBG	Ruderal Blackberry - Greenbrier Shrub Thicket
SXCN	Central & Northern Ruderal Shrubland
SXHE	Successional Heath Shrubland
SXKV	Ruderal Kudzu Vineland
SXMW	Ruderal Mixed Wet Shrub Swamp
VAFB	Alpine Fell-field & Bald
VBAC	Near-Boreal Alkaline Cliff
VCAB	Central Appalachian Acidic Boulderfield
VCMB	Central Appalachian Mafic Boulderfield
VEAC	Eastern Temperate Acidic Cliff
VNBC	Northern Appalachian Barrens & Cliff
VNRR	Northern Riverscour Rock Outcrop
WCNH	Calcareous Northern Hardwood Talus Woodland
WCRS	Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest

Table F–2 (continued). Map-classification listing, sorted alphabetically by map-class code, used for the Appalachian National Scenic Trail vegetation mapping project.

Map-Class Code	Map-Class Name
WDMP	Blue Ridge Mixed Pine Dry Woodland
WHOT	Hardwood - Oak Talus Woodland
WJPR	Jack Pine Heath Barrens
WMBH	Montane Basic Hardwood - Red-cedar Woodland
WMDP	Appalachian Mixed Pine - (Oak) Dry Woodland
WMUM	Red Maple / Upright Sedge Wet Woodland
WNWF	Northern White-cedar Wooded Fen
WPAF	Pasture Fen
WPOS	Central Appalachian Pine - Oak Xeric Shale Woodland
WPPS	Pitch Pine Rocky Summit
WROT	Red Oak Talus Woodland
WSFR	Northern Appalachian Red Spruce Rocky Ridge
WSTS	Red Spruce Talus Slope Woodland
WTRR	Traprock Ridge
XBMV	Beaver Meadow Vegetation Complex
XCMC	Constructed Wetland Ruderal Vegetation Complex
XPLM	Palmerton Smelter Ecological Restoration Area
XPRO	Potomac River Outcrops
XRBL	Recently Burned Landscape
ZOSR	Open Water Stream & River
ZOWL	Open Water Lake
ZOWP	Open Water Pond

Appendix G: Map Classification by Map-Class Category

Explanation of Map-Classification Table

Table G–1 lists the map classification for the Appalachian National Scenic Trail vegetation mapping project for the National Park Service Vegetation Mapping Inventory Program from a map classification perspective and lists the vegetation types in the U.S. National Vegetation Classification (USNVC) that are assigned to each map class. For a listing of the map classification from a vegetation classification perspective, see "Appendix H: Map Classification by U.S. National Vegetation Classification."

The presentation of the map classification in Table G–1 is organized by map-class categories to group similar kinds of map classes. Each map class is listed with its map-class code followed by its map-class name. Listed below each map class is the vegetation type in the USNVC (USNVC Database 2016) that the map class represents (except for Open Water and some Park Special Vegetation map classes). Some map classes represent more than one USNVC type. The USNVC types listed below map classes are association-level types unless otherwise stated. Associations are listed with their scientific name followed by their Community Element Global code (i.e., CEGL00####). Associations represented by more than one map class are denoted with an asterisk (*).

Table G–1. Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
High-Elevation Deciduous Forest & Woodland
FABF - Southern Appalachian Boulderfield Forest (Currant & Rockcap Fern Type)
Betula alleghaniensis / *Ribes glandulosum* / *Polypodium appalachianum* Forest (CEGL006124)
FBGP - Southern Appalachian Beech Gap
Fagus grandifolia / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest (CEGL006130)
FCAB - Central Appalachian High-Elevation Boulderfield Forest
Betula alleghaniensis / *Sorbus americana* - *Acer spicatum* / *Polypodium appalachianum* Forest (CEGL008504)
FCRO - Central Appalachian Northern Red Oak Forest
Quercus rubra - (*Quercus alba*) / *Ilex montana* / *Dennstaedtia punctilobula* - *Lysimachia quadrifolia* Forest (CEGL008506)
FROH - High-Elevation Red Oak Forest
Quercus rubra / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest (CEGL007298)
Quercus rubra / (*Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*) / Galax *urceolata* Forest (CEGL007299)
Quercus rubra / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300)
WROT - Red Oak Talus Woodland
Quercus prinus / *Rhus* spp. / *Deschampsia flexuosa* Woodland (CEGL006074)
Quercus rubra - (*Quercus prinus*) / *Vaccinium* spp. / *Deschampsia flexuosa* Woodland (CEGL006134)
Betula lenta - *Quercus prinus* / *Parthenocissus quinquefolia* Woodland (CEGL006565)*
Quercus rubra - *Betula lenta* / *Polypodium virginianum* Woodland (CEGL006585)*
High-Elevation Mixed Deciduous-Conifer Forest
FBHH - Blue Ridge Hemlock - Northern Hardwood Forest
Betula alleghaniensis - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861)
FMFB - Montane Balsam Fir - Birch Forest
Abies balsamea - (*Betula papyrifera* var. *cordifolia*) Forest (CEGL006112)
FSHH - Red Spruce - Northern Hardwood Forest (Herb Type)
Picea rubens - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Solidago glomerata* Forest (CEGL006256)
FSHS - Spruce - Hardwood / Shrub Forest
Picea rubens - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron* (*maximum*, *catawbiense*) Forest (CEGL004983)
Picea rubens - (*Tsuga canadensis*) / *Rhododendron maximum* Forest (CEGL006152)
FTHS - Transitional Northern Hardwood - Red Spruce Forest
Betula alleghaniensis - *Picea rubens* / *Dryopteris campyloptera* Forest (CEGL006267)
High-Elevation Conifer Forest & Woodland
FFFS - Fraser Fir / Shrub Forest
Abies fraseri / *Viburnum lantanoides* / *Dryopteris campyloptera* - *Oxalis montana* / *Hylocomium splendens* Forest (CEGL006049)
Abies fraseri / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest (CEGL006308)
FMSF - Montane Spruce - Fir Forest
Picea rubens - *Abies balsamea* / *Sorbus americana* Forest (CEGL006128)

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
FSFD - Red Spruce - Fraser Fir Forest (Deciduous Shrub Type)
Picea rubens - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Dryopteris campyloptera* / *Hylocomium splendens* Forest (CEGL007131)
FSFE - Red Spruce - Fraser Fir Forest (Evergreen Shrub Type)
Picea rubens - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest (CEGL007130)
WPPS - Pitch Pine Rocky Summit
Pinus rigida / (*Quercus ilicifolia*) / *Photinia melanocarpa* / *Deschampsia flexuosa* Woodland (CEGL006116)
WSFR - Northern Appalachian Red Spruce Rocky Ridge
Picea rubens / *Vaccinium angustifolium* / *Sibbaldiopsis tridentata* Woodland (CEGL006053)
Low-Elevation Oak Forest
FAMO - Appalachian Mixed Oak Forest
Quercus rubra - Acer rubrum / *Pyrularia pubera* / *Thelypteris noveboracensis* Forest (CEGL006192)
Quercus alba - Quercus (*rubra*, *prinus*) / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest (CEGL007230)
Quercus alba - Quercus rubra - Carya ovalis / *Acer saccharum* / *Polystichum acrostichoides* Forest (CEGL007233)
Quercus alba - Quercus coccinea - Quercus falcata / *Kalmia latifolia - Vaccinium pallidum* Forest (CEGL007691)
Quercus alba - Quercus rubra - Quercus prinus / *Collinsonia canadensis - Podophyllum peltatum* Forest (CEGL007692)
Quercus rubra - Tilia americana var. *heterophylla* - (*Halesia tetraptera* var. *monticola*) / *Collinsonia canadensis - Prosartes lanuginosa* Forest (CEGL007878)
FAOH - Central Appalachian Oak - Hickory Forest
Quercus rubra - Quercus prinus - Carya ovalis / (*Cercis canadensis*) / *Solidago caesia* Forest (CEGL008514)
Quercus alba - Quercus prinus - Carya glabra / *Cornus florida* / *Vaccinium pallidum* Forest (CEGL008515)
Quercus prinus - Quercus rubra - Carya ovalis / *Carex pensylvanica* - (*Calamagrostis porteri*) Forest (CEGL008516)
Quercus rubra - Acer saccharum / *Ostrya virginiana* / *Cardamine concatenata* Forest (CEGL008517)
Quercus rubra - Carya ovata - Fraxinus americana / *Actaea racemosa - Hydrophyllum virginianum* Forest (CEGL008518)
FCAO - Central Appalachian Oak Forest
Quercus prinus - Quercus rubra / *Hamamelis virginiana* Forest (CEGL006057)
Quercus prinus - Quercus rubra / *Vaccinium pallidum* - (*Rhododendron periclymenoides*) Forest (CEGL008523)
FCHO - Central Appalachian Hemlock - Chestnut Oak Forest
Tsuga canadensis - Quercus prinus - Betula lenta Forest (CEGL006923)
FCNO - Central & Northern Oak Forest
Quercus (*velutina*, *alba*) / *Vaccinium pallidum* / *Pteridium aquilinum* High Allegheny Plateau, Western Allegheny Plateau Forest (CEGL006018)
Acer saccharum - Quercus rubra / *Hepatica nobilis* var. *obtusa* Forest (CEGL006046)
Quercus prinus - Quercus (*rubra*, *velutina*) / *Vaccinium* (*angustifolium*, *pallidum*) Forest (CEGL006282)*
Quercus (*alba*, *rubra*, *velutina*) - *Carya* spp. / *Viburnum acerifolium* Forest (CEGL006336)

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
Quercus rubra - Acer saccharum - Fagus grandifolia / *Viburnum acerifolium* Forest (CEGL006633)
Quercus rubra - Acer saccharum / *Viburnum acerifolium - Lindera benzoin* Forest (CEGL006635)
FCOH - Chestnut Oak / Heath Forest
Quercus prinus - (*Quercus coccinea*, *Quercus rubra*) / *Kalmia latifolia* / *Vaccinium pallidum* Forest (CEGL006299)
Quercus alba - Quercus (*coccinea*, *velutina*, *prinus*) / *Gaylussacia baccata* Forest (CEGL008521)
FCOM - Chestnut Oak - Mixed Oak Forest
Quercus rubra - Quercus prinus - Magnolia (*acuminata*, *fraseri*) / *Acer pensylvanicum* Forest (CEGL004817)
Quercus (*prinus*, *coccinea*) / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271)
Quercus prinus - Quercus rubra / *Rhododendron maximum* / *Galax urceolata* Forest (CEGL006286)
Quercus prinus - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267)
Quercus prinus / *Rhododendron catawbiense - Kalmia latifolia* Forest (CEGL008524)
FMCO - Appalachian Sugar Maple - Chinquapin Oak Limestone Forest
Acer saccharum - Quercus muehlenbergii / *Cercis canadensis* Forest (CEGL006017)
FOHG - Oak - Hickory Forest & Woodland
Quercus rubra - Carya (*glabra*, *ovata*) / *Ostrya virginiana* / *Carex lucorum* Forest (CEGL006301)
Carya glabra Woodland (CEGL006640)
FSCO - Lower New England High Slope Chestnut Oak Forest
Quercus prinus - Quercus (*rubra*, *velutina*) / *Vaccinium* (*angustifolium*, *pallidum*) Forest (CEGL006282)*
FSMC - Sugar Maple - Chinquapin Oak / Sedge Forest
Acer saccharum - Quercus muehlenbergii / *Carex platyphylla* Forest (CEGL006162)
Low-Elevation Hardwood Forest
FARB - Southern Appalachian Hardwood Rich Boulderfield Forest
Betula alleghaniensis - Tilia americana var. *heterophylla* / *Acer spicatum* / *Ribes cynosbati* / *Dryopteris marginalis* Forest (CEGL004982)
FCHW - Central Appalachian Hardwood Forest & Woodland
Fraxinus americana - Carya glabra / *Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland (CEGL003683)
Liriodendron tulipifera - Quercus rubra - Fraxinus americana / *Asimina triloba* / *Actaea racemosa* Forest (CEGL006186)
Acer saccharum - Fraxinus americana - Tilia americana - Liriodendron tulipifera / *Actaea racemosa* Forest (CEGL006237)
Liriodendron tulipifera - Platanus occidentalis - Betula lenta / *Lindera benzoin* / *Circaea lutetiana* ssp. *canadensis* Floodplain Forest (CEGL006255)
Acer saccharum - Tilia americana / *Staphylea trifolia* / *Dryopteris marginalis* - (*Impatiens pallida*) Forest (CEGL006471)
Betula lenta - Quercus prinus / *Parthenocissus quinquefolia* Woodland (CEGL006565)*
Quercus rubra - Betula lenta / *Polypodium virginianum* Woodland (CEGL006585)*
Liriodendron tulipifera - Betula lenta - Tsuga canadensis / *Rhododendron maximum* Forest (CEGL007543)*
Aesculus flava - Acer saccharum - (*Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695)*
Liriodendron tulipifera - Fraxinus americana - (*Aesculus flava*) / *Actaea racemosa - Laportea canadensis* Forest (CEGL007710)*

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
Liriodendron tulipifera - Pinus strobus - (*Tsuga canadensis*) / *Carpinus caroliniana* / *Amphicarpaea bracteata* Forest (CEGL008405)
Betula alleghaniensis - Quercus rubra / *Acer spicatum* / *Dryopteris intermedia - Oclemena acuminata* Forest (CEGL008502)
Tsuga canadensis - Quercus prinus - Liriodendron tulipifera / *Kalmia latifolia* - (*Rhododendron catawbiense*) Forest (CEGL008512)
Tilia americana - Fraxinus americana / *Acer pensylvanicum* / *Parthenocissus quinquefolia - Impatiens pallida* Woodland (CEGL008528)
FNAH - Northern Appalachian Hardwood Forest
Acer saccharum - (*Fraxinus americana*) / *Arisaema triphyllum* Forest (CEGL006211)
Acer saccharum - Betula alleghaniensis - Fagus grandifolia / *Viburnum lantanoides* Forest (CEGL006631)
Acer saccharum - Fagus grandifolia - Fraxinus americana / *Arisaema triphyllum* Forest (CEGL006632)
Acer saccharum - Fraxinus americana / *Acer spicatum* / *Caulophyllum thalictroides* Forest (CEGL006636)
Acer saccharum - Tilia americana / *Acer pensylvanicum* / *Caulophyllum thalictroides* Forest (CEGL006637)
FOTM - Oak - Tuliptree - Maple Forest
Quercus rubra - Acer saccharum - Liriodendron tulipifera Forest (CEGL006125)
Fagus grandifolia - Betula lenta - Liriodendron tulipifera - Acer saccharum Forest (CEGL006296)
FRVL - Southern Appalachian Limestone Rich Cove Forest
Tilia americana var. *heterophylla - Aesculus flava - Acer saccharum* / *Cystopteris bulbifera - Asarum canadense* Forest (CEGL006472)
FSAH - Southern Appalachian Hardwood Forest
Aesculus flava - Betula alleghaniensis - Acer saccharum / *Caulophyllum thalictroides - Actaea podocarpa* Forest (CEGL004973)
Betula alleghaniensis - Fagus grandifolia / *Viburnum lantanoides* / *Eurybia chlorolepis - Dryopteris intermedia* Forest (CEGL007285)
Liriodendron tulipifera - Betula lenta - Tsuga canadensis / *Rhododendron maximum* Forest (CEGL007543)*
Tsuga canadensis - Halesia tetraptera - Magnolia fraseri / *Rhododendron maximum* / *Dryopteris intermedia* Forest (CEGL007693)
Aesculus flava - Acer saccharum - (*Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695)*
Liriodendron tulipifera - Fraxinus americana - (*Aesculus flava*) / *Actaea racemosa - Laportea canadensis* Forest (CEGL007710)*
Low-Elevation Mixed Deciduous-Conifer Forest
FCHH - Central Appalachian Hemlock - Hardwood Forest
Tsuga canadensis - Betula alleghaniensis - Prunus serotina / *Rhododendron maximum* Forest (CEGL006206)
Tsuga canadensis - Acer saccharum - Fagus grandifolia / *Dryopteris intermedia* Forest (CEGL006639)
FCHP - Central Appalachian Hardwood - White Pine Forest
Acer saccharum - Pinus strobus / *Acer pensylvanicum* Forest (CEGL005005)
Pinus strobus - *Quercus* (*rubra*, *velutina*) - *Fagus grandifolia* Forest (CEGL006293)
Quercus (*rubra*, *velutina*, *alba*) - *Betula lenta* - (*Pinus strobus*) Forest (CEGL006454)
Pinus strobus - Quercus alba - Quercus prinus / *Vaccinium stamineum* Forest (CEGL008539)

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
FHHO - Hemlock - Hardwood - Oak Forest
Tsuga canadensis - *Fagus grandifolia* - *Quercus rubra* Forest (CEGL006088)
Quercus rubra - *Tsuga canadensis* - *Liriodendron tulipifera* / *Hamamelis virginiana* Forest (CEGL006566)
FHNH - Hemlock - Northern Hardwood Forest
Tsuga canadensis - *Betula alleghaniensis* - *Acer saccharum* / *Dryopteris intermedia* Forest (CEGL006638)
FHSH - Hemlock - Spruce - Hardwood Forest
Tsuga canadensis - (*Betula alleghaniensis*) - *Picea rubens* / *Cornus canadensis* Forest (CEGL006129)
FHWO - White Pine - Hemlock - Oak Forest
Pinus strobus - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102)
Pinus strobus - *Quercus alba* - (*Carya alba*) / *Gaylussacia ursina* Forest (CEGL007517)
Pinus strobus - *Quercus* (*coccinea*, *prinus*) / (*Gaylussacia ursina*, *Vaccinium stamineum*) Forest (CEGL007519)
Low-Elevation Conifer Forest
FCWH - Central Appalachian White Pine - Hemlock Forest
Pinus strobus - *Tsuga canadensis* / *Acer pensylvanicum* / *Polystichum acrostichoides* Forest (CEGL006019)
Tsuga canadensis / *Rhododendron maximum* / *Sphagnum* spp. Swamp Forest (CEGL006279)*
Liriodendron tulipifera - *Pinus strobus* - *Tsuga canadensis* - *Quercus rubra* / *Polystichum acrostichoides* Forest (CEGL006304)
FLSF - Low-Elevation Spruce - Fir Forest
Picea rubens - *Abies balsamea* - *Betula papyrifera* Forest (CEGL006273)
Picea mariana - *Picea rubens* / *Pleurozium schreberi* Swamp Forest (CEGL006361)
FPHD - Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest
Pinus strobus - *Tsuga canadensis* Lower New England-Northern Piedmont Forest (CEGL006328)
FPHS - White Pine - Hemlock - Red Spruce Forest
Pinus strobus - *Tsuga canadensis* - *Picea rubens* Forest (CEGL006324)
FRWP - White Pine - Red Pine Forest
Pinus strobus - *Pinus resinosa* / *Cornus canadensis* Forest (CEGL006253)
Low-Elevation Woodland
WCNH - Calcareous Northern Hardwood Talus Woodland
Acer saccharum - *Tilia americana* - *Fraxinus americana* / *Ostrya virginiana* / *Geranium robertianum* Woodland (CEGL005058)
Acer saccharum - *Fraxinus americana* - *Juglans cinerea* / *Staphylea trifolia* / *Adlumia fungosa* Forest (CEGL006577)
WCRS - Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest
Platanus occidentalis - *Betula nigra* - *Salix* (*caroliniana*, *nigra*) Floodplain Forest (CEGL003896)
WDMP - Blue Ridge Mixed Pine Dry Woodland
Pinus virginiana / *Vaccinium pallidum* / *Schizachyrium scoparium* - *Carex pensylvanica* Woodland (CEGL003624)
Pinus pungens - *Pinus rigida* - (*Quercus prinus*) / *Kalmia latifolia* - *Vaccinium pallidum* Woodland (CEGL007097)
WHOT - Hardwood - Oak Talus Woodland
Alnus viridis ssp. *crispa* - *Spiraea alba* / *Solidago macrophylla* Shrubland (CEGL006064)
Betula alleghaniensis - *Quercus rubra* / *Polypodium virginianum* Woodland (CEGL006584)

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
WJPR - Jack Pine Heath Barrens
Pinus banksiana / *Kalmia angustifolia* - *Vaccinium* spp. Woodland (CEGL006041)
WMBH - Montane Basic Hardwood - Red-cedar Woodland
Carya (*glabra*, *alba*) - *Fraxinus americana* - (*Juniperus virginiana* var. *virginiana*) Woodland (CEGL003752)
WMDP - Appalachian Mixed Pine - (Oak) Dry Woodland
Pinus (*pungens*, *rigida*) - *Quercus prinus* / (*Quercus ilicifolia*) / *Gaylussacia baccata* Woodland (CEGL004996)
Pinus virginiana - *Pinus* (*rigida*, *echinata*) - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119)
Pinus virginiana - (*Pinus rigida*, *Pinus pungens*) / *Schizachyrium scoparium* Forest (CEGL008500)
Quercus prinus - *Pinus virginiana* - (*Pinus pungens*) / *Schizachyrium scoparium* - *Dichanthelium depauperatum* Woodland (CEGL008540)
WPOS - Central Appalachian Pine - Oak Xeric Shale Woodland
Pinus virginiana - *Quercus prinus* / *Quercus ilicifolia* / (*Hieracium greenii*, *Viola pedata*) Woodland (CEGL008525)
Quercus prinus / *Quercus ilicifolia* / *Danthonia spicata* Woodland (CEGL008526)
WSTS - Red Spruce Talus Slope Woodland
Picea rubens / *Ribes glandulosum* Woodland (CEGL006250)
WTRR - Traprock Ridge
Juniperus virginiana - *Fraxinus americana* / *Danthonia spicata* - *Poa compressa* Woodland (CEGL006002)
Floodplain Forest
FAMA - Appalachian Montane Alluvial Forest
Platanus occidentalis - *Liriodendron tulipifera* - (*Betula alleghaniensis*) / *Alnus serrulata* - *Leucothoe fontanesiana* Floodplain Forest (CEGL004691)
FFAW - Ash - Willow Floodplain Forest
Acer saccharum - *Fraxinus* spp. - *Tilia americana* / *Matteuccia struthiopteris* - *Ageratina altissima* Floodplain Forest (CEGL006114)*
Fraxinus pennsylvanica - (*Juglans nigra*, *Platanus occidentalis*) Floodplain Forest (CEGL006575)
Salix nigra - (*Populus deltoides*) Floodplain Forest (CEGL006629)
FFCR - Piedmont-Central Appalachian Rich Floodplain Forest
Platanus occidentalis - *Acer negundo* - *Juglans nigra* / *Asimina triloba* / *Mertensia virginica* Floodplain Forest (CEGL004073)
FFHH - High-gradient Hardwood Floodplain Forest
Acer saccharum / *Ostrya virginiana* / *Brachyelytrum erectum* Floodplain Forest (CEGL006504)
FFTH - Terrace Hardwood Floodplain Forest
Acer saccharum - *Fraxinus* spp. - *Tilia americana* / *Matteuccia struthiopteris* - *Ageratina altissima* Floodplain Forest (CEGL006114)*
FMEF - Midwestern Silver Maple - Elm Floodplain Forest
Acer saccharinum - *Fraxinus pennsylvanica* - *Ulmus americana* Floodplain Forest (CEGL002586)
FMHF - Silver Maple - Hardwood Floodplain Forest
Acer saccharinum - *Ulmus americana* / *Onoclea sensibilis* Floodplain Forest (CEGL006001)
Acer saccharinum - (*Populus deltoides*) / *Matteuccia struthiopteris* - *Laportea canadensis* Floodplain Forest (CEGL006147)
Acer saccharinum / *Onoclea sensibilis* - *Boehmeria cylindrica* Floodplain Forest (CEGL006176)

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
Acer saccharinum - Acer negundo / *Ageratina altissima - Laportea canadensis* - (*Elymus virginicus*) Floodplain Forest (CEGL006217)
Acer saccharum - Fraxinus americana / *Carpinus caroliniana* / *Podophyllum peltatum* Forest (CEGL006459)
FPOF - Pin Oak Small River Floodplain Forest
Quercus palustris - Acer rubrum / *Carex grayi - Geum canadense* Wet Forest (CEGL006185)
Deciduous & Mixed Deciduous-Conifer Wetland Forest & Woodland
FAHS - Acidic Hardwood Swamp Forest
Quercus rubra - Betula alleghaniensis / *Osmunda cinnamomea* Forest (CEGL006000)
Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / *Sphagnum* spp. Swamp Forest (CEGL006014)*
Acer rubrum / *Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest (CEGL006220)
Tsuga canadensis / *Rhododendron maximum* / *Sphagnum* spp. Swamp Forest (CEGL006279)*
Acer rubrum / *Alnus incana - Ilex verticillata* / *Osmunda regalis* Woodland (CEGL006395)
Acer rubrum - Fraxinus (*pennsylvanica*, *americana*) / *Lindera benzoin* / *Symplocarpus foetidus* Swamp Forest (CEGL006406)*
FCAS - Central Appalachian Swamp Forest
Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / *Sphagnum* spp. Swamp Forest (CEGL006014)*
Acer rubrum - Fraxinus (*pennsylvanica*, *americana*) / *Lindera benzoin* / *Symplocarpus foetidus* Swamp Forest (CEGL006406)*
Acer rubrum - Nyssa sylvatica / *Ilex verticillata - Vaccinium fuscatum* / *Osmunda cinnamomea* Seep Forest (CEGL007853)
Acer rubrum - Fraxinus nigra - Betula alleghaniensis / *Veratrum viride - Carex bromoides* Seep Forest (CEGL008416)
FCMS - Red Spruce - Red Maple Acidic Swamp Forest
Picea rubens - Acer rubrum / *Nemopanthus mucronatus* Swamp Forest (CEGL006198)
FRHS - Rich Hardwood Swamp Forest
Acer rubrum - Fraxinus nigra - (*Larix laricina*) / *Rhamnus alnifolia* Swamp Forest (CEGL006009)
Betula alleghaniensis - Acer rubrum - (*Tsuga canadensis*, *Abies balsamea*) / *Osmunda cinnamomea* Swamp Forest (CEGL006380)
Acer rubrum - Fraxinus nigra - (*Tsuga canadensis*) / *Tiarella cordifolia* Swamp Forest (CEGL006502)
WMUM - Red Maple / Upright Sedge Wet Woodland
Acer rubrum / *Carex stricta - Onoclea sensibilis* Wet Woodland (CEGL006119)
WNWF - Northern White-cedar Wooded Fen
Thuja occidentalis - Abies balsamea / *Ledum groenlandicum* / *Carex trisperma* Swamp Woodland (CEGL006507)
WPAF - Pasture Fen
Juniperus virginiana / *Dasiphora fruticosa* ssp. *floribunda* / *Carex flava - Carex tetanica* Fen (CEGL006357)
Conifer Wetland Forest & Woodland
FAWS - Inland Atlantic White-cedar Swamp Forest
Chamaecyparis thyoides - (*Tsuga canadensis*, *Betula alleghaniensis*) / *Clethra alnifolia* Swamp Forest (CEGL006189)
FBSB - Black Spruce Open Bog Woodland
Picea mariana / *Ledum groenlandicum* / *Carex trisperma* / *Sphagnum* spp. Open Bog Woodland (CEGL002485)

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
FHHS - Hemlock - Hardwood Swamp Forest
Tsuga canadensis - Betula alleghaniensis / *Ilex verticillata* / *Sphagnum* spp. Swamp Forest (CEGL006226)
FMSS - Mixed Spruce Swamp Forest & Woodland
Picea mariana / (*Vaccinium corymbosum*, *Gaylussacia baccata*) / *Sphagnum* sp. Swamp Woodland (CEGL006098)
Picea rubens - Abies balsamea / *Gaultheria hispidula* / *Osmunda cinnamomea* / *Sphagnum* spp. Swamp Forest (CEGL006312)
FNWS - Northern White-cedar Swamp Forest
Thuja occidentalis / *Sphagnum* (*girgensohnii*, *warnstorfii*) Swamp Forest (CEGL006007)
Thuja occidentalis - (*Picea rubens*) / *Tiarella cordifolia* Swamp Forest (CEGL006175)
Ruderal Deciduous & Mixed Deciduous-Conifer Forest
FXAH - Appalachian Ruderal Hardwood Forest
Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia Ruderal Forest (CEGL007219)
Acer rubrum var. *rubrum - Betula lenta - Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Ruderal Forest (CEGL008558)
FXBL - Ruderal Black Locust Forest
Robinia pseudoacacia Ruderal Forest (CEGL007279)
FXCH - Central Appalachian Ruderal Hardwood Forest
Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana - (*Robinia pseudoacacia*) Ruderal Forest (CEGL006599)
Ailanthus altissima Ruderal Forest (CEGL007191)
Juglans nigra / *Verbesina alternifolia* Ruderal Forest (CEGL007879)
Betula lenta - Acer rubrum / *Lycopodium annotinum - Dennstaedtia punctilobula* Ruderal Forest (CEGL008503)
FXHO - Southern & Central Appalachian Ruderal Hawthorn Forest
Crataegus punctata - Crataegus flabellata Ruderal Forest (CEGL004184)
FXNH - Ruderal Northern Hardwood Forest & Woodland
Populus (*tremuloides*, *grandidentata*) - *Betula* (*populifolia*, *papyrifera*) Ruderal Woodland (CEGL006303)
Acer saccharum - Betula spp. - *Fagus grandifolia* Ruderal Forest (CEGL006628)
FXOM - Northeastern Ruderal Oak - Red Maple Forest
Quercus rubra - Acer rubrum - Betula spp. - *Pinus strobus* Ruderal Forest (CEGL006506)
FXTT - Ruderal Tuliptree Forest
Liriodendron tulipifera / (*Cercis canadensis*) / (*Lindera benzoin*) Ruderal Forest (CEGL007220)
Liriodendron tulipifera - Quercus spp. Ruderal Forest (CEGL007221)
Ruderal Conifer Forest
FXER - Northeastern Ruderal Red-cedar Forest
Juniperus virginiana Ruderal Forest (CEGL006024)
FXSF - Successional Mixed Spruce - Fir - Hardwood Forest
Picea rubens - Abies balsamea - Betula spp. - Acer rubrum Forest (CEGL006505)
FXVP - Ruderal Virginia Pine Forest
Pinus virginiana Ruderal Forest (CEGL002591)
FXWP - Ruderal Eastern White Pine Forest
Pinus strobus Ruderal Forest (CEGL007944)

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
Alpine Herbaceous & Shrub
HAWM - Alpine Herbaceous Wet Meadow
Trichophorum caespitosum - *Carex scirpoidea* - *Carex bigelowii* Alpine Snowbed (CEGL006424)
HBAM - Bigelow's Sedge Alpine Meadow
Carex bigelowii Alpine Meadow (CEGL006081)
HMSF - Northern Appalachian Alpine Bulrush Cliff
Trichophorum caespitosum - *Calamagrostis pickeringii* Alpine Snowbed (CEGL006423)
SAHM - Alpine Heath Meadow
Vaccinium uliginosum - *Harrimanella hypnoides* - *Loiseleuria procumbens* Dwarf-shrubland (CEGL006155)
Vaccinium uliginosum - *Rhododendron lapponicum* / *Juncus trifidus* Dwarf-shrubland (CEGL006298)
SCTH - Cold Air Talus Heathland
Picea mariana / *Ledum groenlandicum* - *Empetrum nigrum* / *Cladina* spp. Dwarf-shrubland (CEGL006268)
SSSB - Subalpine Slope Bog
Kalmia angustifolia - *Chamaedaphne calyculata* / *Rubus chamaemorus* / *Cladina* spp. Dwarf-shrubland (CEGL006425)
SWAR - Windswept Alpine Ridge
Diapensia lapponica Dwarf-shrubland (CEGL006322)
SWEB - Black Crowberry Wet Alpine Bog
Empetrum nigrum - *Vaccinium uliginosum* - *Vaccinium oxycoccos* / *Rubus chamaemorus* Dwarf-shrubland (CEGL006140)
Upland Herbaceous & Shrub
HALD - Appalachian Low-Elevation Granitic Dome
Selaginella rupestris - *Schizachyrium scoparium* - *Hypericum gentianoides* - *Bulbostylis capillaris* Rocky Grassland (CEGL007690)
HBGF - Graminoid & Forb Bald
Carex pensylvanica Grassland (CEGL004094)
Danthonia compressa - (*Sibbaldiopsis tridentata*) Grassland (CEGL004242)
Saxifraga michauxii - *Carex misera* - *Oclemena acuminata* - *Solidago glomerata* Grassland (CEGL004277)
Saxifraga michauxii - *Carex misera* - *Danthonia spicata* - *Krigia montana* Grassland (CEGL004279)
HCAB - Central Appalachian Wooded Herbaceous Barrens
Juniperus virginiana - *Fraxinus americana* / *Carex pensylvanica* - *Cheilanthes lanosa* Open Woodland (CEGL006037)
Fraxinus americana / *Physocarpus opulifolius* / *Carex pensylvanica* - *Allium cernuum* - (*Phacelia dubia*) Wooded Grassland (CEGL008529)
HHGB - High-Elevation Greenstone Barrens
Diervilla lonicera - *Solidago simplex* var. *randii* - *Deschampsia flexuosa* - *Hylotelephium telephioides* - *Saxifraga michauxii* Grassland (CEGL008536)
HLMO - Low- to Mid-Elevation Little Bluestem - Poverty Oatgrass Outcrop Opening
Schizachyrium scoparium - *Danthonia spicata* - *Carex pensylvanica* / *Cladonia* spp. Grassland (CEGL006544)
SBAA - Southern Appalachian Alder Bald
Alnus viridis ssp. *crispa* / *Carex pensylvanica* Shrubland (CEGL003891)
SBAB - Southern Appalachian Blackberry Bald
Rubus allegheniensis - *Rubus canadensis* / *Carex pensylvanica* Shrubland (CEGL003892)

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
SBAH - Southern Appalachian Heath Bald
Rhododendron carolinianum - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland (CEGL007876)
SBCH - Southern Appalachian Catawba Rosebay Heath Bald
Rhododendron catawbiense Shrubland (CEGL003818)
SBDH - Southern Appalachian Deciduous Heath Bald
Menziesia pilosa - *Vaccinium* (*erythrocarpum*, *simulatum*, *corymbosum*) - *Sorbus americana* Shrubland (CEGL004819)
SBGB - Blueberry Granite Barrens
Vaccinium angustifolium - *Sorbus americana* / *Sibbaldiopsis tridentata* Dwarf-shrubland (CEGL005094)
SBOB - Ridgetop Bear Oak Barrens
Quercus ilicifolia - *Prunus pumila* Shrubland (CEGL006121)
SCAB - Central Appalachian Blueberry Dwarf-shrubland
Vaccinium (*angustifolium*, *myrtilloides*, *pallidum*) Central Appalachian Dwarf-shrubland (CEGL003958)
SCHB - Central Appalachian Heath Barrens
Kalmia latifolia - *Gaylussacia baccata* - *Vaccinium* (*angustifolium*, *pallidum*) - *Menziesia pilosa* Shrubland (CEGL003939)
SHBT - High-Elevation Blackberry Thicket
Rubus canadensis - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland (CEGL003893)
SHOB - High-Elevation Outcrop Barrens (Black Chokeberry Igneous / Metamorphic Type)
Photinia melanocarpa - *Gaylussacia baccata* / *Carex pensylvanica* Shrubland (CEGL008508)
SMBT - Mixed Shrub Bald & Thicket
Kalmia latifolia - *Rhododendron catawbiense* - (*Gaylussacia baccata*, *Pieris floribunda*, *Vaccinium corymbosum*) Shrubland (CEGL003814)
Rhododendron maximum Upland Scrub (CEGL003819)
SMCK - Mixed Conifer Krummholz
(*Picea mariana*, *Abies balsamea*) / *Kalmia angustifolia* - *Ledum groenlandicum* Dwarf-shrubland (CEGL006031)
Picea mariana - *Abies balsamea* / *Sibbaldiopsis tridentata* Shrubland (CEGL006038)
Ruderal Upland & Wetland Herbaceous & Shrub
HXCM - Cultivated Grassland
Lolium (*arundinaceum*, *pratense*) Ruderal Grassland (CEGL004048)
HXFM - Grazed Montane Grassland / Fire Meadow
Phleum pratense - *Bromus pubescens* - *Helenium autumnale* Ruderal Meadow (CEGL004018)
HXNE - Northeastern Ruderal Grassland
Andropogon virginicus var. *virginicus* Ruderal Grassland (CEGL004044)
Dactylis glomerata - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Ruderal Meadow (CEGL006107)
Schizachyrium scoparium - (*Andropogon virginicus*) - *Solidago* spp. Ruderal Meadow (CEGL006333)
SXBG - Ruderal Blackberry - Greenbrier Shrub Thicket
Rubus (*argutus*, *trivialis*) - *Smilax* (*glauca*, *rotundifolia*) Ruderal Shrubland (CEGL004732)
SXCN - Central & Northern Ruderal Shrubland
Elaeagnus umbellata - *Cornus racemosa* - *Rosa multiflora* - *Juniperus virginiana* Ruderal Shrubland (CEGL006451)
Gaylussacia baccata - *Vaccinium pallidum* - *Vaccinium corymbosum* Shrubland (CEGL006622)*

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
SXHE - Successional Heath Shrubland
Gaylussacia baccata - *Vaccinium pallidum* - *Vaccinium corymbosum* Shrubland (CEGL006622)*
SXKV - Ruderal Kudzu Vineland
Pueraria montana var. *lobata* Ruderal Vine-Shrubland (CEGL003882)
SXMW - Ruderal Mixed Wet Shrub Swamp
Salix nigra / *Phalaris arundinacea* - *Apocynum cannabinum* Wet Shrubland (CEGL006065)
Cornus (*amomum*, *sericea*) - *Viburnum dentatum* - *Rosa multiflora* Ruderal Shrub Swamp (CEGL006576)
Wetland Herbaceous & Shrub
HCRB - Central Appalachian Herbaceous Riverbank
Carex torta Riverbed Vegetation (CEGL004103)
Verbesina alternifolia - *Elymus riparius* - *Solidago gigantea* - (*Teucrium canadense*) Riverbar Wet Meadow (CEGL006480)
Eupatorium serotinum - *Polygonum* (*lapathifolium*, *punctatum*, *pensylvanicum*) Riverbar Wet Meadow (CEGL006481)
Eragrostis hypnoides - *Ludwigia palustris* - *Lindernia dubia* - *Cyperus squarrosus* Riverbar Wet Meadow (CEGL006483)
HCRM - Common Rush Marsh
Juncus effusus Marsh (CEGL004112)*
HECM - Eastern Cattail Marsh
Typha (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Eastern Marsh (CEGL006153)*
HGFM - Graminoid & Forb Wet Meadow & Marsh
Carex utriculata - *Carex lacustris* - (*Carex vesicaria*, *Carex stricta*) Wet Meadow (CEGL002257)*
Calamagrostis canadensis - *Carex* spp. Laurentian & Northeast Wet Meadow (CEGL005448)*
Pontederia cordata - *Peltandra virginica* - *Sagittaria latifolia* Marsh (CEGL006191)*
Bidens cernua - *Verbena hastata* - *Polygonum* spp. Marsh (CEGL006446)*
Calamagrostis canadensis - *Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow (CEGL006519)*
HMSM - Mixed Sedge Fen & Wet Meadow
Myrica gale - *Chamaedaphne calyculata* / *Carex* (*lasiocarpa*, *utriculata*) - *Utricularia* spp. Fen (CEGL006302)
Carex stricta - *Carex vesicaria* Wet Meadow (CEGL006412)*
HRGS - Graminoid & Scour Riverbank
Triantha glutinosa - *Carex garberi* Riverscour Wet Meadow (CEGL006142)
Prunus pumila / *Andropogon gerardii* - *Sorghastrum nutans* Riverscour Wet Meadow (CEGL006518)
Carex torta - *Apocynum cannabinum* - *Cyperus* spp. Riverbed Vegetation (CEGL006536)
HTSM - Southern New England Threeway Sedge Fen
Dulichium arundinaceum / *Sphagnum* spp. Fen (CEGL006131)*
HWBS - Water-willow Rocky Bar and Shore
Justicia americana Riverbed Vegetation (CEGL004286)
HXCR - Eastern Ruderal Common Reed Marsh
Phragmites australis ssp. *australis* Eastern Ruderal Marsh (CEGL004141)*
HXSC - Ruderal Steeplebush - Reed Canarygrass Marsh
Phalaris arundinacea Eastern Ruderal Marsh (CEGL006044)*
Spiraea tomentosa - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland (CEGL006571)*
SABR - Southern Appalachian Bog (Rhododendron Type)
Rhododendron maximum / *Sphagnum* spp. Seepage Shrubland (CEGL003849)

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

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Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
SASB - Southern Appalachian Shrub Bog (Long Hope Valley Type)
Rhododendron (*maximum*, *catawbiense*) - *Ilex collina* - *Salix sericea* / *Eriophorum virginicum* Seepage Shrubland (CEGL003913)
SAST - Alder Shrub Thicket & Swamp
Alnus incana Shrub Swamp (CEGL002381)*
Alnus incana - *Cornus* (*amomum*, *sericea*) / *Clematis virginiana* Shrub Swamp (CEGL006062)*
SBBT - Blueberry Peatland Thicket
Vaccinium corymbosum / *Sphagnum* spp. Acidic Peatland (CEGL006190)*
Vaccinium corymbosum - *Rhododendron viscosum* - *Clethra alnifolia* Acidic Peatland (CEGL006371)*
SDBF - Dwarf-shrub Peatland
Kalmia angustifolia - *Chamaedaphne calyculata* - (*Picea mariana*) / *Cladina* spp. Acidic Peatland (CEGL006225)
Rhododendron canadense - *Chamaedaphne calyculata* Acidic Peatland (CEGL006514)
SLBS - Swamp-Loosestrife & Buttonbush Shrub Swamp
Decodon verticillatus Shrub Swamp (CEGL005089)*
Cephalanthus occidentalis - *Decodon verticillatus* Shrub Swamp (CEGL006069)*
SNAS - Northern Appalachian High-Elevation Seepage Shrubland
Prunus virginiana - *Acer spicatum* - *Ribes triste* / *Angelica atropurpurea* - *Heracleum maximum* Seepage Shrubland (CEGL006583)
SRBS - Rocky Bar and Shore (Alder - Yellowroot Type)
Alnus serrulata - *Xanthorhiza simplicissima* Wet Shrubland (CEGL003895)
SSLF - Sweetgale - Leatherleaf Fen
Myrica gale - *Spiraea alba* - *Chamaedaphne calyculata* Fen (CEGL006512)
Chamaedaphne calyculata / *Eriophorum virginicum* / *Sphagnum rubellum* Acidic Peatland (CEGL006513)
SSNB - Southern New England Bog
Chamaedaphne calyculata - (*Gaylussacia dumosa*) - *Decodon verticillatus* / *Woodwardia virginica* Acidic Peatland (CEGL006008)
Floating & Submerged Aquatic Vegetation
HAFV - Aquatic Floating Vegetation
Nuphar advena - *Nymphaea odorata* Aquatic Vegetation (CEGL002386)*
Elodea canadensis - *Potamogeton* spp. Eastern Aquatic Vegetation (CEGL006431)*
HEDP - Eastern North America Duckweed Pond
Lemna spp. Eastern North American Aquatic Vegetation (CEGL005451)
HEVP - Eastern Woodland Vernal Pool
Eastern Woodland Vernal Pool (CEGL006453)
Sparse Vegetation
VAFB - Alpine Fell-field & Bald
Arctoparmelia centrifuga - *Rhizocarpon geographicum* Nonvascular Vegetation (CEGL006420)
Vaccinium uliginosum / *Sibbaldiopsis tridentata* Sparse Vegetation (CEGL006533)
VBAC - Near-Boreal Alkaline Cliff
Carex scirpoidea Alkaline Cliff Sparse Vegetation (CEGL006526)

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
VCAB - Central Appalachian Acidic Boulderfield
Lasallia (*papulosa*, *pensylvanica*) - *Dimelaena oreina* - (*Melanelia culbersonii*) Nonvascular Vegetation (CEGL004142)
VCMB - Central Appalachian Mafic Boulderfield
Lasallia papulosa - *Stereocaulon glaucescens* - *Chrysothrix chlorina* Nonvascular Vegetation (CEGL004143)
VEAC - Eastern Temperate Acidic Cliff
Juniperus virginiana / *Corydalis sempervirens* Cliff Sparse Vegetation (CEGL006422)
VNBC - Northern Appalachian Barrens & Cliff
Polypodium (*virginianum*, *appalachianum*) Cliff Sparse Vegetation (CEGL006528)
Polypodium (*virginianum*, *appalachianum*) / Lichens Nonvascular Vegetation (CEGL006534)
VNRR - Northern Riverscour Rock Outcrop
Andropogon gerardii - *Campanula rotundifolia* - *Solidago simplex* Riverscour Sparse Vegetation (CEGL006284)
Park Special Vegetation
XBMV - Beaver Meadow Vegetation Complex
Carex utriculata - *Carex lacustris* - (*Carex vesicaria*, *Carex stricta*) Wet Meadow (CEGL002257)*
Alnus incana Shrub Swamp (CEGL002381)*
Nuphar advena - *Nymphaea odorata* Aquatic Vegetation (CEGL002386)*
Juncus effusus Marsh (CEGL004112)*
Phragmites australis ssp. *australis* Eastern Ruderal Marsh (CEGL004141)*
Decodon verticillatus Shrub Swamp (CEGL005089)*
Calamagrostis canadensis - *Carex* spp. Laurentian & Northeast Wet Meadow (CEGL005448)*
Phalaris arundinacea Eastern Ruderal Marsh (CEGL006044)*
Alnus incana - *Cornus* (*amomum*, *sericea*) / *Clematis virginiana* Shrub Swamp (CEGL006062)*
Cephalanthus occidentalis - *Decodon verticillatus* Shrub Swamp (CEGL006069)*
Dulichium arundinaceum / *Sphagnum* spp. Fen (CEGL006131)*
Typha (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Eastern Marsh (CEGL006153)*
Vaccinium corymbosum / *Sphagnum* spp. Acidic Peatland (CEGL006190)*
Pontederia cordata - *Peltandra virginica* - *Sagittaria latifolia* Marsh (CEGL006191)*
Vaccinium corymbosum - *Rhododendron viscosum* - *Clethra alnifolia* Acidic Peatland (CEGL006371)*
Carex stricta - *Carex vesicaria* Wet Meadow (CEGL006412)*
Elodea canadensis - *Potamogeton* spp. Eastern Aquatic Vegetation (CEGL006431)*
Bidens cernua - *Verbena hastata* - *Polygonum* spp. Marsh (CEGL006446)*
Calamagrostis canadensis - *Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow (CEGL006519)*
Spiraea tomentosa - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland (CEGL006571)*
XCMC - Constructed Wetland Ruderal Vegetation Complex
Park Special Vegetation
XPLM - Palmerton Smelter Ecological Restoration Area
Park Special Vegetation
XPRO - Potomac River Outcrops
Park Special Vegetation
XRBL - Recently Burned Landscape
Park Special Vegetation

Table G–1 (continued). Map classification and crosswalk to vegetation types in the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

[The bold headings within the table (above the map classes) are map-class categories to organize the map classes.]

Map-Class Category Map-Class Code - Name USNVC Scientific Association Name (Code)[t]
Cultural Agriculture
CHAV - Herbaceous Agricultural Vegetation
Herbaceous Agricultural Vegetation Cultural Subclass (CSC02)
CMCP - Eastern North American Temperate Forest Plantation
Pinus spp. Forest Plantation Cultural Subtype (CST006313)
Picea abies Forest Plantation Cultural Subtype (CST007167)
Pinus resinosa Forest Plantation Cultural Subtype (CST007177)
Pinus strobus Forest Plantation Cultural Subtype (CST007178)
Native Miscellaneous Northern Conifer Plantation Cultural Type (CTY011)
CNHP - Native Northern Hardwood Plantation
Native Northern Hardwood Plantation Cultural Type (CTY016)
CORC - Tropical & Temperate Fruit Orchard
Tropical & Temperate Fruit Orchard Cultural Subgroup (CSG001)
CSFP - Native Northern Spruce-Fir Plantation
Native Northern Spruce-Fir Plantation Cultural Type (CTY010)
CVNY - Tropical & Temperate Grape Vineyard
Tropical & Temperate Grape Vineyard Cultural Subgroup (CSG002)
Cultural Developed
CBRN - Barren Land
Herbaceous & Woody Developed Vegetation Cultural Subclass (CSC03)
CDVH - Developed Area - High Intensity
Herbaceous & Woody Developed Vegetation Cultural Subclass (CSC03)
CDVL - Developed Area - Low Intensity
Herbaceous & Woody Developed Vegetation Cultural Subclass (CSC03)
CDVM - Developed Area - Medium Intensity
Herbaceous & Woody Developed Vegetation Cultural Subclass (CSC03)
CDVO - Developed Area - Open Space
Herbaceous & Woody Developed Vegetation Cultural Subclass (CSC03)
Water
ZOSR - Open Water Stream & River
Open Water (Non-USNVC)
ZOWL - Open Water Lake
Open Water (Non-USNVC)
ZOWP - Open Water Pond
Open Water (Non-USNVC)

[t]Or the lowest hierarchical classification in the USNVC mapped to.

*Vegetation association also represented by another map class.

Appendix H: Map Classification by U.S. National Vegetation Classification

Explanation of Map-Classification Table

Table H–1 lists the map classification for the Appalachian National Scenic Trail vegetation mapping project for the National Park Service Vegetation Mapping Inventory Program from a vegetation classification perspective and lists how the map classes relate to the U.S. National Vegetation Classification (USNVC) in hierarchical order. For a listing of the map classification from a map classification perspective, see "Appendix G: Map Classification by Map-Class Category."

The presentation of the map classification in Table H–1 is organized by the hierarchical classification in the USNVC (USNVC Database 2016). Each map class is listed with its map-class code followed by its map-class name and is nested within the hierarchical levels of classification in the USNVC for the vegetation type that the map classes represent. Map classes are nested in the USNVC at the lowest hierarchical level that the map class represents, which for natural vegetation types is at the Association level of the USNVC. Each hierarchy-level classification in the USNVC is listed with its classification code followed by its classification name, including the hierarchy-level name (e.g., Macrogroup, Association, and Cultural Subtype). Some map classes represent more than one USNVC type and are denoted with an asterisk (*), signifying that those map classes are elsewhere in the table. Some map classes do not represent vegetation types recognized in the USNVC, which include open-water and park-special vegetation map classes.

Table H–1. Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

1. FOREST & WOODLAND CLASS
1.B. Temperate & Boreal Forest & Woodland Subclass
1.B.2. Cool Temperate Forest & Woodland Formation
1.B.2.Na. Eastern North American Forest & Woodland Division
M883. Appalachian-Interior-Northeastern Mesic Forest Macrogroup
G742. Appalachian-Allegheny Northern Hardwood - Conifer Forest Group
A3301 *Acer saccharum - Fagus grandifolia - Tilia americana* Forest Alliance
CEGL006632 *Acer saccharum - Fagus grandifolia - Fraxinus americana* / *Arisaema triphyllum* Forest Association
FNAH* - Northern Appalachian Hardwood Forest
CEGL006459 *Acer saccharum - Fraxinus americana* / *Carpinus caroliniana* / *Podophyllum peltatum* Forest Association
FMHF* - Silver Maple - Hardwood Floodplain Forest
CEGL006637 *Acer saccharum - Tilia americana* / *Acer pensylvanicum* / *Caulophyllum thalictroides* Forest Association
FNAH* - Northern Appalachian Hardwood Forest
A4126 *Acer saccharum - Tilia americana - Quercus rubra* Rocky Forest Alliance
CEGL006577 *Acer saccharum - Fraxinus americana - Juglans cinerea* / *Staphylea trifolia* / *Adlumia fungosa* Forest Association
WCNH* - Calcareous Northern Hardwood Talus Woodland
CEGL006471 *Acer saccharum - Tilia americana* / *Staphylea trifolia* / *Dryopteris marginalis* - (*Impatiens pallida*) Forest Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
CEGL008502 *Betula alleghaniensis - Quercus rubra* / *Acer spicatum* / *Dryopteris intermedia - Oclemena acuminata* Forest Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
CEGL008528 *Tilia americana - Fraxinus americana* / *Acer pensylvanicum* / *Parthenocissus quinquefolia - Impatiens pallida* Woodland Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
A0266 *Betula alleghaniensis - Aesculus flava* Forest Alliance
CEGL008558 *Acer rubrum* var. *rubrum - Betula lenta - Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Ruderal Forest Association
FXAH* - Appalachian Ruderal Hardwood Forest
CEGL004973 *Aesculus flava - Betula alleghaniensis - Acer saccharum* / *Caulophyllum thalictroides - Actaea podocarpa* Forest Association
FSAH* - Southern Appalachian Hardwood Forest
CEGL007861 *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest Association
FBHH - Blue Ridge Hemlock - Northern Hardwood Forest
CEGL007285 *Betula alleghaniensis - Fagus grandifolia* / *Viburnum lantanoides* / *Eurybia chlorolepis - Dryopteris intermedia* Forest Association
FSAH* - Southern Appalachian Hardwood Forest
CEGL004982 *Betula alleghaniensis - Tilia americana* var. *heterophylla* / *Acer spicatum* / *Ribes cynosbati* / *Dryopteris marginalis* Forest Association
FARB - Southern Appalachian Hardwood Rich Boulderfield Forest

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name Map-Class Code - Name
CEGL006124 *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest Association
FABF - Southern Appalachian Boulderfield Forest (Currant & Rockcap Fern Type)
CEGL008504 *Betula alleghaniensis* / *Sorbus americana - Acer spicatum* / *Polypodium appalachianum* Forest Association
FCAB - Central Appalachian High-Elevation Boulderfield Forest
CEGL006130 *Fagus grandifolia* / *Carex pensylvanica - Ageratina altissima* var. *roanensis* Forest Association
FBGP - Southern Appalachian Beech Gap
A3303 *Quercus rubra - Acer saccharum - Betula lenta* Forest Alliance
CEGL006046 *Acer saccharum - Quercus rubra* / *Hepatica nobilis* var. *obtusa* Forest Association
FCNO* - Central & Northern Oak Forest
CEGL006125 *Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest Association
FOTM* - Oak - Tuliptree - Maple Forest
CEGL008517 *Quercus rubra - Acer saccharum* / *Ostrya virginiana* / *Cardamine concatenata* Forest Association
FAOH* - Central Appalachian Oak - Hickory Forest
CEGL006635 *Quercus rubra - Acer saccharum* / *Viburnum acerifolium - Lindera benzoin* Forest Association
FCNO* - Central & Northern Oak Forest
CEGL006000 *Quercus rubra - Betula alleghaniensis* / *Osmunda cinnamomea* Forest Association
FAHS* - Acidic Hardwood Swamp Forest
CEGL006566 *Quercus rubra - Tsuga canadensis - Liriodendron tulipifera* / *Hamamelis virginiana* Forest Association
FHHO* - Hemlock - Hardwood - Oak Forest
A3302 *Tsuga canadensis - Betula lenta - Betula alleghaniensis* Forest Alliance
CEGL006019 *Pinus strobus - Tsuga canadensis* / *Acer pensylvanicum* / *Polystichum acrostichoides* Forest Association
FCWH* - Central Appalachian White Pine - Hemlock Forest
CEGL006328 *Pinus strobus - Tsuga canadensis* Lower New England-Northern Piedmont Forest Association
FPHD - Lower New England-Northern Piedmont White Pine - Hemlock Dry-Mesic Forest
CEGL006639 *Tsuga canadensis - Acer saccharum - Fagus grandifolia* / *Dryopteris intermedia* Forest Association
FCHH* - Central Appalachian Hemlock - Hardwood Forest
CEGL006206 *Tsuga canadensis - Betula alleghaniensis - Prunus serotina* / *Rhododendron maximum* Forest Association
FCHH* - Central Appalachian Hemlock - Hardwood Forest
CEGL006088 *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest Association
FHHO* - Hemlock - Hardwood - Oak Forest
G020. Appalachian-Central Interior Mesic Forest Group
A2033 *Fagus grandifolia - Liriodendron tulipifera - Carya cordiformis* Forest Alliance
CEGL006296 *Fagus grandifolia - Betula lenta - Liriodendron tulipifera - Acer saccharum* Forest Association
FOTM* - Oak - Tuliptree - Maple Forest
CEGL006186 *Liriodendron tulipifera - Quercus rubra - Fraxinus americana* / *Asimina triloba* / *Actaea racemosa* Forest Association
FCHW* - Central Appalachian Hardwood Forest & Woodland

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

A0235 *Liriodendron tulipifera - Tilia americana* var. *heterophylla - Aesculus flava* Forest Alliance
CEGL006237 *Acer saccharum - Fraxinus americana - Tilia americana - Liriodendron tulipifera* / *Actaea racemosa* Forest Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
CEGL007695 *Aesculus flava - Acer saccharum* - (*Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense - Solidago flexicaulis* Forest Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
FSAH* - Southern Appalachian Hardwood Forest
CEGL007710 *Liriodendron tulipifera - Fraxinus americana* - (*Aesculus flava*) / *Actaea racemosa - Laportea canadensis* Forest Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
FSAH* - Southern Appalachian Hardwood Forest
CEGL007878 *Quercus rubra - Tilia americana* var. *heterophylla* - (*Halesia tetraptera* var. *monticola*) / *Collinsonia canadensis - Prosartes lanuginosa* Forest Association
FAMO* - Appalachian Mixed Oak Forest
CEGL006472 *Tilia americana* var. *heterophylla - Aesculus flava - Acer saccharum* / *Cystopteris bulbifera - Asarum canadense* Forest Association
FRVL - Southern Appalachian Limestone Rich Cove Forest
A3304 *Tsuga canadensis - Liriodendron tulipifera* Forest Alliance
CEGL007543 *Liriodendron tulipifera - Betula lenta - Tsuga canadensis* / *Rhododendron maximum* Forest Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
FSAH* - Southern Appalachian Hardwood Forest
CEGL008405 *Liriodendron tulipifera - Pinus strobus* - (*Tsuga canadensis*) / *Carpinus caroliniana* / *Amphicarpaea bracteata* Forest Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
CEGL006304 *Liriodendron tulipifera - Pinus strobus - Tsuga canadensis - Quercus rubra* / *Polystichum acrostichoides* Forest Association
FCWH* - Central Appalachian White Pine - Hemlock Forest
CEGL007102 *Pinus strobus - Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest Association
FHWO* - White Pine - Hemlock - Oak Forest
CEGL003819 *Rhododendron maximum* Upland Scrub Association
SMBT* - Mixed Shrub Bald & Thicket
CEGL007693 *Tsuga canadensis - Halesia tetraptera - Magnolia fraseri* / *Rhododendron maximum* / *Dryopteris intermedia* Forest Association
FSAH* - Southern Appalachian Hardwood Forest
CEGL006923 *Tsuga canadensis - Quercus prinus - Betula lenta* Forest Association
FCHO - Central Appalachian Hemlock - Chestnut Oak Forest
CEGL008512 *Tsuga canadensis - Quercus prinus - Liriodendron tulipifera* / *Kalmia latifolia* - (*Rhododendron catawbiense*) Forest Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
M502. Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland Macrogroup
G015. Appalachian Oak / Chestnut Forest Group
A4128 *Pinus strobus - Quercus alba* Allegheny Forest & Woodland Alliance
CEGL006293 *Pinus strobus - Quercus* (*rubra*, *velutina*) - *Fagus grandifolia* Forest Association
FCHP* - Central Appalachian Hardwood - White Pine Forest

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

A2080 *Pinus strobus* - *Quercus prinus* Appalachian Forest Alliance
CEGL007519 *Pinus strobus* - *Quercus* (*coccinea*, *prinus*) / (*Gaylussacia ursina*, *Vaccinium stamineum*) Forest Association
FHWO* - White Pine - Hemlock - Oak Forest
CEGL007517 *Pinus strobus* - *Quercus alba* - (*Carya alba*) / *Gaylussacia ursina* Forest Association
FHWO* - White Pine - Hemlock - Oak Forest
CEGL008539 *Pinus strobus* - *Quercus alba* - *Quercus prinus* / *Vaccinium stamineum* Forest Association
FCHP* - Central Appalachian Hardwood - White Pine Forest
CEGL006454 *Quercus* (*rubra*, *velutina*, *alba*) - *Betula lenta* - (*Pinus strobus*) Forest Association
FCHP* - Central Appalachian Hardwood - White Pine Forest
A0248 *Quercus prinus* - *Quercus coccinea* Forest Alliance
CEGL006271 *Quercus* (*prinus*, *coccinea*) / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest Association
FCOM* - Chestnut Oak - Mixed Oak Forest
CEGL006299 *Quercus prinus* - (*Quercus coccinea*, *Quercus rubra*) / *Kalmia latifolia* / *Vaccinium pallidum* Forest Association
FCOH* - Chestnut Oak / Heath Forest
CEGL006282 *Quercus prinus* - *Quercus* (*rubra*, *velutina*) / *Vaccinium* (*angustifolium*, *pallidum*) Forest Association
FCNO* - Central & Northern Oak Forest
FSCO - Lower New England High Slope Chestnut Oak Forest
CEGL008524 *Quercus prinus* / *Rhododendron catawbiense* - *Kalmia latifolia* Forest Association
FCOM* - Chestnut Oak - Mixed Oak Forest
A0250 *Quercus prinus* - *Quercus rubra* Forest Alliance
CEGL007267 *Quercus prinus* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest Association
FCOM* - Chestnut Oak - Mixed Oak Forest
CEGL006057 *Quercus prinus* - *Quercus rubra* / *Hamamelis virginiana* Forest Association
FCAO* - Central Appalachian Oak Forest
CEGL006286 *Quercus prinus* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest Association
FCOM* - Chestnut Oak - Mixed Oak Forest
CEGL008523 *Quercus prinus* - *Quercus rubra* / *Vaccinium pallidum* - (*Rhododendron periclymenoides*) Forest Association
FCAO* - Central Appalachian Oak Forest
CEGL004817 *Quercus rubra* - *Quercus prinus* - *Magnolia* (*acuminata*, *fraseri*) / *Acer pensylvanicum* Forest Association
FCOM* - Chestnut Oak - Mixed Oak Forest
CEGL003890 *Vitis aestivalis* Vine-Scrub Association
N/A - N/A
A3116 *Quercus rubra* - *Quercus alba* Montane Forest Alliance
CEGL008506 *Quercus rubra* - (*Quercus alba*) / *Ilex montana* / *Dennstaedtia punctilobula* - *Lysimachia quadrifolia* Forest Association
FCRO - Central Appalachian Northern Red Oak Forest
CEGL007299 *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*) / *Galax urceolata* Forest Association
FROH* - High-Elevation Red Oak Forest

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name Map-Class Code - Name
CEGL007300 *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest Association
FROH* - High-Elevation Red Oak Forest
CEGL007298 *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest Association
FROH* - High-Elevation Red Oak Forest
A0624 *Quercus rubra* - *Quercus prinus* Woodland Alliance
CEGL006565 *Betula lenta* - *Quercus prinus* / *Parthenocissus quinquefolia* Woodland Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
WROT* - Red Oak Talus Woodland
CEGL006640 *Carya glabra* Woodland Association
FOHG* - Oak - Hickory Forest & Woodland
CEGL008526 *Quercus prinus* / *Quercus ilicifolia* / *Danthonia spicata* Woodland Association
WPOS* - Central Appalachian Pine - Oak Xeric Shale Woodland
CEGL006074 *Quercus prinus* / *Rhus* spp. / *Deschampsia flexuosa* Woodland Association
WROT* - Red Oak Talus Woodland
CEGL006134 *Quercus rubra* - (*Quercus prinus*) / *Vaccinium* spp. / *Deschampsia flexuosa* Woodland Association
WROT* - Red Oak Talus Woodland
CEGL006585 *Quercus rubra* - *Betula lenta* / *Polypodium virginianum* Woodland Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
WROT* - Red Oak Talus Woodland
A2048 *Quercus velutina* - *Quercus alba* Eastern Forest Alliance
CEGL006018 *Quercus* (*velutina*, *alba*) / *Vaccinium pallidum* / *Pteridium aquilinum* High Allegheny Plateau, Western Allegheny Plateau Forest Association
FCNO* - Central & Northern Oak Forest
CEGL008521 *Quercus alba* - *Quercus* (*coccinea*, *velutina*, *prinus*) / *Gaylussacia baccata* Forest Association
FCOH* - Chestnut Oak / Heath Forest
CEGL007691 *Quercus alba* - *Quercus coccinea* - *Quercus falcata* / *Kalmia latifolia* - *Vaccinium pallidum* Forest Association
FAMO* - Appalachian Mixed Oak Forest
G016. Northeastern Chinquapin Oak - Red-cedar Alkaline Forest & Woodland Group
A3107 *Juniperus virginiana* - *Fraxinus americana* - *Carya* spp. Woodland Alliance
CEGL006037 *Juniperus virginiana* - *Fraxinus americana* / *Carex pensylvanica* - *Cheilanthes lanosa* Open Woodland Association
HCAB* - Central Appalachian Wooded Herbaceous Barrens
CEGL006002 *Juniperus virginiana* - *Fraxinus americana* / *Danthonia spicata* - *Poa compressa* Woodland Association
WTRR - Traprock Ridge
A2047 *Quercus muehlenbergii* - *Acer saccharum* - *Tilia americana* Forest Alliance
CEGL006162 *Acer saccharum* - *Quercus muehlenbergii* / *Carex platyphylla* Forest Association
FSMC - Sugar Maple - Chinquapin Oak / Sedge Forest
CEGL006017 *Acer saccharum* - *Quercus muehlenbergii* / *Cercis canadensis* Forest Association
FMCO - Appalachian Sugar Maple - Chinquapin Oak Limestone Forest

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name Map-Class Code - Name
G650. Northeastern Oak - Hickory Forest & Woodland Group
A2053 *Quercus alba* - *Carya* spp. - *Fraxinus americana* Forest Alliance
CEGL003683 *Fraxinus americana* - *Carya glabra* / *Muhlenbergia sobolifera* - *Helianthus divaricatus* - *Solidago ulmifolia* Woodland Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
CEGL006336 *Quercus* (*alba*, *rubra*, *velutina*) - *Carya* spp. / *Viburnum acerifolium* Forest Association
FCNO* - Central & Northern Oak Forest
CEGL008515 *Quercus alba* - *Quercus prinus* - *Carya glabra* / *Cornus florida* / *Vaccinium pallidum* Forest Association
FAOH* - Central Appalachian Oak - Hickory Forest
CEGL008516 *Quercus prinus* - *Quercus rubra* - *Carya ovalis* / *Carex pensylvanica* - (*Calamagrostis porteri*) Forest Association
FAOH* - Central Appalachian Oak - Hickory Forest
CEGL006301 *Quercus rubra* - *Carya* (*glabra*, *ovata*) / *Ostrya virginiana* / *Carex lucorum* Forest Association
FOHG* - Oak - Hickory Forest & Woodland
CEGL008518 *Quercus rubra* - *Carya ovata* - *Fraxinus americana* / *Actaea racemosa* - *Hydrophyllum virginianum* Forest Association
FAOH* - Central Appalachian Oak - Hickory Forest
CEGL008514 *Quercus rubra* - *Quercus prinus* - *Carya ovalis* / (*Cercis canadensis*) / *Solidago caesia* Forest Association
FAOH* - Central Appalachian Oak - Hickory Forest
G161. Pitch Pine Barrens Group
A0524 *Pinus rigida* Woodland Alliance
CEGL006116 *Pinus rigida* / (*Quercus ilicifolia*) / *Photinia melanocarpa* / *Deschampsia flexuosa* Woodland Association
WPPS - Pitch Pine Rocky Summit
G162. Virginia Pine - Table Mountain Pine Woodland & Barrens Group
A0677 *Pinus pungens* - *Pinus rigida* - Quercus prinus Woodland Alliance
CEGL004996 *Pinus* (*pungens*, *rigida*) - *Quercus prinus* / (*Quercus ilicifolia*) / *Gaylussacia baccata* Woodland Association
WMDP* - Appalachian Mixed Pine - (Oak) Dry Woodland
CEGL007097 *Pinus pungens* - *Pinus rigida* - (*Quercus prinus*) / *Kalmia latifolia* - *Vaccinium pallidum* Woodland Association
WDMP* - Blue Ridge Mixed Pine Dry Woodland
A3312 *Pinus virginiana* - *Quercus prinus* Acidic Shale Woodland Alliance
CEGL008525 *Pinus virginiana* - *Quercus prinus* / *Quercus ilicifolia* / (*Hieracium greenii*, *Viola pedata*) Woodland Association
WPOS* - Central Appalachian Pine - Oak Xeric Shale Woodland
CEGL003624 *Pinus virginiana* / *Vaccinium pallidum* / *Schizachyrium scoparium* - *Carex pensylvanica* Woodland Association
WDMP* - Blue Ridge Mixed Pine Dry Woodland
CEGL008540 *Quercus prinus* - *Pinus virginiana* - (*Pinus pungens*) / *Schizachyrium scoparium* - *Dichanthelium depauperatum* Woodland Association
WMDP* - Appalachian Mixed Pine - (Oak) Dry Woodland

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

A0144 *Tsuga caroliniana* Woodland Alliance
CEGL006178 *Tsuga caroliniana - Pinus* (*rigida*, *pungens*, *virginiana*) Forest Association
N/A - N/A
CEGL007139 *Tsuga caroliniana* / *Kalmia latifolia - Rhododendron catawbiense* Forest Association
N/A - N/A
M013. Eastern North American Ruderal Forest Macrogroup
G032. Eastern North American Exotic Ruderal Forest Group
A3230 *Acer platanoides - Ailanthus altissima - Pinus* spp. Exotic Ruderal Forest Alliance
CEGL007191 *Ailanthus altissima* Ruderal Forest Association
FXCH* - Central Appalachian Ruderal Hardwood Forest
G030. Eastern North American Native Ruderal Forest Group
A3229 *Acer rubrum - Prunus serotina - Pinus strobus* Ruderal Forest Alliance
CEGL006628 *Acer saccharum - Betula* spp. - *Fagus grandifolia* Ruderal Forest Association
FXNH* - Ruderal Northern Hardwood Forest & Woodland
CEGL008503 *Betula lenta - Acer rubrum* / *Lycopodium annotinum - Dennstaedtia punctilobula* Ruderal Forest Association
FXCH* - Central Appalachian Ruderal Hardwood Forest
CEGL006303 *Populus* (*tremuloides*, *grandidentata*) - *Betula* (*populifolia*, *papyrifera*) Ruderal Woodland Association
FXNH* - Ruderal Northern Hardwood Forest & Woodland
CEGL006599 *Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana* - (*Robinia pseudoacacia*) Ruderal Forest Association
FXCH* - Central Appalachian Ruderal Hardwood Forest
CEGL006506 *Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest Association
FXOM - Northeastern Ruderal Oak - Red Maple Forest
A3227 *Juniperus virginiana - Pinus virginiana - Pinus echinata* Ruderal Forest Alliance
CEGL006024 *Juniperus virginiana* Ruderal Forest Association
FXER - Northeastern Ruderal Red-cedar Forest
CEGL007944 *Pinus strobus* Ruderal Forest Association
FXWP - Ruderal Eastern White Pine Forest
CEGL002591 *Pinus virginiana* Ruderal Forest Association
FXVP - Ruderal Virginia Pine Forest
A3228 *Liriodendron tulipifera - Juglans nigra - Robinia pseudoacacia* Ruderal Forest Alliance
CEGL004184 *Crataegus punctata - Crataegus flabellata* Ruderal Forest Association
FXHO - Southern & Central Appalachian Ruderal Hawthorn Forest
CEGL007879 *Juglans nigra* / *Verbesina alternifolia* Ruderal Forest Association
FXCH* - Central Appalachian Ruderal Hardwood Forest
CEGL007219 *Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia* Ruderal Forest Association
FXAH* - Appalachian Ruderal Hardwood Forest
CEGL007221 *Liriodendron tulipifera - Quercus* spp. Ruderal Forest Association
FXTT* - Ruderal Tuliptree Forest
CEGL007220 *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Ruderal Forest Association
FXTT* - Ruderal Tuliptree Forest
CEGL007279 *Robinia pseudoacacia* Ruderal Forest Association
FXBL - Ruderal Black Locust Forest

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

M014. Laurentian-Acadian Mesic Hardwood - Conifer Forest Macrogroup
G632. Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest Group
A0136 *Picea rubens* - *Abies fraseri* Forest Alliance
CEGL006308 *Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest Association
FFFS* - Fraser Fir / Shrub Forest
CEGL006049 *Abies fraseri* / *Viburnum lantanoides* / *Dryopteris campyloptera* - Oxalis montana / *Hylocomium splendens* Forest Association
FFFS* - Fraser Fir / Shrub Forest
CEGL007130 *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest Association
FSFE - Red Spruce - Fraser Fir Forest (Evergreen Shrub Type)
CEGL007131 *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Dryopteris campyloptera* / *Hylocomium splendens* Forest Association
FSFD - Red Spruce - Fraser Fir Forest (Deciduous Shrub Type)
A0138 *Picea rubens* - *Betula alleghaniensis* - *Aesculus flava* Forest Alliance
CEGL004983 *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron* (*maximum*, *catawbiense*) Forest Association
FSHS* - Spruce - Hardwood / Shrub Forest
CEGL006256 *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Solidago glomerata* Forest Association
FSHH - Red Spruce - Northern Hardwood Forest (Herb Type)
CEGL006152 *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest Association
FSHS* - Spruce - Hardwood / Shrub Forest
G743. Laurentian-Acadian Hardwood Forest Group
A3224 *Acer saccharum* - *Fagus grandifolia* - *Betula alleghaniensis* Forest Alliance
CEGL006631 *Acer saccharum* - *Betula alleghaniensis* - *Fagus grandifolia* / *Viburnum lantanoides* Forest Association
FNAH* - Northern Appalachian Hardwood Forest
A3240 *Acer saccharum* - *Tilia americana* - *Fraxinus americana* Forest Alliance
CEGL006211 *Acer saccharum* - (*Fraxinus americana*) / *Arisaema triphyllum* Forest Association
FNAH* - Northern Appalachian Hardwood Forest
CEGL006636 *Acer saccharum* - *Fraxinus americana* / *Acer spicatum* / *Caulophyllum thalictroides* Forest Association
FNAH* - Northern Appalachian Hardwood Forest
A3297 *Acer saccharum* - *Tilia americana* Limestone Woodland Alliance
CEGL005058 *Acer saccharum* - *Tilia americana* - *Fraxinus americana* / *Ostrya virginiana* / *Geranium robertianum* Woodland Association
WCNH* - Calcareous Northern Hardwood Talus Woodland
A3241 *Quercus rubra* - *Acer saccharum* Forest Alliance
CEGL006584 *Betula alleghaniensis* - *Quercus rubra* / *Polypodium virginianum* Woodland Association
WHOT* - Hardwood - Oak Talus Woodland
CEGL006633 *Quercus rubra* - *Acer saccharum* - *Fagus grandifolia* / *Viburnum acerifolium* Forest Association
FCNO* - Central & Northern Oak Forest
G741. Laurentian-Acadian Hemlock - White Pine - Hardwood Forest Group
A3251 *Pinus strobus* - *Tsuga canadensis* Forest Alliance
CEGL006324 *Pinus strobus* - *Tsuga canadensis* - *Picea rubens* Forest Association
FPHS - White Pine - Hemlock - Red Spruce Forest

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

A4072 *Tsuga canadensis - Betula alleghaniensis - Acer saccharum* Forest Alliance
CEGL005005 *Acer saccharum - Pinus strobus* / *Acer pensylvanicum* Forest Association
FCHP* - Central Appalachian Hardwood - White Pine Forest
CEGL006129 *Tsuga canadensis* - (*Betula alleghaniensis*) - *Picea rubens* / *Cornus canadensis* Forest Association
FHSH - Hemlock - Spruce - Hardwood Forest
CEGL006638 *Tsuga canadensis - Betula alleghaniensis - Acer saccharum* / *Dryopteris intermedia* Forest Association
FHNH - Hemlock - Northern Hardwood Forest
G744. Northern Appalachian-Acadian Red Spruce - Fir - Hardwood Forest Group
A0150 *Picea rubens - Abies balsamea* Forest Alliance
CEGL006112 *Abies balsamea* - (*Betula papyrifera* var. *cordifolia*) Forest Association
FMFB - Montane Balsam Fir - Birch Forest
CEGL006267 *Betula alleghaniensis - Picea rubens* / *Dryopteris campyloptera* Forest Association
FTHS - Transitional Northern Hardwood - Red Spruce Forest
CEGL006273 *Picea rubens - Abies balsamea - Betula papyrifera* Forest Association
FLSF* - Low-Elevation Spruce - Fir Forest
CEGL006505 *Picea rubens - Abies balsamea - Betula* spp. - *Acer rubrum* Forest Association
FXSF - Successional Mixed Spruce - Fir - Hardwood Forest
CEGL006128 *Picea rubens - Abies balsamea* / *Sorbus americana* Forest Association
FMSF - Montane Spruce - Fir Forest
CEGL006250 *Picea rubens* / *Ribes glandulosum* Woodland Association
WSTS - Red Spruce Talus Slope Woodland
A3314 *Picea rubens* / *Vaccinium angustifolium* Northern Rocky Woodland Alliance
CEGL006053 *Picea rubens* / *Vaccinium angustifolium* / *Sibbaldiopsis tridentata* Woodland Association
WSFR - Northern Appalachian Red Spruce Rocky Ridge
M159. Laurentian-Acadian Pine - Hardwood Forest & Woodland Macrogroup
G025. Laurentian-Acadian Pine - Oak Forest & Woodland Group
A3238 *Pinus banksiana - Pinus resinosa - Quercus ellipsoidalis* Forest & Woodland Alliance
CEGL006041 *Pinus banksiana* / *Kalmia angustifolia - Vaccinium* spp. Woodland Association
WJPR - Jack Pine Heath Barrens
A4127 *Pinus strobus - Pinus resinosa - Quercus rubra* Forest & Woodland Alliance
CEGL006253 *Pinus strobus - Pinus resinosa* / *Cornus canadensis* Forest Association
FRWP - White Pine - Red Pine Forest
M016. Southern & South-Central Oak - Pine Forest & Woodland Macrogroup
G601. Chinquapin Oak - Shumard Oak - Blue Ash Alkaline Forest & Woodland Group
A3274 *Fraxinus americana - Carya glabra - Juniperus virginiana* Piedmont-Appalachian Woodland Alliance
CEGL003752 *Carya* (*glabra*, *alba*) - *Fraxinus americana* - (*Juniperus virginiana* var. *virginiana*) Woodland Association
WMBH - Montane Basic Hardwood - Red-cedar Woodland
G165. Piedmont-Central Atlantic Coastal Plain Oak Forest Group
A3293 *Quercus rubra - Quercus alba - Carya* spp. Piedmont Forest Alliance
CEGL007230 *Quercus alba - Quercus* (*rubra*, *prinus*) / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest Association
FAMO* - Appalachian Mixed Oak Forest

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

CEGL007233 *Quercus alba - Quercus rubra - Carya ovalis* / *Acer saccharum* / *Polystichum acrostichoides* Forest Association
FAMO* - Appalachian Mixed Oak Forest
CEGL007692 *Quercus alba - Quercus rubra - Quercus prinus* / *Collinsonia canadensis - Podophyllum peltatum* Forest Association
FAMO* - Appalachian Mixed Oak Forest
CEGL006192 *Quercus rubra - Acer rubrum* / *Pyrularia pubera* / *Thelypteris noveboracensis* Forest Association
FAMO* - Appalachian Mixed Oak Forest
G012. Shortleaf Pine - Oak Forest & Woodland Group
A3269 *Pinus echinata - Pinus pungens - Quercus prinus* Appalachian Woodland Alliance
CEGL008500 *Pinus virginiana* - (*Pinus rigida*, *Pinus pungens*) / *Schizachyrium scoparium* Forest Association
WMDP* - Appalachian Mixed Pine - (Oak) Dry Woodland
CEGL007119 *Pinus virginiana - Pinus* (*rigida*, *echinata*) - (*Quercus prinus*) / *Vaccinium pallidum* Forest Association
WMDP* - Appalachian Mixed Pine - (Oak) Dry Woodland
G159. South-Central Interior Oak Forest & Woodland Group
A3289 *Quercus prinus - Quercus falcata* Forest Alliance
CEGL007720 *Quercus prinus - Juniperus virginiana* - (*Pinus virginiana*) / *Philadelphus hirsutus - Celtis occidentalis* Woodland Association
N/A - N/A

1.B.3. Temperate Flooded & Swamp Forest Formation

1.B.3.Na. Eastern North American-Great Plains Flooded & Swamp Forest Division

M029. Central Hardwood Floodplain Forest Macrogroup
G652. Silver Maple - Green Ash - Sycamore Floodplain Forest Group
A3710 *Acer saccharinum - Populus deltoides* Floodplain Forest Alliance
CEGL006147 *Acer saccharinum* - (*Populus deltoides*) / *Matteuccia struthiopteris - Laportea canadensis* Floodplain Forest Association
FMHF* - Silver Maple - Hardwood Floodplain Forest
CEGL002586 *Acer saccharinum - Fraxinus pennsylvanica - Ulmus americana* Floodplain Forest Association
FMEF - Midwestern Silver Maple - Elm Floodplain Forest
CEGL006629 *Salix nigra* - (*Populus deltoides*) Floodplain Forest Association
FFAW* - Ash - Willow Floodplain Forest
G673. Silver Maple - Sugarberry - Sweetgum Floodplain Forest Group
A3697 *Acer saccharinum - Acer negundo* Appalachian-Piedmont Floodplain Forest Alliance
CEGL006217 *Acer saccharinum - Acer negundo* / *Ageratina altissima - Laportea canadensis* - (*Elymus virginicus*) Floodplain Forest Association
FMHF* - Silver Maple - Hardwood Floodplain Forest
A3699 *Betula nigra - Platanus occidentalis* Appalachian-Piedmont Floodplain Forest Alliance
CEGL003896 *Platanus occidentalis - Betula nigra - Salix* (*caroliniana*, *nigra*) Floodplain Forest Association
WCRS - Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest
A3701 *Platanus occidentalis - Fraxinus pennsylvanica - Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance
CEGL006575 *Fraxinus pennsylvanica* - (*Juglans nigra*, *Platanus occidentalis*) Floodplain Forest Association
FFAW* - Ash - Willow Floodplain Forest

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

CEGL006255 *Liriodendron tulipifera - Platanus occidentalis - Betula lenta* / *Lindera benzoin* / *Circaea lutetiana* ssp. *canadensis* Floodplain Forest Association
FCHW* - Central Appalachian Hardwood Forest & Woodland
CEGL004073 *Platanus occidentalis - Acer negundo - Juglans nigra* / *Asimina triloba* / *Mertensia virginica* Floodplain Forest Association
FFCR - Piedmont-Central Appalachian Rich Floodplain Forest
A3702 *Platanus occidentalis - Liquidambar styraciflua - Liriodendron tulipifera* Southern Appalachian Floodplain Forest Alliance
CEGL004691 *Platanus occidentalis - Liriodendron tulipifera* - (*Betula alleghaniensis*) / *Alnus serrulata - Leucothoe fontanesiana* Floodplain Forest Association
FAMA - Appalachian Montane Alluvial Forest
M503. Central Hardwood Swamp Forest Macrogroup
G597. Central Hardwood Flatwoods & Swamp Forest Group
A3408 *Quercus palustris - Quercus bicolor* Flooded & Swamp Forest Alliance
CEGL006185 *Quercus palustris - Acer rubrum* / *Carex grayi - Geum canadense* Wet Forest Association
FPOF - Pin Oak Small River Floodplain Forest
G044. Central Interior-Appalachian Seepage Swamp Group
A3358 *Acer rubrum* / *Alnus serrulata - Ilex verticillata* Appalachian-Piedmont Seepage Forest Alliance
CEGL007853 *Acer rubrum - Nyssa sylvatica* / *Ilex verticillata - Vaccinium fuscatum* / *Osmunda cinnamomea* Seep Forest Association
FCAS* - Central Appalachian Swamp Forest
CEGL007443 *Acer rubrum* var. *trilobum - Nyssa sylvatica* / *Osmunda cinnamomea - Carex intumescens* / *Sphagnum lescurii* Seep Forest Association
N/A - N/A
CEGL007565 *Tsuga canadensis - Acer rubrum* - (*Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Seep Forest Association
N/A - N/A
G667. Northeastern Forest Vernal Pool Group
A3686 Eastern North American Vernal Pool Alliance
CEGL006453 Eastern Woodland Vernal Pool Association
HEVP - Eastern Woodland Vernal Pool
M504. Laurentian-Acadian-North Atlantic Coastal Flooded & Swamp Forest Macrogroup
G045. Laurentian-Acadian-Appalachian Acidic Swamp Group
A3706 *Acer rubrum - Fraxinus pennsylvanica* Northeastern Swamp Forest Alliance
CEGL006406 *Acer rubrum - Fraxinus* (*pennsylvanica*, *americana*) / *Lindera benzoin* / *Symplocarpus foetidus* Swamp Forest Association
FAHS* - Acidic Hardwood Swamp Forest
FCAS* - Central Appalachian Swamp Forest
CEGL008416 *Acer rubrum - Fraxinus nigra - Betula alleghaniensis* / *Veratrum viride - Carex bromoides* Seep Forest Association
FCAS* - Central Appalachian Swamp Forest
CEGL006220 *Acer rubrum* / *Nemopanthus mucronatus - Vaccinium corymbosum* Swamp Forest Association
FAHS* - Acidic Hardwood Swamp Forest

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

A2058 *Acer rubrum - Nyssa sylvatica* Swamp Forest Alliance
CEGL006014 *Acer rubrum - Nyssa sylvatica - Betula alleghaniensis* / *Sphagnum* spp. Swamp Forest Association
FAHS* - Acidic Hardwood Swamp Forest
FCAS* - Central Appalachian Swamp Forest
A0653 *Acer rubrum* Swamp Woodland Alliance
CEGL006119 *Acer rubrum* / *Carex stricta - Onoclea sensibilis* Wet Woodland Association
WMUM - Red Maple / Upright Sedge Wet Woodland
A3416 *Betula alleghaniensis - Tsuga canadensis* Swamp Forest Alliance
CEGL006380 *Betula alleghaniensis - Acer rubrum* - (*Tsuga canadensis*, *Abies balsamea*) / *Osmunda cinnamomea* Swamp Forest Association
FRHS* - Rich Hardwood Swamp Forest
CEGL006226 *Tsuga canadensis - Betula alleghaniensis* / *Ilex verticillata* / *Sphagnum* spp. Swamp Forest Association
FHHS - Hemlock - Hardwood Swamp Forest
CEGL006279 *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. Swamp Forest Association
FAHS* - Acidic Hardwood Swamp Forest
FCWH* - Central Appalachian White Pine - Hemlock Forest
A3418 *Picea rubens* Northern Appalachian Swamp Forest Alliance
CEGL006361 *Picea mariana - Picea rubens* / *Pleurozium schreberi* Swamp Forest Association
FLSF* - Low-Elevation Spruce - Fir Forest
CEGL006098 *Picea mariana* / (*Vaccinium corymbosum*, *Gaylussacia baccata*) / *Sphagnum* sp. Swamp Woodland Association
FMSS* - Mixed Spruce Swamp Forest & Woodland
CEGL006312 *Picea rubens - Abies balsamea* / *Gaultheria hispidula* / *Osmunda cinnamomea* / *Sphagnum* spp. Swamp Forest Association
FMSS* - Mixed Spruce Swamp Forest & Woodland
CEGL006198 *Picea rubens - Acer rubrum* / *Nemopanthus mucronatus* Swamp Forest Association
FCMS - Red Spruce - Red Maple Acidic Swamp Forest
G046. Laurentian-Acadian-Appalachian Alkaline Swamp Group
A0347 *Fraxinus nigra - Acer rubrum* Swamp Forest Alliance
CEGL006009 *Acer rubrum - Fraxinus nigra* - (*Larix laricina*) / *Rhamnus alnifolia* Swamp Forest Association
FRHS* - Rich Hardwood Swamp Forest
CEGL006502 *Acer rubrum - Fraxinus nigra* - (*Tsuga canadensis*) / *Tiarella cordifolia* Swamp Forest Association
FRHS* - Rich Hardwood Swamp Forest
CEGL006395 *Acer rubrum* / *Alnus incana - Ilex verticillata* / *Osmunda regalis* Woodland Association
FAHS* - Acidic Hardwood Swamp Forest
A3720 *Thuja occidentalis - Acer rubrum - Larix laricina* Swamp Forest Alliance
CEGL006175 *Thuja occidentalis* - (*Picea rubens*) / *Tiarella cordifolia* Swamp Forest Association
FNWS* - Northern White-cedar Swamp Forest
CEGL006507 *Thuja occidentalis - Abies balsamea* / *Ledum groenlandicum* / *Carex trisperma* Swamp Woodland Association
WNWF - Northern White-cedar Wooded Fen
CEGL006007 *Thuja occidentalis* / *Sphagnum* (*girgensohnii*, *warnstorfii*) Swamp Forest Association
FNWS* - Northern White-cedar Swamp Forest

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

G039. Northern Atlantic Coastal Hardwood - Conifer Swamp Group
A3400 *Chamaecyparis thyoides* Northern Peat Swamp Forest Alliance
CEGL006189 *Chamaecyparis thyoides* - (*Tsuga canadensis*, *Betula alleghaniensis*) / *Clethra alnifolia* Swamp Forest Association
FAWS - Inland Atlantic White-cedar Swamp Forest
G653. Silver Maple - Green Ash - Black Ash Floodplain Forest Group
A3715 *Acer saccharinum* - *Acer rubrum* - *Ulmus americana* Floodplain Forest Alliance
CEGL006001 *Acer saccharinum* - *Ulmus americana* / *Onoclea sensibilis* Floodplain Forest Association
FMHF* - Silver Maple - Hardwood Floodplain Forest
CEGL006176 *Acer saccharinum* / *Onoclea sensibilis* - *Boehmeria cylindrica* Floodplain Forest Association
FMHF* - Silver Maple - Hardwood Floodplain Forest
A3714 *Acer saccharum* - *Tilia americana* Mesic Floodplain Forest Alliance
CEGL006114 *Acer saccharum* - *Fraxinus* spp. - *Tilia americana* / *Matteuccia struthiopteris* - *Ageratina altissima* Floodplain Forest Association
FFTH - Terrace Hardwood Floodplain Forest
FFAW* - Ash - Willow Floodplain Forest
CEGL006504 *Acer saccharum* / *Ostrya virginiana* / *Brachyelytrum erectum* Floodplain Forest Association
FFHH - High-gradient Hardwood Floodplain Forest
2. SHRUB & HERB VEGETATION CLASS
2.B. Temperate & Boreal Grassland & Shrubland Subclass
2.B.2. Temperate Grassland & Shrubland Formation
2.B.2.Nc. Eastern North American Grassland & Shrubland Division
M506. Appalachian Rocky Felsic & Mafic Scrub & Grassland Macrogroup
G180. Appalachian Mafic Glade Group
A2074 *Fraxinus americana* - *Quercus stellata* / *Carex pensylvanica* Appalachian Mafic-Circumneutral Scrub Alliance
CEGL008529 *Fraxinus americana* / *Physocarpus opulifolius* / *Carex pensylvanica* - *Allium cernuum* - (*Phacelia dubia*) Wooded Grassland Association
HCAB* - Central Appalachian Wooded Herbaceous Barrens
A3470 Southern Appalachian Mafic Shrubland Alliance
CEGL008536 *Diervilla lonicera* - *Solidago simplex* var. *randii* - *Deschampsia flexuosa* - *Hylotelephium telephioides* - *Saxifraga michauxii* Grassland Association
HHGB - High-Elevation Greenstone Barrens
CEGL008508 *Photinia melanocarpa* - *Gaylussacia baccata* / *Carex pensylvanica* Shrubland Association
SHOB - High-Elevation Outcrop Barrens (Black Chokeberry Igneous / Metamorphic Type)
G670. Central & Southern Appalachian Rocky Outcrop Group
A1621 *Saxifraga michauxii* - *Carex misera* - *Schizachyrium scoparium* Rocky Grassland Alliance
CEGL004279 *Saxifraga michauxii* - *Carex misera* - *Danthonia spicata* - *Krigia montana* Grassland Association
HBGF* - Graminoid & Forb Bald
CEGL004277 *Saxifraga michauxii* - *Carex misera* - *Oclemena acuminata* - *Solidago glomerata* Grassland Association
HBGF* - Graminoid & Forb Bald
A3961 *Selaginella rupestris* - *Selaginella tortipila* - *Schizachyrium scoparium* Rocky Grassland Alliance
CEGL007690 *Selaginella rupestris* - *Schizachyrium scoparium* - *Hypericum gentianoides* - *Bulbostylis capillaris* Rocky Grassland Association
HALD - Appalachian Low-Elevation Granitic Dome

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

G789. North-Central Appalachian Acidic Scrub & Grassland Group
A3910 *Danthonia spicata - Deschampsia flexuosa - Deschampsia caespitosa* Bedrock Grassland Alliance
CEGL006544 *Schizachyrium scoparium - Danthonia spicata - Carex pensylvanica* / *Cladonia* spp. Grassland Association
HLMO - Low- to Mid-Elevation Little Bluestem - Poverty Oatgrass Outcrop Opening
A3909 *Quercus ilicifolia - Photinia melanocarpa* Bedrock Shrubland Alliance
CEGL006121 *Quercus ilicifolia - Prunus pumila* Shrubland Association
SBOB - Ridgetop Bear Oak Barrens
A4111 *Vaccinium angustifolium - Vaccinium pallidum* Rocky Heath Alliance
CEGL003939 *Kalmia latifolia - Gaylussacia baccata - Vaccinium* (*angustifolium*, *pallidum*) - *Menziesia pilosa* Shrubland Association
SCHB - Central Appalachian Heath Barrens
CEGL003958 *Vaccinium* (*angustifolium*, *myrtilloides*, *pallidum*) Central Appalachian Dwarf-shrubland Association
SCAB - Central Appalachian Blueberry Dwarf-shrubland
A3913 *Vaccinium angustifolium - Vaccinium pallidum* Sandy Heath Alliance
CEGL006622 *Gaylussacia baccata - Vaccinium pallidum - Vaccinium corymbosum* Shrubland Association
SXCN* - Central & Northern Ruderal Shrubland
SXHE - Successional Heath Shrubland
G657. Southern Appalachian Grass Bald Group
A2026 *Carex pensylvanica - Danthonia compressa - Hypericum mitchellianum* Grass Bald Alliance
CEGL004094 *Carex pensylvanica* Grassland Association
HBGF* - Graminoid & Forb Bald
CEGL004242 *Danthonia compressa* - (*Sibbaldiopsis tridentata*) Grassland Association
HBGF* - Graminoid & Forb Bald
A0930 *Rubus allegheniensis - Rubus canadensis* Shrubland Alliance
CEGL003892 *Rubus allegheniensis - Rubus canadensis* / *Carex pensylvanica* Shrubland Association
SBAB - Southern Appalachian Blackberry Bald
CEGL003893 *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina - Solidago glomerata* Shrubland Association
SHBT - High-Elevation Blackberry Thicket
G658. Southern Appalachian Shrub Bald Group
A0929 *Alnus viridis* ssp. *crispa* Shrub Bald Alliance
CEGL003891 *Alnus viridis* ssp. *crispa* / *Carex pensylvanica* Shrubland Association
SBAA - Southern Appalachian Alder Bald
A0744 *Rhododendron catawbiense - Rhododendron carolinianum - Kalmia latifolia* Shrub Bald Alliance
CEGL003814 *Kalmia latifolia - Rhododendron catawbiense* - (*Gaylussacia baccata*, *Pieris floribunda*, *Vaccinium corymbosum*) Shrubland Association
SMBT* - Mixed Shrub Bald & Thicket
CEGL004819 *Menziesia pilosa - Vaccinium* (*erythrocarpum*, *simulatum*, *corymbosum*) - *Sorbus americana* Shrubland Association
SBDH - Southern Appalachian Deciduous Heath Bald
CEGL007876 *Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium* Shrubland Association
SBAH - Southern Appalachian Heath Bald
CEGL003818 *Rhododendron catawbiense* Shrubland Association
SBCH - Southern Appalachian Catawba Rosebay Heath Bald

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

M123. Eastern North American Ruderal Grassland & Shrubland Macrogroup
G059. Eastern North American Ruderal Meadow & Shrubland Group
A1190 *Dactylis glomerata* - *Festuca* spp. - *Solidago canadensis* Ruderal Mesic Meadow Alliance
CEGL006107 *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Ruderal Meadow Association
HXNE* - Northeastern Ruderal Grassland
CEGL004018 *Phleum pratense* - *Bromus pubescens* - *Helenium autumnale* Ruderal Meadow Association
HXFM - Grazed Montane Grassland / Fire Meadow
A3934 *Poa compressa* - *Solidago nemoralis* - *Centaurea biebersteinii* Ruderal Dry Meadow & Shrubland Alliance
CEGL006333 *Schizachyrium scoparium* - (*Andropogon virginicus*) - *Solidago* spp. Ruderal Meadow Association
HXNE* - Northeastern Ruderal Grassland
A3935 *Rhamnus cathartica* - *Rosa multiflora* - *Elaeagnus umbellata* Ruderal Mesic Shrubland Alliance
CEGL006451 *Elaeagnus umbellata* - *Cornus racemosa* - *Rosa multiflora* - *Juniperus virginiana* Ruderal Shrubland Association
SXCN* - Central & Northern Ruderal Shrubland
M505. Laurentian-Acadian Acidic Rocky Scrub & Grassland Macrogroup
G788. Laurentian-Acadian Acidic Scrub & Grassland Group
A4110 *Vaccinium angustifolium* - *Vaccinium myrtilloides* Rocky Heath Alliance
CEGL005094 *Vaccinium angustifolium* - *Sorbus americana* / *Sibbaldiopsis tridentata* Dwarf-shrubland Association
SBGB - Blueberry Granite Barrens

2.B.2.Ne. Southeastern North American Grassland & Shrubland Division
M307. Southeastern Ruderal Grassland & Shrubland Macrogroup
G583. Southeastern Ruderal Grassland & Shrubland Group
A3321 *Andropogon virginicus* - *Ambrosia artemisiifolia* - *Conyza canadensis* Eastern Ruderal Grassland Alliance
CEGL004044 *Andropogon virginicus* var. *virginicus* Ruderal Grassland Association
HXNE* - Northeastern Ruderal Grassland
CEGL004048 *Lolium* (*arundinaceum*, *pratense*) Ruderal Grassland Association
HXCM - Cultivated Grassland
A4082 *Pueraria montana* - *Wisteria sinensis* Exotic Ruderal Vine-Shrubland Alliance
CEGL003882 *Pueraria montana* var. *lobata* Ruderal Vine-Shrubland Association
SXKV - Ruderal Kudzu Vineland
A3322 *Rubus* spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance
CEGL004732 *Rubus* (*argutus*, *trivialis*) - *Smilax* (*glauca*, *rotundifolia*) Ruderal Shrubland Association
SXBG - Ruderal Blackberry - Greenbrier Shrub Thicket

2.C. Shrub & Herb Wetland Subclass
2.C.2. Temperate to Polar Bog & Fen Formation
2.C.2.Na. North American Bog & Fen Division
M877. North American Boreal & Sub-boreal Alkaline Fen Macrogroup
G185. Eastern North American Sub-boreal Alkaline Fen Group
A3477 *Betula pumila* - *Chamaedaphne calyculata* - *Myrica gale* Shrub Fen Alliance
CEGL006302 *Myrica gale* - *Chamaedaphne calyculata* / *Carex* (*lasiocarpa*, *utriculata*) - *Utricularia* spp. Fen Association
HMSM* - Mixed Sedge Fen & Wet Meadow

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

CEGL006512 *Myrica* gale - *Spiraea alba* - *Chamaedaphne calyculata* Fen Association
SSLF* - Sweetgale - Leatherleaf Fen
G805. North-Central Interior & Appalachian Alkaline Fen Group
A3703 *Dasiphora fruticosa* ssp. *floribunda* - *Carex sterilis* - *Carex flava* Alkaline Shrub Fen Alliance
CEGL006326 *Dasiphora fruticosa* ssp. *floribunda* / *Carex* (*sterilis*, *hystericina*, *flava*) Fen Association
N/A - N/A
CEGL006357 *Juniperus virginiana* / *Dasiphora fruticosa* ssp. *floribunda* / *Carex flava* - *Carex tetanica* Fen Association
WPAF - Pasture Fen
M876. North American Boreal & Sub-boreal Bog & Acidic Fen Macrogroup
G748. Eastern North American Boreal Bog & Acidic Fen Group
A3836 *Picea mariana* / *Sphagnum* spp. Eastern Boreal Treed Bog Alliance
CEGL002485 *Picea mariana* / *Ledum groenlandicum* / *Carex trisperma* / *Sphagnum* spp. Open Bog Woodland Association
FBSB - Black Spruce Open Bog Woodland
G745. Eastern North American Sub-boreal Bog & Acidic Fen Group
A3450 *Chamaedaphne calyculata* / *Carex lasiocarpa* Sub-boreal Acidic Shrub Bog & Fen Alliance
CEGL006008 *Chamaedaphne calyculata* - (*Gaylussacia dumosa*) - *Decodon verticillatus* / *Woodwardia virginica* Acidic Peatland Association
SSNB - Southern New England Bog
CEGL006513 *Chamaedaphne calyculata* / *Eriophorum virginicum* / *Sphagnum rubellum* Acidic Peatland Association
SSLF* - Sweetgale - Leatherleaf Fen
CEGL006225 *Kalmia angustifolia* - *Chamaedaphne calyculata* - (*Picea mariana*) / *Cladina* spp. Acidic Peatland Association
SDBF* - Dwarf-shrub Peatland
CEGL006514 *Rhododendron canadense* - *Chamaedaphne calyculata* Acidic Peatland Association
SDBF* - Dwarf-shrub Peatland
A3452 *Dulichium arundinaceum* - *Carex canescens* Sub-boreal Acidic Graminoid Fen Alliance
CEGL006131 *Dulichium arundinaceum* / *Sphagnum* spp. Fen Association
HTSM - Southern New England Threeway Sedge Fen
XBMV* - Beaver Meadow Vegetation Complex
A1018 *Vaccinium corymbosum* Peat Shrubland Alliance
CEGL006158 *Alnus incana* ssp. *rugosa* - *Nemopanthus mucronatus* / *Sphagnum* spp. Acidic Peatland Association
N/A - N/A
CEGL006371 *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Acidic Peatland Association
SBBT* - Blueberry Peatland Thicket
XBMV* - Beaver Meadow Vegetation Complex
CEGL006190 *Vaccinium corymbosum* / *Sphagnum* spp. Acidic Peatland Association
SBBT* - Blueberry Peatland Thicket
XBMV* - Beaver Meadow Vegetation Complex

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

2.C.4. Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland Formation

2.C.4.Nd. Eastern North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland Division

M061. Eastern North American Cool Temperate Seep Macrogroup

G184. Central & Southern Appalachian Seep Group

A3381 *Carex atlantica - Solidago patula - Parnassia asarifolia* Seep Alliance

CEGL003909 *Alnus serrulata - Lindera benzoin* / *Scutellaria lateriflora - Thelypteris noveboracensis* Seepage Shrubland Association

N/A - N/A

CEGL003913 *Rhododendron* (*maximum*, *catawbiense*) - *Ilex collina - Salix sericea* / *Eriophorum virginicum* Seepage Shrubland Association

SASB - Southern Appalachian Shrub Bog (Long Hope Valley Type)

CEGL003849 *Rhododendron maximum* / *Sphagnum* spp. Seepage Shrubland Association

SABR - Southern Appalachian Bog (Rhododendron Type)

A3382 *Carex gynandra - Glyceria melicaria - Glyceria striata* Seep Alliance

CEGL007697 *Carex gynandra - Platanthera clavellata - Drosera rotundifolia - Carex ruthii* / *Sphagnum* spp. Herbaceous Seep Association

N/A - N/A

CEGL008438 *Glyceria striata - Carex gynandra - Chelone glabra - Symphyotrichum puniceum* / *Sphagnum* spp. Herbaceous Seep Association

N/A - N/A

CEGL004293 *Impatiens* (*capensis*, *pallida*) - *Monarda didyma - Rudbeckia laciniata* var. *humilis* Herbaceous Seep Association

N/A - N/A

A1688 *Diphylleia cymosa - Saxifraga micranthidifolia* Seep Alliance

CEGL004296 *Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis* Forested Herbaceous Seep Association

N/A - N/A

G189. North-Central & Northeastern Seep Group

A1685 *Carex scabrata - Chrysosplenium americanum* Seep Alliance

CEGL006193 *Chrysosplenium americanum* Seepage Meadow Association

N/A - N/A

A3373 *Eriophorum virginicum - Dulichium arundinaceum - Carex echinata* Seep Alliance

CEGL006552 *Dulichium arundinaceum - Carex folliculata - Juncus* spp. Seepage Meadow Association

N/A - N/A

A3374 *Impatiens capensis - Symplocarpus foetidus - Caltha palustris* Seep Alliance

CEGL006567 *Symplocarpus foetidus - Impatiens capensis* Seepage Meadow Association

N/A - N/A

CEGL006448 *Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Seepage Meadow Association

N/A - N/A

A3372 *Prunus virginiana - Acer spicatum - Cornus sericea* Seep Alliance

CEGL006583 *Prunus virginiana - Acer spicatum - Ribes triste* / *Angelica atropurpurea - Heracleum maximum* Seepage Shrubland Association

SNAS - Northern Appalachian High-Elevation Seepage Shrubland

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

M069. Eastern North American Marsh, Wet Meadow & Shrubland Macrogroup
G125. Eastern North American Freshwater Marsh Group
A3669 *Peltandra virginica* - *Pontederia cordata* - *Sagittaria* spp. Marsh Alliance
CEGL006446 *Bidens cernua* - *Verbena hastata* - *Polygonum* spp. Marsh Association
HGFM* - Graminoid & Forb Wet Meadow & Marsh
XBMV* - Beaver Meadow Vegetation Complex
CEGL006191 *Pontederia cordata* - *Peltandra virginica* - *Sagittaria latifolia* Marsh Association
HGFM* - Graminoid & Forb Wet Meadow & Marsh
XBMV* - Beaver Meadow Vegetation Complex
A1436 *Typha angustifolia* - *Typha latifolia* - *Schoenoplectus* spp. Deep Marsh Alliance
CEGL006153 *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Eastern Marsh Association
HECM - Eastern Cattail Marsh
XBMV* - Beaver Meadow Vegetation Complex
G167. Eastern North American Shrub Swamp Group
A3684 *Alnus incana* - *Cornus amomum* Alluvial & Tidal Shrub Swamp Alliance
CEGL006062 *Alnus incana* - *Cornus* (*amomum*, *sericea*) / *Clematis virginiana* Shrub Swamp Association
SAST* - Alder Shrub Thicket & Swamp
XBMV* - Beaver Meadow Vegetation Complex
A3685 *Alnus* spp. - *Salix* spp. Lakeshore & Depression Shrub Swamp Alliance
CEGL002381 *Alnus incana* Shrub Swamp Association
SAST* - Alder Shrub Thicket & Swamp
XBMV* - Beaver Meadow Vegetation Complex
A3670 *Cephalanthus occidentalis* - *Decodon verticillatus* Shrub Swamp Alliance
CEGL006069 *Cephalanthus occidentalis* - *Decodon verticillatus* Shrub Swamp Association
SLBS* - Swamp-Loosestrife & Buttonbush Shrub Swamp
XBMV* - Beaver Meadow Vegetation Complex
CEGL005089 *Decodon verticillatus* Shrub Swamp Association
SLBS* - Swamp-Loosestrife & Buttonbush Shrub Swamp
XBMV* - Beaver Meadow Vegetation Complex
A3656 *Cornus sericea* - *Salix* spp. Shrub Swamp Alliance
CEGL006576 *Cornus* (*amomum*, *sericea*) - *Viburnum dentatum* - *Rosa multiflora* Ruderal Shrub Swamp Association
SXMW* - Ruderal Mixed Wet Shrub Swamp
G771. Laurentian-Northeastern Wet Meadow Group
A4107 *Carex* spp. - *Calamagrostis canadensis* Eastern Wet Meadow Alliance
CEGL005448 *Calamagrostis canadensis* - *Carex* spp. Laurentian & Northeast Wet Meadow Association
HGFM* - Graminoid & Forb Wet Meadow & Marsh
XBMV* - Beaver Meadow Vegetation Complex
CEGL006519 *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow Association
HGFM* - Graminoid & Forb Wet Meadow & Marsh
XBMV* - Beaver Meadow Vegetation Complex
CEGL006412 *Carex stricta* - *Carex vesicaria* Wet Meadow Association
HMSM* - Mixed Sedge Fen & Wet Meadow
XBMV* - Beaver Meadow Vegetation Complex

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name Map-Class Code - Name
CEGL002257 *Carex utriculata* - *Carex lacustris* - (*Carex vesicaria*, *Carex stricta*) Wet Meadow Association
HGFM* - Graminoid & Forb Wet Meadow & Marsh
XBMV* - Beaver Meadow Vegetation Complex
M881. Eastern North American Riverscour Vegetation Macrogroup
G792. Laurentian-Acadian Riverscour Vegetation Group
A3830 *Alnus incana* / *Dasiphora fruticosa* ssp. *floribunda* Riverscour Alliance
CEGL006142 *Triantha glutinosa* - *Carex garberi* Riverscour Wet Meadow Association
HRGS* - Graminoid & Scour Riverbank
G754. Northeastern Riverscour Barrens & Prairie Group
A3826 *Andropogon gerardii* - *Anemone virginiana* var. *alba* Riverscour Alliance
CEGL006284 *Andropogon gerardii* - *Campanula rotundifolia* - *Solidago simplex* Riverscour Sparse Vegetation Association
VNRR - Northern Riverscour Rock Outcrop
CEGL006518 *Prunus pumila* / *Andropogon gerardii* - *Sorghastrum nutans* Riverscour Wet Meadow Association
HRGS* - Graminoid & Scour Riverbank
M880. Eastern North American Wet Shoreline Vegetation Macrogroup
G755. Eastern North American Riverine Wetland Vegetation Group
A0943 *Alnus serrulata* Riverscour Shrubland Alliance
CEGL003895 *Alnus serrulata* - *Xanthorhiza simplicissima* Wet Shrubland Association
SRBS - Rocky Bar and Shore (Alder - Yellowroot Type)
A3647 *Carex torta* Riverbed Alliance
CEGL006536 *Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. Riverbed Vegetation Association
HRGS* - Graminoid & Scour Riverbank
CEGL004103 *Carex torta* Riverbed Vegetation Association
HCRB* - Central Appalachian Herbaceous Riverbank
A2078 *Eupatorium serotinum* - *Verbesina alternifolia* Depositional Bar Alliance
CEGL006481 *Eupatorium serotinum* - *Polygonum* (*lapathifolium*, *punctatum*, *pensylvanicum*) Riverbar Wet Meadow Association
HCRB* - Central Appalachian Herbaceous Riverbank
CEGL006480 *Verbesina alternifolia* - *Elymus riparius* - *Solidago gigantea* - (*Teucrium canadense*) Riverbar Wet Meadow Association
HCRB* - Central Appalachian Herbaceous Riverbank
A1657 *Justicia americana* Riverbed Alliance
CEGL004286 *Justicia americana* Riverbed Vegetation Association
HWBS - Water-willow Rocky Bar and Shore
A0948 *Salix nigra* Riverscour Scrub Alliance
CEGL006065 *Salix nigra* / *Phalaris arundinacea* - *Apocynum cannabinum* Wet Shrubland Association
SXMW* - Ruderal Mixed Wet Shrub Swamp
A4152 Mid-Atlantic Piedmont & Mountain Riverscour Annual Vegetation Alliance
CEGL006483 *Eragrostis hypnoides* - *Ludwigia palustris* - *Lindernia dubia* - *Cyperus squarrosus* Riverbar Wet Meadow Association
HCRB* - Central Appalachian Herbaceous Riverbank

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

M303. Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland Macrogroup
G556. Eastern Ruderal Wet Meadow & Marsh Group
A1381 *Phalaris arundinacea* Eastern Ruderal Marsh Alliance
CEGL006044 *Phalaris arundinacea* Eastern Ruderal Marsh Association
HXSC* - Ruderal Steeplebush - Reed Canarygrass Marsh
XBMV* - Beaver Meadow Vegetation Complex
A1431 *Phragmites australis* ssp. *australis* Ruderal Marsh Alliance
CEGL004141 *Phragmites australis* ssp. *australis* Eastern Ruderal Marsh Association
HXCR - Eastern Ruderal Common Reed Marsh
XBMV* - Beaver Meadow Vegetation Complex
A4106 *Spiraea tomentosa* - *Rubus* spp. Ruderal Wet Shrubland Alliance
CEGL006571 *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Ruderal Wet Shrubland Association
HXSC* - Ruderal Steeplebush - Reed Canarygrass Marsh
XBMV* - Beaver Meadow Vegetation Complex
G557. Southeastern Ruderal Marsh, Wet Meadow & Shrubland Group
A3412 *Juncus effusus* - *Andropogon glomeratus* var. *pumilus* - *Saccharum giganteum* Ruderal Marsh Alliance
CEGL004112 *Juncus effusus* Marsh Association
HCRM - Common Rush Marsh
XBMV* - Beaver Meadow Vegetation Complex

4. POLAR & HIGH MONTANE SCRUB, GRASSLAND & BARRENS CLASS
4.B. Temperate to Polar Alpine & Tundra Vegetation Subclass
4.B.1. Temperate & Boreal Alpine Tundra Formation
4.B.1.Na. Eastern North American Alpine Tundra Division

M131. Eastern North American Alpine Tundra Macrogroup
G108. Eastern Alpine Cliff, Scree & Rock Vegetation Group
A4003 *Rhizocarpon geographicum* - *Umbilicaria hyperborea* Eastern Alpine Fell-field Alliance
CEGL006420 *Arctoparmelia centrifuga* - *Rhizocarpon geographicum* Nonvascular Vegetation Association
VAFB* - Alpine Fell-field & Bald
G104. Eastern Alpine Tundra Group
A3285 *Betula papyrifera* var. *cordifolia* - *Betula glandulosa* - *Alnus viridis* Alpine Shrubland Alliance
CEGL006064 *Alnus viridis* ssp. *crispa* - *Spiraea alba* / *Solidago macrophylla* Shrubland Association
WHOT* - Hardwood - Oak Talus Woodland
A1295 *Carex bigelowii* Alpine Meadow Alliance
CEGL006081 *Carex bigelowii* Alpine Meadow Association
HBAM - Bigelow's Sedge Alpine Meadow
A1120 *Diapensia lapponica* - Mixed Alpine Dwarf-shrubland Alliance
CEGL006322 *Diapensia lapponica* Dwarf-shrubland Association
SWAR - Windswept Alpine Ridge
A3286 *Ledum groenlandicum* / *Trichophorum caespitosum* / *Sphagnum* spp. Alpine Bog & Fen Alliance
CEGL006140 *Empetrum nigrum* - *Vaccinium uliginosum* - *Vaccinium oxycoccos* / *Rubus chamaemorus* Dwarf-shrubland Association
SWEB - Black Crowberry Wet Alpine Bog

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

A3360 *Picea mariana* Krummholz Alliance
CEGL006031 (*Picea mariana*, *Abies balsamea*) / *Kalmia angustifolia - Ledum groenlandicum* Dwarf-shrubland Association
SMCK* - Mixed Conifer Krummholz
CEGL006038 *Picea mariana - Abies balsamea* / *Sibbaldiopsis tridentata* Shrubland Association
SMCK* - Mixed Conifer Krummholz
CEGL006268 *Picea mariana* / *Ledum groenlandicum - Empetrum nigrum* / *Cladina* spp. Dwarf-shrubland Association
SCTH - Cold Air Talus Heathland
A3287 *Salix herbacea* / *Trichophorum caespitosum - Carex bigelowii* Alpine Snowbed Alliance
CEGL006423 *Trichophorum caespitosum - Calamagrostis pickeringii* Alpine Snowbed Association
HMSF - Northern Appalachian Alpine Bulrush Cliff
CEGL006424 *Trichophorum caespitosum - Carex scirpoidea - Carex bigelowii* Alpine Snowbed Association
HAWM - Alpine Herbaceous Wet Meadow
A1116 *Vaccinium uliginosum* - Mixed Alpine Heath Alliance
CEGL006425 *Kalmia angustifolia - Chamaedaphne calyculata* / *Rubus chamaemorus* / *Cladina* spp. Dwarf-shrubland Association
SSSB - Subalpine Slope Bog
CEGL006155 *Vaccinium uliginosum - Harrimanella hypnoides - Loiseleuria procumbens* Dwarf-shrubland Association
SAHM* - Alpine Heath Meadow
CEGL006298 *Vaccinium uliginosum - Rhododendron lapponicum* / *Juncus trifidus* Dwarf-shrubland Association
SAHM* - Alpine Heath Meadow
CEGL006533 *Vaccinium uliginosum* / *Sibbaldiopsis tridentata* Sparse Vegetation Association
VAFB* - Alpine Fell-field & Bald

5. AQUATIC VEGETATION CLASS
5.B. Freshwater Aquatic Vegetation Subclass
5.B.2. Temperate to Polar Freshwater Aquatic Vegetation Formation
5.B.2.Na. North American Freshwater Aquatic Vegetation Division
M108. Eastern North American Freshwater Aquatic Vegetation Macrogroup
G114. Eastern North American Freshwater Aquatic Vegetation Group
A4147 *Lemna* spp. - *Wolffia* spp. - *Spirodela polyrrhiza* Aquatic Vegetation Alliance
CEGL005451 *Lemna* spp. Eastern North American Aquatic Vegetation Association
HEDP - Eastern North America Duckweed Pond
A4064 *Nymphaea odorata - Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance
CEGL002386 *Nuphar advena - Nymphaea odorata* Aquatic Vegetation Association
HAFV* - Aquatic Floating Vegetation
XBMV* - Beaver Meadow Vegetation Complex
A4066 *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Aquatic Vegetation Alliance
CEGL006431 *Elodea canadensis - Potamogeton* spp. Eastern Aquatic Vegetation Association
HAFV* - Aquatic Floating Vegetation
XBMV* - Beaver Meadow Vegetation Complex

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name
USNVC Middle and Lower Hierarchical Code and Name
Map-Class Code - Name

6. OPEN ROCK VEGETATION CLASS
6.B. Temperate & Boreal Open Rock Vegetation Subclass
6.B.1. Temperate & Boreal Cliff, Scree & Other Rock Vegetation Formation
6.B.1.Na. Eastern North American Temperate & Boreal Cliff, Scree & Rock Vegetation Division
M111. Eastern North American Cliff & Rock Vegetation Macrogroup
G840. Appalachian Cliff & Rock Vegetation Group
A2071 Appalachian Acidic Cliff Alliance
CEGL004980 *Asplenium montanum* - *Heuchera villosa* Felsic Cliff Sparse Vegetation Association
N/A - N/A
A3991 Appalachian Lichen Boulderfield Alliance
CEGL004142 *Lasallia* (*papulosa*, *pensylvanica*) - *Dimelaena oreina* - (*Melanelia culbersonii*) Nonvascular Vegetation Association
VCAB - Central Appalachian Acidic Boulderfield
CEGL004143 *Lasallia papulosa* - *Stereocaulon glaucescens* - *Chrysothrix chlorina* Nonvascular Vegetation Association
VCMB - Central Appalachian Mafic Boulderfield
A4229 Appalachian-Northeastern Acidic Talus Alliance
CEGL006422 *Juniperus virginiana* / *Corydalis sempervirens* Cliff Sparse Vegetation Association
VEAC - Eastern Temperate Acidic Cliff
CEGL006534 *Polypodium* (*virginianum*, *appalachianum*) / Lichens Nonvascular Vegetation Association
VNBC* - Northern Appalachian Barrens & Cliff
G839. Laurentian-Acadian-Great Lakes Cliff & Rock Vegetation Group
A4007 Laurentian-Acadian-Great Lakes Acidic Cliff Alliance
CEGL006429 *Drosera rotundifolia* - *Viola* spp. Cliff Sparse Vegetation Association
N/A - N/A
CEGL006528 *Polypodium* (*virginianum*, *appalachianum*) Cliff Sparse Vegetation Association
VNBC* - Northern Appalachian Barrens & Cliff
A4006 Laurentian-Acadian-Great Lakes Alkaline Cliff Alliance
CEGL006526 *Carex scirpoidea* Alkaline Cliff Sparse Vegetation Association
VBAC - Near-Boreal Alkaline Cliff
7. AGRICULTURAL & DEVELOPED VEGETATION CULTURAL CLASS
7.A. Woody Agricultural Vegetation Cultural Subclass
7.A.1. Woody Horticultural Crop Cultural Formation
7.A.1.1. Tree Orchard Cultural Subformation
CGR001. Fruit Orchard Cultural Group
CSG001. Tropical & Temperate Fruit Orchard Cultural Subgroup
CORC - Tropical & Temperate Fruit Orchard
7.A.1.2. Vineyard Cultural Subformation
CGR003. Grape Vineyard Cultural Group
CSG002. Tropical & Temperate Grape Vineyard Cultural Subgroup
CVNY - Tropical & Temperate Grape Vineyard

Table H–1 (continued). Map classification set into the hierarchy of the U.S. National Vegetation Classification (USNVC) for the Appalachian National Scenic Trail vegetation mapping project.

USNVC Upper Hierarchical Code and Name USNVC Middle and Lower Hierarchical Code and Name Map-Class Code - Name
7.A.2. Forest Plantation & Agroforestry Cultural Formation
7.A.2.1. Forest Plantation Cultural Subformation
CGR007. Temperate & Boreal Plantation Cultural Group
CSG005. Eastern North American Temperate Forest Plantation Cultural Subgroup
CTY016 Native Northern Hardwood Plantation Cultural Type
CNHP - Native Northern Hardwood Plantation
CTY010 Native Northern Spruce-Fir Plantation Cultural Type
CSFP - Native Northern Spruce-Fir Plantation
CTY011 Eastern North American Temperate Forest Plantation Cultural Type
CMCP* - Eastern North American Temperate Forest Plantation
CTY014 Exotic Northern Conifer Plantation Cultural Type
CST007167 *Picea abies* Forest Plantation Cultural Subtype
CMCP* - Eastern North American Temperate Forest Plantation
CST006313 *Pinus* spp. Forest Plantation Cultural Subtype
CMCP* - Eastern North American Temperate Forest Plantation
CTY009 Native Northern Pine Plantation Cultural Type
CST007177 *Pinus resinosa* Forest Plantation Cultural Subtype
CMCP* - Eastern North American Temperate Forest Plantation
CST007178 *Pinus strobus* Forest Plantation Cultural Subtype
CMCP* - Eastern North American Temperate Forest Plantation
7.B. Herbaceous Agricultural Vegetation Cultural Subclass
CHAV - Herbaceous Agricultural Vegetation
7.C. Herbaceous & Woody Developed Vegetation Cultural Subclass
CBRN - Barren Land
CDVO - Developed Area - Open Space
CDVL - Developed Area - Low Intensity
CDVM - Developed Area - Medium Intensity
CDVH - Developed Area - High Intensity
PARK SPECIAL VEGETATION
Managed & Restored Vegetation
XCMC - Constructed Wetland Ruderal Vegetation Complex
XPLM - Palmerton Smelter Ecological Restoration Area
Outcrop Vegetation
XPRO - Potomac River Outcrops
Catastrophic Vegetation
XRBL - Recently Burned Landscape
NON-USNVC
Open Water (<1% vegetation)
ZOSR - Open Water Stream & River
ZOWL - Open Water Lake
ZOWP - Open Water Pond

*Map class also represents other USNVC types.

Appendix I: Accuracy Assessment Site Form

NPS VEGETATION MAPPING PROGRAM: ACCURACY ASSESSMENT SITE FORM

Park: **APPA** Map Area: **SBR/CAP/LNE/NAP** State:____ AA Site Code**:**_____ GPS Site Code:_____

Survey Date ___/____/_____ **AA Site Time:** _____ am/pm **Field Team**_____

Photo of Form Y / N Photo #s _____[*Photo of Form, N, E, S, W, then 1or more representative of MMU*]

NAD83 UTM ZONE 18 [*All GPS units set to this*] **WAAS enabled? Y N Averaging? Y N Accuracy (m)** _____

UTM X __ __ __ __ __ __ m E **UTM Y** __ __ __ __ __ __ __ m N **#of sats**:_____ **iterations/GPS score**_____

If GPS Point is an *intentional* offset from the AA Site, circle the explanation & illustrate relationships in sketch below:

a. **Physical constraints in reaching waypoint** (*list direction and estimated distance from new GPS point to the area observed and describe any other relevant details)*:
b. **Other** (*explain in notes below*):

ENVIRONMENTAL DESCRIPTION

1. Elevation _____**(m) Elevation Source**: GPS/DRG/other:_____

2. Unvegetated Surface Substrate
(*estimate percentage of applicable covers;* ***should total 100%***):
____ bedrock
____ loose boulders and stones
____ leaf litter / organic matter
____ decaying wood
____ water
____ mineral soil / sand
____ other (*specify*)

3. Slope _____
A – 0-3% (0-2^0) (level or nearly level)
B – 3-9% (2-5^0) (gentle)
C – 9-16% (5-9^0) (sloping/rolling)
D – 16-31% (9-17^0) (moderate/hilly)
E – 31-65% (17-33^0) (steep)
F – 65-75% (33-37^0) (very steep)
G – 75%+ (>37^0) (extremely steep)

4. Aspect _____
F (flat)
V (variable)

N 338-22^0	NE 23-67^0
E 68-112^0	SE 113-157^0
S 158-202^0	SW 203-247^0
W 248-292^0	NW 293-337^0

5. Environmental Comments: (*Characteristics that affect vegetation –e.g., if site is a wetland, indicate type of hydrology, e.g., seepage wetland, temporarily flooded stream bottom, seasonally flooded pond, etc.; topographic position, landform, evidence of natural and human disturbance, successional status, stand maturity, etc.*)

6. SKETCH OF OBSERVATION AREA
(aerial view or transect view or both): indicate north arrow, where GPS positions were collected, whether an offset point was needed, locations and bearings of photopoints, plot orientation, roads, trails, as well as distinctive features of the vegetation, e.g., transitions to different vegetation types, or landscape features , etc. Use the symbols in the key below for GPS points and photos. *Site need not be circular if constrained by map guidelines.*

⊗	GPS position
○→	Photo # and direction

VEGETATION STRUCTURE: AA Site Code: _____

Stratum	Strata max. height (select one from right)	Cover values by strata (upper value of range = 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, or 100%)	Strata Heights (max. defaults)
Canopy			20 m, 35 m, or > 35 m
Subcanopy			10 m, 20m
Shrub			2 m, or 5 m
Herbaceous			0.5 m, 1 m, or 2 m
Aquatic or NonVascular *(circle one)*			

VEGETATION COMPOSITION: (list all dominant and diagnostic species for each stratum (one species per row)
Record total cover, then record the cover class for each species in all strata in which that species is dominant or diagnostic.
Use the following cover classes for all cover estimates: **P < 5%; 01 = 5-15%; 02 = 15-25%; 03 = 25-35%; 04 = 35-45%; 05 = 45-55%; 06 = 55-65%; 07 = 65-75%; 08 = 75-85%; 09 = 85-95%; 10=>95%**

SPECIES Write out full name or use code from approved list *E.g.:* CORNFLO [= *Cornus florida*]	Diagn. species (X)	Total cover for assessed area	Tree Canopy layer	Subcanopy layer	Shrub layer	Herb layer	Specimen Collected (Y), Confidence in ID (C, P, U)
Plants Reference: USDA Plants							

SITE ASSESSMENT: Is the **MMU 0.25 ha or 0.5 ha**: (circle one) *consult map for MMU size at this site*

Representativeness: Is the area of the vegetation being assessed at least equivalent to 1 MMU? **Y N**
Is the vegetation homogeneous, very patchy, or does it appear to be transitional between two types? (circle one)
Please note adjacent vegetation communities.

Fit (does MMU key easily to an association?): **H M L** Your **confidence** in determination: **H M L**
Provide additional comments about problems or ease applying the key at this site, rationale for choice of association, if there was doubt, etc.

FIELD CLASSIFICATION: Primary Field Call (*Name & Code in Key*):_____ **CEGL00**_____
Secondary Field Call *(if there is doubt about first call)*:_____ **CEGL00**_____

OFFICE CLASSIFICATION: Reviewer Name: Review Date: **Final CEGL00**
Final Common Name:_____ If final call differs from original, give reason why:

Appendix J: Accuracy Assessment Field Manual

FIELD MANUAL FOR ACCURACY ASSESSMENT SAMPLING

NATIONAL PARK SERVICE
VEGETATION MAPPING INVENTORY PROGRAM

APPALACHIAN NATIONAL SCENIC TRAIL
SUMMER 2014/2015

Prepared for
United States Department of the Interior
National Park Service

Prepared by
NatureServe
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Arlington, VA 22203

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A. THE BASIC FRAMEWORK FOR VEGETATION DESCRIPTION

Vegetation Physiognomy, Floristics, and Environment

The U.S. National Vegetation Classification (USNVC) is a vegetation classification that integrates floristic and physiognomic criteria, along with some environmental criteria, to define vegetation units. Physiognomy plays a role in defining and organizing units, which are evaluated at multiple levels within the USNVC hierarchy. At lower levels (i.e., the alliance and association levels), floristic composition is the primary criteria. Environmental factors such as macroclimate are used at higher levels, while more local site factors, such as hydrology or substrate, are used at lower levels. The field-sampling design emphasizes collecting data on all three sets of criteria. Field teams gather data on (1) dominant species, (2) dominant growth forms, and (3) environmental factors. Physiognomic and structural information are needed for the dominant and uppermost layers of vegetation. Location and environmental data are needed to confirm or explain floristic classification decisions.

Floristic information is the leading criteria for the USNVC association units (vegetation communities) that are being used to check the vegetation map of the Appalachian National Scenic Trail (APPA, also referred to as the "AT corridor" for Appalachian Trail corridor). These vegetation communities are based on total species composition of a stand, as represented by a sampling unit. Thus, floristics and physiognomy must be described across all strata (or layers) of vegetation. Information on dominant and diagnostic species is collected across these layers to confirm the classification of the vegetation at accuracy assessment (AA) observation sites.

B. PROJECT AND FIELD SAMPLING OVERVIEW

This section provides field teams with general instructions and guidelines for completing fieldwork for a given APPA project area (also referred as map area). The information gives the "how-to" for decision making in collecting data. Detailed, field-by-field coding conventions are provided for the AA site forms.

Field Sampling Considerations

Field sites are pre-selected and supplied to the field crews on hard-copy maps as well as a set of digital coordinates to be uploaded to global positioning system (GPS) units. Between 5 and 30 AA sites will be selected per vegetation map class with more abundant map classes having more AA sites. Only natural and semi-natural vegetation map classes are targets for AA. Accessibility, including factors such as slope steepness, distance from roads, and private vs. public land, is considered in selecting AA sites. These are estimated from a geographic information system (GIS) model and conditions on the ground may be different; therefore, the final decision on whether it is safe to get to an AA site is left to the crew.

Guidelines for Sites of Concern

All AA sites are to be sampled as near as possible to the coordinates of each site. Some AA sites might not be accessible because the site or the routes to the site pose a safety risk to the field crew, or there is some other unforeseen factor to restrict the crew from accessing (e.g., the AA site is on private property). If the field crew cannot get to an AA site, the crew should determine whether they can still gather enough accurate data to classify the site from a distance. This is preferable to abandoning the AA site, since re-selecting a site to make up for an abandoned site can be

complicated and inefficient. A pair of binoculars is very helpful in these situations. If an AA site is deemed unsafe and/or inaccessible and is not sampled, please provide the RndID number for the site to the project manager as soon as possible (that night when you get out of the field if possible) so a replacement site can be issued as soon as possible. Replacement sites will be chosen randomly and may occur in areas the field crew has already completed AA sites. The sooner a replacement site can be issued the less chance it will occur in an area the crew has already worked in. Replacement AA sites will be provided sparingly. Field crews should be prepared for some long days of getting very few AA sites and other days of getting many AA sites that are clustered closely together.

MMU Considerations

Field crews will navigate to the pre-selected AA sites, assess an area roughly equal to the minimum mapping unit (MMU) for the map class, record environmental, physiognomic, and floristic information about the AA site area, and assign a vegetation classification to the AA site.

The MMU for APPA varies based on the map class; most map classes are 0.5 hectares (ha) (~1.2 acres) while others are 0.25 ha (~0.6 acres). These MMU areas correspond to a circle 40 meters (m) and 28 m in radius, respectively. The mapping team will not map vegetation units at scales smaller than these MMUs and thus it is critical that the AA field team does not consider smaller vegetation units, either. If the field team evaluates an area substantially different from the MMU, then the validity of comparing field data and map data is reduced. Not every AA site area will be circular in shape since vegetation associations may be narrow linear or irregular shaped polygons. The AA site maps will show polygon lines where they are within the standard MMU buffer. That is, if an AA site is chosen for a map class that normally has a 28-m radius, but the selected polygon is only 20 m wide, the mapped boundaries of polygons within 28 m will be shown so the field crew will know approximately how to limit their assessment. Vegetation associations found at an AA site that are below the MMU for the site in question are to be considered inclusions to the surrounding dominant vegetation association (for example, a forested seep community will be considered an inclusion within the matrix upland forest community). Once the field crew is at the correct AA site and has scouted out an area equal to the MMU, the crew will begin to collect field data.

It is helpful to remember that map classes are not necessarily the same thing as vegetation associations. Map polygons are drawn and AA sites are selected based on map classes. The field crew will assess the vegetation at an AA site and assign it to a vegetation association based on the field key to vegetation associations of APPA. For the APPA vegetation mapping project, map classes often include more than one vegetation association. In most cases, this difference will not be important, or even apparent, to the field crews. One possible result of the difference that will affect the crews is that AA sites may include more than one vegetation association. If a map class is composed of two similar vegetation associations, an AA site may be chosen that falls entirely within that single map class but includes parts of two vegetation associations. In this event, field crews should not move the AA site but should record data as normal and note that two vegetation associations are present, or field crews should note that the site is intermediate between two associations and that crews are not confident only one association fits the site best

Recognizing Strata and Growth Forms

A comprehensive vegetation description requires information on physiognomy, floristics, and environment. To standardize the collection of physiognomic information, information is collect on the main strata of vegetation, including a list of species present in those strata. Because of the importance of using a standard approach to sampling vegetation strata, the issue is discussed in some detail here to ensure that subsequent discussions of field data collection are clear. A stratum is a layer of vegetation that includes all plant growth forms that occur within it. Plants are assigned to strata based on their predominant position or height in the stand, not by their taxonomy or mature growth form. Consequently, a tree species that has both seedlings and saplings in an AA site will be listed in several strata. In describing the vegetation physiognomy of an AA site for classification purposes, it is only necessary to capture the main features of the often-complex stand conditions rather than to describe the layering in the greatest possible detail.

In terrestrial environments, four basic vegetation strata should be recognized whenever they are present: tree, shrub, herb, and moss (sensu Fosberg 1961; the ground layer of mosses, liverworts, lichens, and algae). In aquatic environments, floating and submerged strata should be recognized where present. These six strata are needed to convey both the vertical distribution of overall cover and the predominant growth forms. Additionally, the six strata may be used to convey the abundance of each species in each stratum so as to provide a more detailed record of vegetation composition by strata. The six strata are defined as follows (see Figure J–1 for an example):

Tree stratum includes tall trees (single-stemmed woody plants, generally more than 5 m in height at maturity under optimal growing conditions). Very tall shrubs with tree-like form may also be included here, as may other growth forms such as lianas and epiphytes. For this project, two sub-strata are distinguished within the tree stratum. These are the Tree Canopy and Subcanopy sub-strata:

- Tree Canopy: the main layer of tree canopy, composed of trees whose crowns form the upper predominant canopy; includes dominant, codominant trees.
- Subcanopy: trees greater than 5 m in height that do not reach the main canopy; they may form a distinct secondary layer or may consist of suppressed trees that are wholly beneath the main canopy.

Shrub stratum includes shrubs (multiple-stemmed woody plants, generally less than 5 m in height at maturity under optimal growing conditions) and shorter trees (saplings) less than 5 m in height. As with the tree stratum, other growth forms present in this stratum may also be included; however, herbaceous growth forms should be excluded, as their stems often die back annually and do not have as consistent a height as woody growth forms. Where dwarf-shrubs (i.e., shrubs less than 0.5 m in height) form a distinct stratum (either as part of a series of strata, such as in a forest, or as the top stratum of more open vegetation, such as in tundra), they should be treated as a low version of the shrub stratum. In many vegetation types, dwarf-shrubs may occur as one growth form component of the herb stratum (see below).

Herb stratum (also referred to as field or ground stratum) includes herbs (plants without woody stems and often dying back annually) often in association with low creeping semi-shrubs, dwarf-shrubs, vines, and nonwoody brambles (such as raspberries), as well as tree or shrub seedlings. Where herbs are entirely absent, it is still possible to recognize this stratum if other very low woody or semi-woody growth forms are present.

Nonvascular stratum (also referred to as moss, bryoid, or ground stratum): is defined entirely by mosses, lichens, liverworts, and alga. Ground-creeping vines, prostrate shrubs, and herbs should be treated in the herb stratum.

Floating aquatic stratum includes rooted or drifting plants that float on the water surface (e.g., duckweed, water-lily).

Submerged aquatic stratum includes rooted or drifting plants that by-and-large remain submerged in the water column or on the aquatic bottom (e.g., pondweed). The focus is on the overall strata arrangement of these aquatic plants. Note that emergent plants in a wetland should be placed in the strata listed above (e.g., cattail or sedges would be placed in the herb stratum, bald cypress or black ash in the tree stratum).

Epiphytes, vines, and lianas are treated where they are present within the strata defined above, not as separate strata.

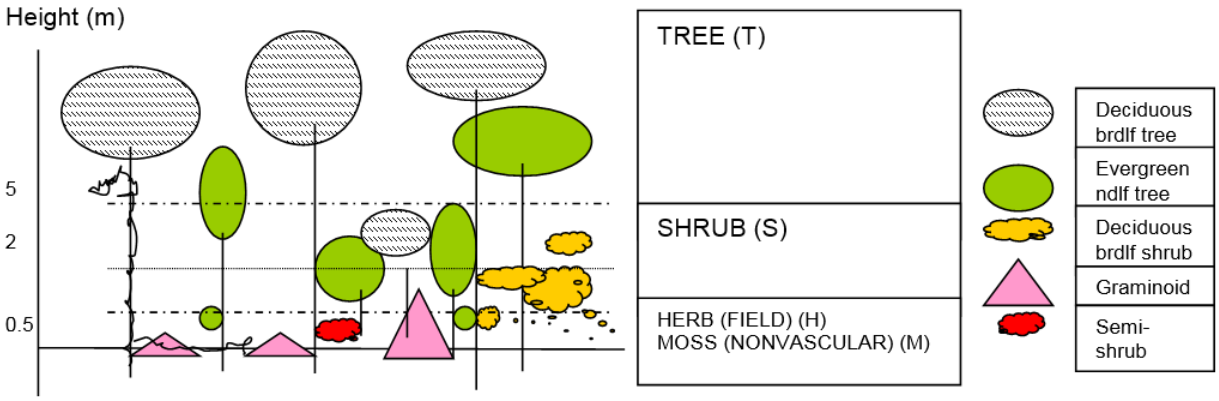


Figure J–1. Major strata (layers) recognized in terrestrial vegetation. Shown here are typical strata found in forests. Additional strata within stands of aquatic vegetation are floating aquatic and submerged aquatic.

Measuring Species Abundance and Strata Using Percent Cover

Percent cover is a meaningful attribute for nearly all plant growth forms and allows their abundances to be evaluated in comparable terms. Percent cover can be defined generically as "the vertical projection of the crown or shoot area to the ground surface expressed as … percent of the reference area" (Mueller-Dombois and Ellenberg 1974). For the NPS Vegetation Mapping Inventory Program, percent cover based on crown or shoot area is applied as canopy cover. Canopy cover is the percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of plants. Small openings within the canopy are ignored and their area included in the canopy cover.

Canopy cover is the preferred method of collecting cover because it better estimates the "area that is directly influenced by the individuals of each species" (Daubenmire 1968), is easier than foliar cover to estimate from aerial photographs (or imagery), and is more likely to correlate with satellite image analysis. A classification based on canopy cover is better suited for mapping vegetation than one based on foliar cover. Strata cover and individual taxa should always be estimated on an absolute or total basis, i.e., the actual proportion of the sampled area (e.g., if the total tree stratum cover is 50%, and northern red oak (*Quercus rubra*) tree cover is 30%, the cover should be recorded as the 25-35% cover class, not 60%).

C. FIELD PREPARATION AND DATA COLLECTION

Before Leaving

Before leaving for the site... check that the field team has all the materials needed to complete the fieldwork. Ideally, the week before site visits, plan the week out in terms of the routes to take, access sites, the need for overnight camping, and the use of two cars for shuttling to make the field days as efficient as possible. This will save the field team a large amount of time during the week. Consult with the main NatureServe contact to get advice about the week's work and what seems realistic. Plan for visiting 45 AA sites each week to build in a buffer for future weeks when fewer than 40 sites a week are visited.

Park specific research permits will be provided by NatureServe to each field crew for work on National Park Service (NPS) lands. Prior to beginning work NPS lands, each field team will notify the NPS staff identified on the NPS research permit of the upcoming visit. This is a good time to ask for keys to gates, additional park maps, and request help from the park if needed (perhaps a pick up at the end of the day).

Prior to beginning fieldwork, the field ecologists should review the ecological classification, field key, and list of relevant diagnostic and characteristic plant species for the AT corridor, and be prepared to identify diagnostic species and relevant natural communities. Also, the field ecologists should review field map and target AA site locations to prepare an efficient route for data collection.

Every morning... check the GPS receiver to make sure it is set to North American Datum of 1983 (NAD 83) and Universal Transverse Mercator (UTM), Zone 18 (EVEN IF YOU ARE NOT IN THIS UTM ZONE!!-these are the official project coordinates so all field teams from Georgia to Maine need to set their units for this setting), for a sufficient supply of replacement batteries, and that there is sufficient storage memory for the day's work. Check the camera to ensure there is sufficient storage memory and replacement batteries for the day's work. If the field team will be in the backcountry for several nights, the team should have sufficient supplies and an idea of where to camp along the AT corridor. Do NOT rely on having access to AT shelters since thru-hikers can be numerous and may already have claimed all spaces inside the shelter before you arrive at day's end. Confirm the AA sites that the field team will be visiting for the day and consult with maps and access sites to determine the most efficient route and order of AA sites.

List of Field Materials

- Maps of AA sites
- Road/trail maps (will also be included on the maps of AA sites)
- Site inventory checklist where the field team will record AA sites assessed and any comments about the target AA sites. Submit weekly to NatureServe for project tracking
- Research permits
- GPS receiver (checked daily to ensure that it is set right (to NAD 83, UTM Zone 18)
- Compass/clinometer
- Camera and batteries/memory card (allow at least 6 exposures per AA site)
- Baggies
- Pencils/pens/permanent markers
- AA site forms, including write-in-the-rain AA site forms
- Plant list with species codes
- Classification report for the project
- Vegetation field key
- Botanical manuals

Getting There

For APPA, there are between 5 and 30 AA sites per map class. The AA field team will be provided a series of hard-copy maps with the AA sites to visit and sample. The maps will contain a digital raster graphic (DRG) background; roads, trails, and private land will be noted on the maps, also. Image-interpreted polygons will not be on the maps unless the boundaries are within 40 m of the AA site (28 m for map classes with 0.25-ha MMU) so as not to bias the field team's classification decisions. An exception to this is small or linear polygons for which the AA site buffer cannot be accommodated; in these cases polygon boundaries within the standard buffer distance will be indicated, giving AA field crews a general idea as to the direction/orientation of the polygon in question. The field crew navigates to each selected area using road and trail maps, the AA site map, and/or GPS.

Location of the AA site... navigate to the exact coordinates of the target AA GPS coordinate as possible (generally within 1–2 m of the target UTM X and UTM Y coordinates). On the AA site form and in the GPS, record the coordinates the field team navigated to, as read from the GPS, whether they are exactly the same as the target coordinates or not. If it is not practical or safe to get to the exact coordinates, get as close as possible, record the UTM coordinates of the position the field team reaches, and then record the offset. The offset should be recorded as a direction (azimuth) and distance from the UTM coordinate of the field crew's location to the target location the field crew was originally aiming for (as given in the GPS).

It is very important that the field crew ensure that they either have a high degree of accuracy in their GPS reading or, if the GPS accuracy is low, be confident that the vegetation is very homogenous in the area surrounding them. When the vegetation is homogenous, some flexibility in the exact site location is acceptable (e.g., if the field crew is within 10 m of an assigned AA site location, they are

definitely close enough.); however, it is not appropriate to shift the location of an AA site to ensure a more homogenous assessment area.

When GPS reception is favorable, it is recommended that the AA site coordinate be averaged up to 100% confidence (for Garmin units) or averaged until site data is complete (for Juno Trimble units). However, if using averaging will cause a significant time delay, it is acceptable not to use averaging or average a much smaller number of measurements. The recorded GPS precision will need to reflect this information on the field form. If WAAS enabled units are not receiving WAAS signals, and data collection is slow, disabling WAAS may increase collection speed. Be sure to enable WAAS again after taking a GPS coordinate with WAAS disabled.

In some extreme cases, it is possible that the topography of the AT corridor may prevent collection of AA site location data by GPS. If this situation is encountered, but the field crew is confident in their location using the topographic map only and able to safely navigate to the pre-assigned AA site, then the field crew should note on the "Site Inventory Checklist" that no GPS data were collected for that AA site and document the AA site location clearly on a paper map, which then should be attached to the field form.

Once There—The Basic Procedures for Field Data Collection

Upon reaching the assigned AA site, the field crew will need to assess the vegetation community in the vicinity of the site and determine the dominant vegetation association using the appropriate APPA project area vegetation field key the AA site. The field crew should survey an approximately 0.5-ha area (40-m radius circle) or 0.25-ha area (28-m radius circle) surrounding each AA point coordinate after consulting the field map to identify the correct size of the assessment area. These correspond to the MMUs used in the vegetation mapping. Sites may be linear or irregular rather than circular. Field crews are to complete the Accuracy Assessment Site Form (fields on the AA site form are defined in the section at the end of this field manual).

Determine and Record the AA Site Location

Using the GPS receiver, field teams determine the UTM Zone 18 coordinates and record the coordinates under the **UTM X** and **UTM Y** blanks on the AA site form. Field teams also record the GPS error. If the field team cannot get a GPS reading with sufficient accuracy (~10 m), they should mark the location they were at as precisely as they can on the AA site map. The field team can use these marked locations to estimate UTMs later. Note on the AA site form that this method is used. In addition, save the GPS reading on your Trimble or Garmin GPS unit so that the exact metadata behind all the measurements can be uploaded later.

Recording Species Cover

Having decided on the strata, record the species information in the following manner:

1. Begin by listing the dominant 1–4 species observed in each of the main layers.
2. Collect any unknown dominant species (see details below) and label each bag or sheet containing the specimen with the AA site code and a unique identifier corresponding to the code on the AA site form (e.g., *Carex* #1, *Fern* #2).
3. When the list appears complete, begin estimating cover. For each stratum
   a. Estimate total cover of the stratum (Tree Canopy, Subcanopy, etc.);
   b. Estimate individual species covers across the entire assessed area and in each stratum for which that species is dominant or diagnostic.
   c. Add up species covers within the stratum, compare to total stratum cover. Sort out any discrepancies, recognizing that overlap can occur between species and layers and that you are only recording cover of dominant species (e.g., cover of minor species will not appear on the data sheet).
4. Check the list of species to be sure that each is clearly written out. Whenever possible, use the species names that match the taxonomic authority for your project.

Some guidance on estimating cover

The percent cover of the stratum is the total vertical projection of the canopy cover of all species collectively on the ground, not the sum of the individual covers of all species in the stratum. Therefore, the total percent cover of the stratum will never exceed 100% (whereas, adding up the individual cover of species within the stratum could well exceed 100% since species usually overlap in their cover). The chart in Figure J-2 can be used to estimate percent cover.

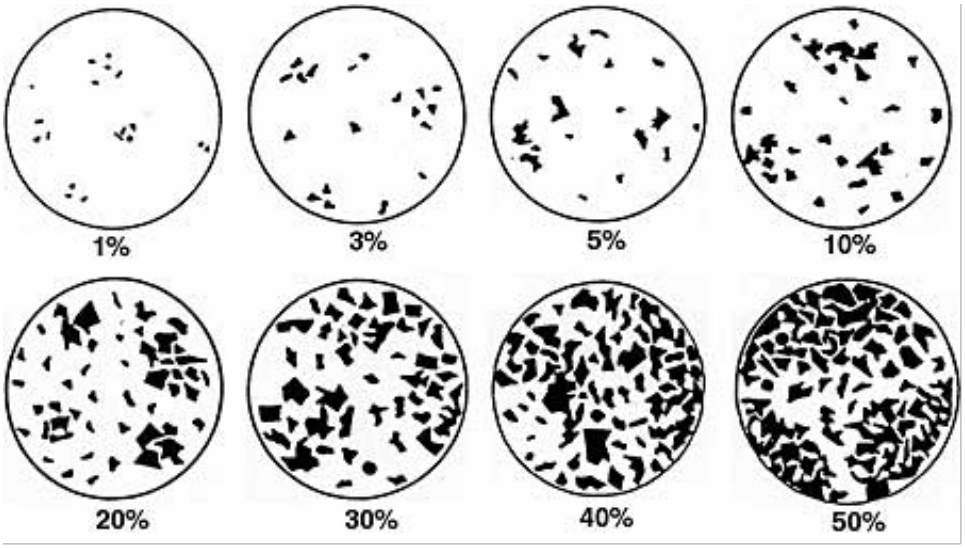


Figure J-2. Percent cover chart.

Plants are assigned to strata based on their predominant position or height in the stand, not by their taxonomy or mature growth form. Consequently, a tree species that has both seedlings and saplings in an AA site could be listed in several strata.

The herb stratum (or field stratum) includes all low woody, semi-woody plants, and creeping vines, where these woody plants and vines overlap in height with the herbs. This inclusion is a compromise among strata based strictly on height versus growth form. More specific measures of growth form composition (forbs, grasses, dwarf-shrubs) within the herb stratum can be recognized either directly in the field or can be estimated later by assigning species within a stratum to a growth form category and calculating an approximate percent cover of the growth form. Field teams may find it helpful to create a checklist of dwarf-shrubs, semi-woody shrubs, or vines that are to be recorded along with herbaceous plants as part of the herb stratum.

The nonvascular stratum (sometimes called moss, bryoid, or ground stratum) is reserved strictly for cryptogams (mosses, lichens, liverworts, algae, and bacteria), even where herbs or woody plants may be reduced to very short heights.

Collecting Specimens

Minimize plant collection for later identification and do not allow a significant backlog of plant specimens to accumulate. If this is unavoidable, let the project supervisor know. Field teams should have sufficient botanical expertise to identify most plant species encountered with the project. If botanical expertise is not possible, an expert taxonomist should be identified early in the project. A large backlog of unidentified pressed plant specimens should be avoided because storing and curating large numbers of specimens becomes inefficient. A judgment must be made by the field crew early on regarding plant species that should be identified in the field at the AA site or identified later using a collected specimen. Common plants recurring in many AA sites are best keyed in the field, whereas those encountered rarely or at low cover may be keyed later when manuals are likely to be readily accessible. A quick prioritization of what to key and what to press may be made based on the recurrence of the species in samples and on the cover-class estimate of the species in a particular AA site.

If the team cannot identify a plant to species, they should record it on the AA site form as “unknown species 1,” “unknown species 2,” “unknown *Carex* sp. 1,” etc. They can record associated cover class and other data for the unknown as they would for any other species. They can then do one of two things:

a) If the team needs the plant species identified right away because it appears to be dominant or diagnostic (they will be seeing it all over the place or it’s much more common in this particular vegetation type than in others), they can take a sample of the species with as much of the plant as possible, especially intact flower or fruiting parts, if present. Place the sample in a bag or on a sheet and label the bag or sheet with the AA site code and the name used on the AA site form (e.g., *Carex* sp.1). A member of the team should then try to key it out.

b) If plant specimens must be saved for identification beyond a few days, they must be dried and pressed. Mosses and lichens are not required to be identified to species level for many communities in this project but can be very important in determining certain boulderfield associations, so particular attention should be given to nonvasculars in that habitat. Aquatic plants should be handled by placing a mounting sheet at the bottom of a deep tray of water. Suspend the plant in the basin and arrange it as needed, then carefully remove from the basin. Place between blotters to dry. Mark the pressed specimen with the AA site code and the name used on the AA site form.

If possible, store specimens in a cool, dry place. Bagged specimens will keep fresh longer in the refrigerator or ice chest until pressed or identified. Field teams should mark the specimen tag with its cover-class estimate and any notes helpful in identification such as "tall shrub" or "wetland plant", as well as its unique identifying number for the vegetation sample.

Classifying the AA Site

Once all data have been collected at an AA site, the field team needs to provide a classification name for the vegetation. Field teams will have a vegetation field key to work through to decide on the classification. Typically, physiognomy, floristics, and environmental setting will be important to place a community within the USNVC. Any confusion about how to classify the AA site should be noted on the AA site form in the "Fit" field. If the vegetation present in the AA area is not included in the vegetation field key or vegetation classification, the field crew should report this on the Site Inventory Checklist and also assign the AA site to the vegetation association that it best fits using the vegetation field key. If a vegetation association is known (though not included in the field key or classification), record the known vegetation association on the AA site form, on the Site Inventory Checklist, and report these immediately to the NatureServe contact.

Before Leaving Each AA Site

Before heading off, be sure to check the AA site forms to be sure all of the essential categories have been completed. In particular:

1. Look over the various strata and check that there are cover values and heights for all strata.
2. Look over the dominant species lists to be sure none were missed that were called out or observed.
3. Verify that field photographs have been taken and photographs information recorded on the AA site form. Verify that UTM coordinates have been accurately recorded.
4. Review the descriptive fields that summarize the overall impression of the stand (representativeness, observation notes, successional status, stand maturity, homogeneity). If these have not been filled out, now is a good time.
5. Check the equipment list to be sure nothing is left behind and all flagging or other markers have been cleaned up.

D. POSTCOLLECTION TIMETABLE

It is required that completed and reviewed AA site forms and associated data be received by Upper Midwest Environmental Science Center (UMESC) staff on a bi-weekly basis (i.e., after two weeks of data collection, the completed and reviewed AA site forms, field photographs, and GPS shapefile are to be sent to UMESC staff). Information on who will perform the review of completed AA site forms, including information regarding the individuals who will send in the completed forms, should be finalized before the field collection portion of the AA process begins.

Specific procedures will need to be followed each week. Field teams must work with Ery Largay of NatureServe to identify an efficient process for keeping the data collection on track.

Within one week following the completion of the previous week of fieldwork, field teams should (1) review the AA site forms to ensure completeness, (2) deliver all original forms and supporting information, such as the Site Inventory Checklist (make copies of all data prior to mailing and keep copies until originals are received by the recipient), and (3) deliver GPS data and high-resolution copies of all AA field photograph images (digital photograph images can be copied to CD to be mailed or they can be posted to the web for download). All GPS data should be delivered as an Esri shapefile and include, at a minimum, the .SHP, .DBF, .SHX, PRJ and metadata (.XML) files. All digital GPS data must include at a minimum, the assessment area identifier (AA site), coordinates, datum, date, and type of GPS unit.

E. ACCURACY ASSESSMENT SITE FORM

Filling out the data sheet.

LOCATION INFORMATION

Map Area
SBR: Springer Mtn. Georgia north to Dickey Gap, Virginia.
CAP: Dickey Gap, Virginia north to the southern boundary of Delaware Water Gap National Park, Pennsylvania.
LNE: Delaware Water Gap, Pennsylvania north to through Vermont.
NAP: New Hampshire and Maine.

State Name
Provide state name or code.

AA Site Code
Number for the AA site, from AA map or from pre-loaded list in the GPS unit. In the GPS unit, these are called RndID projected in NAD 83, UTM Zone 18.

GPS Site Code
Code for the coordinates saved in the GPS. These coordinates are usually near the coordinates from the pre-loaded list of AA sites in the GPS but may be substantially different if the field crew cannot access the pre-loaded site.

Survey Date
Record the date the survey was taken; month, day, year.

AA Point Time
Record the time data collection was started at the site.

Field Team
Record the names of surveyors, with team leader listed first. The team leader is the person most responsible for the quality of the data recorded on the AA site form and the first person to which questions about the data will be addressed. Full names should be recorded (full first and last name).

Photo of Form
Circle whether photos were taken of the first page of the AA site form.

Photo #s
Record the individual photograph numbers or range of photograph numbers, as listed in the camera, taken at each specific site. There should be at least six photographs collected, and can be more. The first six photographs are, in order, (1) the first page of the AA form after at least the site number, UTM, and date have been recorded, (2) in cardinal directions from the GPS site clockwise starting with north (N, E, S, W), and (3) one or more photographs that best represent the assessed area.

Datum/UTM Zone
For the APPA project, this should be NAD 83. For the purposes of recording UTM coordinates, **ALL SITES IN THE APPA PROJECT ARE TO BE IN UTM ZONE 18. The coordinates pre-loaded in the GPS assume the crew is using UTM Zone 18, as well.**

WAAS Enabled
Is the WAAS system available and enabled on your GPS unit? Wide Area Augmentation System (WAAS) is an air navigation aid developed by the Federal Aviation Administration to augment the GPS, with the goal of improving its accuracy, integrity, and availability.

GPS Accuracy
Note the accuracy of your GPS unit (in meters) and whether GPS averaging was used.

UTM X
Record UTM X coordinates, also called “easting”, using GPS if at all possible. If a GPS reading cannot be collected, estimate coordinates from a topo map and note on the AA site form that this method was used.

UTM Y
Record UTM Y coordinates, also called “northing” using GPS if at all possible. If a GPS reading cannot be collected, estimate coordinates from a topo map and note on the AA site form that this method was used.

No. of Satellites
Record the number of satellites available to your GPS unit when reaching the site location.

Iterations/GPS Score

Averaging points is generally advisable. When averaging, please do so ideally for 100 iterations.

GPS Point is Intentionally Offset

If the crew cannot reach the pre-set coordinates of the AA site, note the reason (e.g., dangerous slope, water, private property) then record the azimuth and estimated distance to the pre-set coordinates. If the assessment area around the original coordinates is visible and the field crew thinks they can accurately classify the vegetation (binoculars may be useful for this), they should continue with the assessment and AA site form.

ENVIRONMENTAL DESCRIPTION

Elevation and Elevation Source

Record the elevation in meters at which the GPS coordinate was recorded. Note the source used to calculate elevation. The GPS unit is preferred as a source for elevation over the DRG maps, but the latter can be used if necessary.

Unvegetated Surface Substrate

Estimate ground or surface cover to the nearest percentage by each category, including woody stem basal area (Table J–1). For surface features not provided on this list, use the "other" category and note the feature. Cover estimates should sum to 100%. In cases where moss, lichen, sand or litter thinly covers the rock, ignore the less significant cover and record the total cover of rock. Rock and sand definitions are from Brady and Weil (2002).

Table J–1. Percent value descriptions to record unvegetated surface values within an accuracy assessment site.

[mm, millimeter; cm, centimeter]

Value	Description
Percent Bedrock	Percent of surface that is exposed bedrock
Percent Loose Boulders and Stone	Percent of surface that is exposed gravel/pebble (2–75 mm), cobble (75–256 mm) and stone/boulder (>256 mm).
Percent Leaf Litter / Organic Matter	Percent of surface that is litter
Percent Decaying Wood	Percent of surface that is wood >1 cm diameter
Percent Water	Percent of surface that is covered in water
Percent Mineral Soil / Sand	Percent of surface that is occupied by bare mineral soil or eolian or alluvial sand deposits (0.05 mm to 2.0 mm)
Other	–

Slope

Measure the slope in degrees using a clinometer or estimate using a compass that contains a slope-measuring device. Circle the appropriate slope degree that best describes each site.

Aspect

Measure the slope aspect using a compass (be sure to correct for the magnetic declination). Note: all compasses should be pre-set to an average declination for the park and thus, readings from the

compasses carried by the field teams may be directly noted. Circle the aspect that best describes the site along with the best-fit degree measurements.

Environmental Comments
Enter any additional noteworthy comments on the environmental setting. This field can be used to describe stand history such as fire events (date since last fire or evidence of severity), as well as other disturbance or stand regeneration factors. On the AA site form it states, "(*Characteristics that affect vegetation—e.g., if the site is a wetland, indicate type of hydrology, e.g., seepage wetland, temporarily flooded stream bottom, seasonally flooded pond, etc.; topographic position, landform, evidence of natural and human disturbance, successional status, stand maturity, etc.*)"

Sketch of Observation Area
Draw a sketch of the observation area using aerial view or transect view, or both, Indicate north arrow, where GPS coordinates were collected, whether an offset coordinate was needed, locations and bearings of photograph locations, AA site orientation, roads, trails, and any other distinctive features of the vegetation (e.g., transitions to different vegetation types, landscape features). The AA site need not be circular if constrained by map guidelines.

VEGETATION STRUCTURE
Stratum, Strata Maximum Height, Cover Values by Strata
For all of the strata that are present, record the average height and total cover. Use the Height Scale and Cover Scale on the AA site form. Estimate the stratum heights to the nearest height from the options provided.

Record the maximum cover class for each vertical vegetation stratum indicated on the table. The heights in the right column indicate the maximum height accepted for each stratum. The lowest stratum contains all woody plants less than 0.5 m tall and all herbaceous plants, regardless of height. Choose a default height for each stratum.

VEGETATION COMPOSITION
List the most abundant species in each stratum. Generally, this list should be of the one to four most common species in each stratum, but in cases where strata have several species of approximately equal cover, then list more. List additional species which are present at lower cover if they are deemed to be diagnostic of a particular association. Write the species in the left column and indicate whether a diagnostic species for the purpose of classification was considered. Note if a specimen was collected for further identification work. Note the total cover and mark the cover class in the stratum layer where that species is one of the most abundant species. Record species cover in the following cover classes:

P <5%, 01 = 5-15%, 02 = 15-25%, 03 = 25-35%, 04 = 35-45%, 05 = 45-55%, 06 = 55-65%, 07 = 65-75%, 08 = 75-85%, 09 = 85-95%, 10 = >95%

Species
Record the full taxon name.

Diagnostic Species
Place a check mark or X if the taxon is diagnostic of the vegetation community. A diagnostic taxon is any species whose relative constancy or abundance differentiates one vegetation type from another.

Total Cover for Assessed Area
Record the total cover of the taxon in all strata combined over the assessed area.

Tree Canopy Layer
Record the total cover of the taxon in the tree canopy over the assessed area.

Subcanopy Layer
Record the total cover of the taxon in the subcanopy over the assessed area.

Shrub Layer
Record the total cover of the taxon in the shrub stratum over the assessed area.

Herb Layer
Record the total cover of the taxon in the herbaceous layer over the assessed area.

Specimen Collected
Place a "Y" if a specimen was collected for this species.

Confidence in ID
Note the confidence in the identification of the taxon as C = Confident, P = Probable, U = Uncertain.

SITE ASSESSMENT
Representativeness
Is the area of the vegetation being assessed around the AA site at least equivalent to one MMU? Indicate whether the vegetation is homogeneous, very patchy, or transitional between two types. Note whether there are other vegetation communities within or near the assessment area.

Fit
Rated as HIGH, MEDIUM, or LOW – record both how easily the vegetation at the AA site was keyed to a vegetation community AND how confident the field crew is that the vegetation communities they keyed the site to actually fits the vegetation at the site. Vegetation at a site may fit the vegetation field key well but the final classification may not match the community well or vice versa. If MEDIUM or LOW is chosen, record how well the vegetation field key worked to classify the vegetation in the AA site. Especially important is to note any difficulties or questions encountered in classifying the AA site, either because of confusion with the vegetation field key or disturbance/heterogeneity around the AA site.

Primary Field Call
This is the vegetation community that best fits the AA site based on the vegetation field key. Please use the Common Name of the vegetation association as listed in the vegetation field key and record the ELCODE (i.e. CEGL00XXXX) of association that best fits the AA site.

Secondary Field Call

If the vegetation of the area at the AA site seems intermediary between two types or if there are two associations prominent within the assessment area, record the second best fit in this field and record the ELCODE (i.e. CEGL00XXXX) and common name of that association as listed in the vegetation field key. Small inclusions of a second association in the assessment area are ignored.

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Explanation of Accuracy Assessment Reconciliation

This appendix presents the steps used to reconcile the vegetation map layer following the accuracy assessment (AA) analysis for the Appalachian National Scenic Trail (APPA) vegetation mapping project. This process involved presenting to National Park Service (NPS) staff from APPA and the Northeast Temperate Network Natural Resource Inventory and Monitoring (I&M) Program a review of how and why vegetation map classes did not meet NPS Vegetation Mapping Inventory (VMI) Program standards, providing a suggestion for how to remedy the issue, and explaining the benefits and consequences from accepting the suggestion.

The standard set by the NPS VMI Program is that a map class be at least 80% accurate within the 90% confidence interval for the map class; the upper limit 90% confidence interval is abbreviated as (UL–CI). The following table (Table K–1) presents a list of the map classes referenced in this appendix and what became of them to help understand the process and maintain continuity with the final map classification for APPA. Please reference Table K–1 for map-class acronyms in this appendix only.

Table K–1. Original map-class codes, accuracies, and U.S. National Vegetation Classification association codes that existed prior to accuracy assessment map reconciliation, linked to current map-class codes and accuracy.

[USNVC, U.S. National Vegetation Classification; CEGL, Community Element Global; UL–CI, Upper Limit–Confidence Interval]

Original Map-Class Code	Original Accuracy				USNVC CEGL Code(s)	New Map-Class Code	New Accuracy			
	Users'		Producers'				Users'		Producers'	
	Straight	UL–CI	Straight	UL–CI			Straight	UL–CI	Straight	UL–CI
WTMP	70%	87%	76%	92%	CEGL007097	WDMP	69%	83%	89%	101%
WVPS	14%	43%	100%	150%	CEGL003624					
SFWPO	67%	82%	83%	98%	CEGL007517	FHWO	83%	94%	90%	99%
					CEGL007519					
SFWPH	50%	78%	46%	73%	CEGL007102					
FCOD	83%	96%	49%	62%	CEGL006271	FCOM	86%	95%	54%	63%
FCOM	57%	73%	49%	64%	CEGL004817					
					CEGL006286					
					CEGL007267					
					CEGL008524					
FOHL	40%	56%	92%	108%	CEGL007691	FAMO	74%	82%	74%	82%
FOHM	53%	70%	48%	64%	CEGL007230					
FROM	73%	87%	48%	61%	CEGL006192					
					CEGL007233					
					CEGL007692					
					CEGL007878					
FROH	81%	93%	61%	74%	CEGL007298	FROH	78%	90%	61%	73%
					CEGL007299					
					CEGL007300					
FXHR	96%	104%	63%	76%	CEGL008558	FXAH	85%	93%	78%	87%
FXMH	40%	56%	57%	77%	CEGL007219					

Table K–1 (continued). Original map-class codes, accuracies, and U.S. National Vegetation Classification association codes that existed prior to accuracy assessment map reconciliation, linked to current map-class codes and accuracy.

[USNVC, U.S. National Vegetation Classification; CEGL, Community Element Global; UL–CI, Upper Limit–Confidence Interval]

Original Map-Class Code	Original Accuracy				USNVC CEGL Code(s)	New Map-Class Code	New Accuracy			
	Users'		Producers'				Users'		Producers'	
	Straight	UL–CI	Straight	UL–CI			Straight	UL–CI	Straight	UL–CI
FNHV	47%	63%	54%	72%	CEGL007285	FSAH	67%	76%	83%	91%
FNHC	45%	62%	87%	104%	CEGL004973					
SFCVM	50%	67%	45%	61%	CEGL007543 CEGL007693 CEGL007695 CEGL007710					
SXBB	57%	73%	100%	103%	CEGL004732	SXBG	50%	67%	100%	103%
SBML	87%	104%	57%	76%	CEGL003814	SMBT	78%	97%	58%	77%
SXRD	20%	59%	25%	73%	CEGL003819					
SXBB	57%	73%	100%	103%	CEGL004732	SXBB	80%	90%	95%	102%
SBML	87%	104%	57%	76%	CEGL003814					
SXRD	20%	59%	25%	73%	CEGL003819					
FDMO	73%	88%	48%	61%	CEGL006057 CEGL008523	FCAO	70%	85%	47%	60%
FOHS	69%	85%	51%	66%	CEGL008514 CEGL008515 CEGL008516 CEGL008517 CEGL008518	FAOH	69%	85%	53%	67%
CFCVM	69%	89%	45%	59%	CEGL006186 CEGL006237 CEGL006255 CEGL006471 CEGL007543 CEGL007695 CEGL007710 CEGL008405 CEGL008512 CEGL008528	FCHW	76%	84%	84%	91%
FNHN	40%	56%	60%	81%	CEGL008502					
CWTAL	49%	64%	95%	106%	CEGL003683 CEGL006565 CEGL006585					
C/LFCHO	63%	79%	68%	84%	CEGL006923	FCHO	67%	83%	71%	87%
FROS/FOTH	45%	61%	93%	107%	CEGL006125	FOTM	52%	68%	89%	104%
FHTT	0%	0%	0%	17%	CEGL006296					

Table K–1 (continued). Original map-class codes, accuracies, and U.S. National Vegetation Classification association codes that existed prior to accuracy assessment map reconciliation, linked to current map-class codes and accuracy.

[USNVC, U.S. National Vegetation Classification; CEGL, Community Element Global; UL–CI, Upper Limit–Confidence Interval]

Original Map-Class Code	Original Accuracy				USNVC CEGL Code(s)	New Map-Class Code	New Accuracy			
	Users'		Producers'				Users'		Producers'	
	Straight	UL–CI	Straight	UL–CI			Straight	UL–CI	Straight	UL–CI
FHHS	50%	76%	78%	106%	CEGL006226	FHHS	50%	76%	78%	106%
C/LFWPO	86%	98%	65%	79%	CEGL006293 CEGL008539 CEGL006454	FCHP	81%	93%	76%	89%
FHWP	38%	72%	100%	117%	CEGL005005					
FXNE	57%	76%	27%	39%	CEGL006599 CEGL007191 CEGL007879 CEGL008503	FXCH	58%	76%	33%	46%
FXNH	94%	102%	64%	77%	CEGL006303 CEGL006628	FXNH	94%	102%	61%	74%
FAHS/ FRMS	67%	78%	69%	80%	CEGL006014 CEGL006220 CEGL006395 CEGL006406	FAHS	72%	80%	82%	90%
FHLS	0%	13%	0%	50%	CEGL006279					
FTOH	38%	58%	89%	112%	CEGL006000					
SMSF	74%	90%	87%	101%	CEGL006512	SSLF	85%	96%	97%	104%
SLBN	50%	92%	43%	81%	CEGL006513					
FSMF	97%	103%	82%	93%	CEGL006001 CEGL006147 CEGL006176 CEGL006217	FMHF	83%	94%	92%	101%
FHFS	13%	38%	100%	150%	CEGL006459					
FXOH	62%	79%	86%	101%	CEGL006506	FXOM	66%	82%	79%	95%
FNHW	84%	96%	62%	75%	CEGL006211 CEGL006631 CEGL006632 CEGL006636 CEGL006637	FNAH	82%	95%	58%	71%
FHBO	77%	91%	59%	73%	CEGL006088	FHHO	78%	88%	75%	86%
FOTC	58%	79%	85%	105%	CEGL006566					
FMCS	50%	74%	62%	88%	CEGL006198	FRHS	54%	71%	56%	73%
FMFS	56%	73%	58%	76%	CEGL006009 CEGL006380 CEGL006502					

Table K–1 (continued). Original map-class codes, accuracies, and U.S. National Vegetation Classification association codes that existed prior to accuracy assessment map reconciliation, linked to current map-class codes and accuracy.

[USNVC, U.S. National Vegetation Classification; CEGL, Community Element Global; UL–CI, Upper Limit–Confidence Interval]

Original Map-Class Code	Original Accuracy				USNVC CEGL Code(s)	New Map-Class Code	New Accuracy			
	Users'		Producers'				Users'		Producers'	
	Straight	UL–CI	Straight	UL–CI			Straight	UL–CI	Straight	UL–CI
FOHN	32%	52%	55%	84%	CEGL006336	FCNO	86%	93%	75%	83%
FMHO	60%	76%	64%	81%	CEGL006046 CEGL006635 CEGL006633					
FMOH	100%	102%	53%	64%	CEGL006018 CEGL006282					
FSFL	86%	105%	50%	69%	CEGL006273 CEGL006361	FLSF	86%	105%	57%	77%
FCPS	100%	110%	38%	65%	CEGL006007	FNWS	94%	102%	83%	94%
FWCS	77%	91%	85%	98%	CEGL006175					
L/NFSFS	58%	79%	85%	105%	CEGL006098 CEGL006312	FMSS	56%	78%	71%	95%
SXBM	69%	94%	45%	66%	CEGL006571	HXSC	84%	94%	78%	88%
HXRC	74%	89%	88%	101%	CEGL006074					
WSRH	87%	99%	76%	90%	CEGL006134	WROT	79%	88%	96%	102%
LWTAL	47%	63%	100%	104%	CEGL006074 CEGL006585 CEGL006565					
SAST (CEGL006064)	N/A	N/A	N/A	N/A	CEGL006064	WHOT	79%	95%	86%	101%
NWTAL	77%	92%	91%	103%	CEGL006584					

A. WTMP and WVPS

Confusion between dry (yellow) pine map classes in the southern end of the corridor

Problem: The southern-most dry (yellow) pine (*Pinus* [*echinata*, *pungens*, *rigida*, *virginiana*]) map classes showed general confusion with each other.

Suggestion: Collapse WTMP and WVPS into a single map class. While the accuracy for WTMP is sufficient for it to remain alone, the accuracy of WVPS combined with its general rarity warrants merging into WTMP.

Consequences: This final map class would reduce the ability to distinguish the rare yellow pine woodland vegetation types found in the rarer map classes, but given the inaccuracy of the existing map classes, that ability does not really exist. The new map class will much more accurately provide the location for dry pine vegetation in southern APPA.

Park Staff Decision: Accept collapsing WTMP and WVPS into a single map class.

B. SFWPO and SFWPH

Confusion between eastern white pine dominated map classes in the southern end of the corridor

Problem: There was general confusion between the southern-most eastern white pine (*Pinus strobus*) - oak species (*Quercus spp*.) and eastern white pine - hemlock (*Tsuga canadensis*) map classes. This results from the eastern white pine - hemlock map class allowing more oak than original thought and the eastern white pine - oak map class having a significant amount of "invisible" eastern hemlock canopy obscured by overtopping eastern white pine and oak.

Suggestion: Collapse SFWPO and SFWPH into a single map class.

Consequences: Collapsing these two map classes will result in a poorer resolution of exactly where on the landscape hemlock forests may still occur in southern APPA, but that accuracy would be below 50% without collapse. Collapsing these two map classes together will result in a more cohesive map class.

Park Staff Decision: Accept collapsing SFWPO and SFWPH into a single map class.

C. FCOD and FCOM

Confusion between xeric and dry-mesic chestnut oak forests in the southern corridor and continued low accuracy

Problem: Initially, mappers expected to be able to distinguish the most xeric chestnut oak (*Quercus prinus*) map class based on canopy structure and landscape position, but the AA process found generalized confusion between FCOD and FCOM. This indicates that there are extenuating conditions dictating the locations for these map classes not perceived by the mappers. Additionally, FCOD and FCOM were both generally undermapped. Instances of FCOD and FCOM were found by AA in 10 other map classes, which results in producers' accuracy UL–CI of 70%, below VMI Program standards even after merging. Bringing accuracy above 80% would not be possible short of

collapsing two or three other important, ecologically different map classes, with each map class covering thousands of hectares.

Suggestion: Collapse FCOD and FCOM into a single map class and accept a lower producers' accuracy to preserve other well-mapped map classes.

Consequences: Collapsing these into a single map class will reduce the resolution of the map for different types of chestnut oak map classes in the southern most section of the corridor, but greatly increase the ability of the map to resolve locations of chestnut oak in the southern portion of the map.

Park Staff Decision: Accept collapsing FCOD and FCOM into a single map class.

D. FOHL, FOHM, and FROM

Confusion between dry-mesic and mesic oak forests in southern corridor

Problem: Initially, mappers expected to be able to distinguish non-chestnut oak dry-mesic to mesic mixed oak map class from mesic to wet-mesic mixed oak map class based on canopy structure, landscape position and non-oak hardwood tree cover. However, AA found generalized confusion between the FOHL, FOHM, and FROM map classes, indicating that there are extenuating conditions dictating the locations for these map classes not perceived by the mappers. An additional problem is the general undermapping of both FROM and FOHM and overmapping of FOHL.

Suggestion: Collapse FOHL, FOHM, and FROM into a single map class.

Consequences: Collapsing these map classes would result in some loss of resolution amongst the mesic oaks in southern APPA.

Park Staff Decision: Accept collapsing FOHL, FOHM, and FROM into a single map class.

E. Low FROH Producers' Accuracy

FROH has a producers' accuracy slightly below VMI Program standards

Problem: The high-elevation red oak (*Quercus rubra*) forests found in the southern portion of the corridor have an UL–CI producers' accuracy of 74%, which is below the VMI Program standard. This results from a general undermapping of the FROH map class caused by "high-elevation" forests being found at lower elevations than mappers expected. Instances of FROH are spread across six (postcollapse) different forest map classes with these map classes being primarily tied to lower elevations.

Suggestion: Accept a slightly lower producers' accuracy for FROH in order to maintain the locational information for the majority of the FROH occurrences.

Consequences: Map users will need to understand that additional examples of the FROH map class are sometimes found in the lower-elevation oak forests surrounding FROH polygons.

Park Staff Decision: Leave FROH as an independent map class and accept a lower producers' accuracy.

F. FXHR and FXMH

Confusion of southern ruderal hardwood forests

Problem: Initially, mappers believed these two map classes would easily separate based on elevation and evergreen shrub cover. However, AA determined these characteristics to be unreliable for splitting apart these map classes. The intersection of these two map classes is found in FXMH polygons dominated by red maple (as FXMH may be dominated by several species or a mix). In instances where forests were dominated by red maple mappers routinely confused these two map classes and consistently called forests FXMH when they were FXHR.

Suggestion: Collapse FXHR and FXMH into a single map class.

Consequences: Collapsing these map classes will result in very little loss to the map's ability to display ruderal forests in the southern end of the corridor as both map classes are composed of native species. There will be some loss in resolution of where ruderal forests with an evergreen shrub layer occur.

Park Staff Decision: Accept collapsing FXHR and FXMH into a single map class.

G. FNHV, FNHC, and SFCVM and Low Users' Accuracy

Confusion between southern non-oak hardwood forests and a below-standard final users' accuracy

Problem: There are two different sources of confusion to consider here. The first is elevation based, where mappers believed that SFCVM would split from FNHV/FNHC based on elevation. This was true below the established elevation split with no FNHV/FNHC found in polygons mapped as SFCVM, but failed consistently above the elevation split with AA finding SFCVM in areas mapped as FNHV/FNHC. The second is the topographical location of FNHV and FNHC at higher elevations. Mappers believed that FNHV would occur primarily on exposed and flat topographic positions while FNHC would occur primarily in sheltered locations, but AA found this theory to be correct only about two-thirds of the time, well below VMI Program standards. A final issue is that following collapse, the users' accuracy will still be below VMI Program standards with an UL–CI of 74% due to a general overmapping of the "hardwood cove" concept. Instances of this final collapsed map class are spread across nine (postcollapse) different forest map classes with the only clear options for additional collapse being with oak-dominated forests that are in no way confined to sheltered topography.

Suggestion: Collapse the FNHV, FNHC, and SFCVM into a single map class and accept the lower producers' accuracy to preserve other well-mapped map classes.

Consequences: Collapsing these three map classes would result in some diminishment of the ability to see exactly where the richest, most diverse communities along the corridor occur, but this information is still somewhat captured in the vegetation plots and AA data. Additionally, it will remove the line between lower- and upper-elevation non-oak hardwood forests, but AA results show this distinction is much muddier than expected. Accepting the lower accuracy will prevent the

collapse of this non-oak sheltered topography map class into a wide-spread oak map class found across the southern part of the corridor.

Park Staff Decision: Accept collapsing FNHV, FNHC, and SFCVM into a single map class.

H. SBML, SXRD, and SXBB

Confusion between low-elevation shrub balds and ruderal shrublands

Problem: There are two interrelated, but independent concepts to consider here. The first is the confusion between SBML and SXRD. For this the species of ericaceous shrub were confused along with the degree of disturbance, and for this pair of map classes the confusion was mutual with both confused as the other.

The second is the confusion between SBML and SXBB. Numerous areas mapped as the ruderal nonericaceous SXBB shrubland were of sufficient quality and ericaceous shrub cover to qualify as SBML. The mappers suspect it resulted from a miscommunication on the degree of disturbance and amount of nonericaceous shrub that the SBML map class could accept. The result is that there is significant confusion between these map classes. No areas mapped as SBML were found by AA to be SXBB; all the confusion rests with areas mapped as SXBB found to be SBML by AA.

Suggestion: While AA results suggest that SBML and SXRD should be collapsed, they are somewhat inconclusive for the collapse of SXBB into the SBML/SXRD map class. Given the degree of difference found in the vegetation and landscape history for the SXBB compared to SBML/SXRD, it may warrant accepting a lower accuracy to preserve the integrity of the SBML/SXRD map class. This decision rests with the park based on management needs.

Consequences: For the collapse of SBML and SXRD, the map would lose some resolution for species of ericaceous shrub, but the ability to distinguish natural ericaceous balds would remain largely intact. For the collapse of SXBB into SBML/SXRD, the ability to distinguish ericaceous balds would be greatly diminished along with the ability to distinguish successional nonericaceous shrublands.

Park Staff Decision: Accept collapsing SBML and SXRD into a single map class and leave SXBB as an independent map class.

I. FDMO and Low Producers' Accuracy

Confusion between south-central mixed oak and mixed oak-hickory forests and continued low producers' accuracy

Problem: There is generalized undermapping of the FDMO map class, with it found in 10 (postcollapse) map classes resulting in a producers' accuracy below VMI Program standards. This is primarily caused by areas mapped as one of several oak-heath map classes classified as having a nonheath understory during AA. As FDMO is the primary nonheath-oak map class, these nonheath-dominated areas were classified as FDMO. The final producers' accuracy is below VMI Program standards with an UL–CI of 61% and no clean collapse option to bring the accuracy up. User's accuracy is well within VMI Program standards with an UL–CI of 88%.

Suggestion: Accept a lower producers' accuracy.

Consequences: Accepting the lower producers' accuracy will preserve other heath-dominated oak map classes from collapsing into this one.

Park Staff Decision: Leave FDMO as an independent map class and accept a lower producers' accuracy.

J. FOHS and Low Producers' Accuracy

Confusion between south-central mixed oak and mixed oak-hickory forests and continued low producers' accuracy

Problem: There is generalized undermapping of the FOHS map class, with it found in nine (postcollapse) map classes resulting in a producers' accuracy below VMI Program standards. This is primarily caused by areas mapped as one of several oak map classes classified as having an oak-hickory canopy, and due to several areas mapped as one of several hardwood map classes classified as an "oakless" oak-hickory forest during AA. As FOHS is the primary oak-hickory map class, these oak-hickory forests were classified as FOHS. The final producers' accuracy is below VMI Program standards with an UL–CI of 66% and no clean collapse option to bring the accuracy up. User's accuracy is well within VMI Program standards with an UL–CI of 85%.

Suggestion: Accept a lower producers' accuracy.

Consequences: Accepting the lower producers' accuracy will preserve other oak map classes lacking hickory from collapsing into this one.

Park Staff Decision: Leave FOHS as an independent map class and accept a lower producers' accuracy.

K. CFCVM, FNHN, and CWTAL

Confusion of south-central hardwood forests and overmapping of central talus woodland

Problem: The are two issues to examine here. The first is a consistent mapping of CFCVM as FNHN due to CFCVM occurring at a greater elevation than initially expected by the mappers. Over one-quarter of FNHN sites tested during AA were determined to be CFCVM. The second is the chronic overmapping of CWTAL. Of the CWTAL sites tested during AA, over one-third of them were determined to be CFCVM or FNHN. This is likely caused by some of the U.S. National Vegetation Classification associations in CFCVM or FNHN being early-senescing hardwood tree forests that occur over broken rocky substrate, which AA suggests looks like CWTAL in the aerial imagery.

Suggestion: Collapse CFCVM, FNHN, and CWTAL into a single map class.

Consequences: The map will lose the ability to discern the high-elevation hardwood tree forests from the lower-elevation hardwood tree forests, but this ability was not highly reliable to begin with. Additionally, the map will lose the ability to provide the location of true talus woodlands, but many of those now classified as talus woodlands are either CFCVM or FNHN.

Park Staff Decision: Accept collapsing CFCVM, FNHN, and CWTAL into a single map class.

L. Low C/LFCHO Users' Accuracy

C/LFCHO has a users' accuracy slightly below VMI Program standards

Problem: The users' accuracy UL–CI for the C/LFCHO map class is 79% while the UL–CI producers' accuracy is 84%. This results from a slight overmapping of the C/LFCHO map class spread among three (postcollapse) other map classes.

Suggestion: While an artificial collapse for C/LFCHO could be engineered, this map class very nearly meets VMI Program standards and collapsing it would result in degrading an otherwise well-mapped map class.

Consequences: None

Park Staff Decision: Leave C/LFCHO as an independent map class and accept a lower users' accuracy.

M. FROS/FOTH and FHTT and Low Users' Accuracy

Confusion between north-central oak-tuliptree forests and accept a lower users' accuracy

Problem: First, note that FROS/FOTH is a single map class; as an artifact of different project area names there was an initial confusion on the U.S. National Vegetation Classification association that defines this map class. The issue here is the chronic overmapping of FROS/FOTH and undermapping of FHTT. Both map classes are defined by the occurrence of tuliptree (*Liriodendron tulipifera*) at the northern end of its range. During mapping, no areas were mapped as FHTT, but AA found this map class exclusively in the FROS/FOTH map class. Regarding the chronic overmapping of FROS/FOTH, this likely results from a combination of mappers over-weighting the cover of tuliptree in polygons and the AA teams' under-weighting the cover of tuliptree at AA sites. During AA reconciliation there were several AA sites in FROS/FOTH polygons that showed tuliptree in the field photograph images, but did not note tuliptree on the data sheet. As the species composition of the AA data sheet cannot be modified, these AA sites were classified as errors and this pushed the accuracy below VMI Program standards. Postcollapse UL–CI users' accuracy would be 71%.

Suggestion: Collapse FROS/FOTH and FHTT into a single map class and accept a lower users' accuracy. This will preserve much of the northern extent information of the occurrence of tuliptree along the corridor.

Consequences: There is very little consequence from collapsing FROS/FOTH and FHTT as both are moderately rich hardwood forests with tuliptree near the northern extent of its' range. Accepting a lower users' accuracy will preserve much of the northern extent occurrence information for tuliptree along the corridor.

Park Staff Decision: Accept collapsing FROS/FOTH and FHTT into a single map class.

N. Low FHHS Users' Accuracy

FHHS has a users' accuracy slightly below VMI Program standards

Problem: The users' accuracy for the map class is slightly below VMI Program standards with an UL–CI of 76%. All of the confusion for this swamp forest map class is with other swamp forest map classes, with the difference being that FHHS is generally dominated by eastern hemlock. One reason for the apparent overmapping of the FHHS map class may be caused by eastern hemlock decline and mortality between the date of imagery and date of AA.

Suggestion: Accept a slightly lower users' accuracy.

Consequences: Map users' will need to note that there are instances of other swamp forest map classes within the FHHS map class.

Park Staff Decision: Leave FHHS as an independent map class and accept a lower users' accuracy.

O. C/LFWPO and FHWP

Confusion between north-central oak-eastern white pine and hardwood-eastern white pine forests

Problem: While C/LFWPO is mapped consistently, the much rarer FHWP map classes were often found to be C/LFWPO during AA. Both map classes represent eastern white pine - mixed-hardwood tree forests with C/LFWPO having more oak and FHWP having more non-oak hardwoods. Both are nonruderal forests.

Suggestion: Collapse C/LFWPO and FHWP into a single map class.

Consequences: There will be a diminished ability of the map to present the locations for the rare FHWP map class, but the locations for mature eastern white pine - mixed-hardwood tree will be much better.

Park Staff Decision: Accept collapsing C/LFWPO and FHWP into a single map class.

P. Low FXNE Producers' Accuracy

FXNE was mapped poorly and has low producers' and users' accuracy

Problem: The FXNE map class was mapped poorly. Reasons for this vary, but users' errors are spread across 8 (postcollapse) map classes while producers' errors are spread across 16 (postcollapse) map classes. The UL–CI for users' is approaching VMI Program standards at 76%, but the producers' accuracy shows a chronic undermapping with the UL–CI at 39%. It generally suggests that the landscape where this map class occurs is much more disturbed and ruderal in nature than the map presents it as. Given the broad and deep confusion found within this map class, there is no option for collapse that will bring producers' accuracy anywhere near VMI Program standards. It might be possible to come near VMI Program standards with the collapse of four or five map classes with FXNE, but each of those map classes would be a very common map class covering hundreds to thousands of hectares each and this would result in a final map lacking detail throughout the range of FXNE.

Suggestion: Accept the low accuracy of FXNE in order to preserve other well-mapped map classes.

Consequences: Map users will need to understand that over the range of the FXNE map class, the map is generally more disturbed and ruderal in nature than the map presents it as.

Park Staff Decision: Leave FXNE as an independent map class and accept a lower producers' accuracy.

Q. Low FXNH Producers' Accuracy

FXNH has a producers' accuracy slightly below VMI Program standards

Problem: The producers' accuracy UL–CI for the FXNH map class is 77% while the straight users' accuracy is 94%. This results from a slight undermapping of the FXNH map class. This suggests (similarly to section P) that over the range of the FXNH map class, the map is generally more disturbed and ruderal in nature than the map presents it as.

Suggestion: While an artificial collapse for FXNH could be engineered, this map class nearly meets VMI Program standards and collapsing it would result in degrading an otherwise well-mapped map class.

Consequences: Map users will need to understand that over the range of the FXNH map class, the map is slightly more disturbed and ruderal in nature than the map presents it as.

Park Staff Decision: Leave FXNH as an independent map class and accept a lower producers' accuracy.

R. FAHS/FRMS, FHLS, and FTOH

Confusion between north-central swamp forests and the forested upland - swamp interface

Problem: There are two separate problems to consider here. The first is chronic overmapping of FHLS, an eastern hemlock swamp. Of the locations tested during AA, three-quarters of them were classified as FAHS/FRMS, a deciduous forest swamp. This indicates that FHLS, while present on the landscape, generally looks too much like FAHS/FRMS to reliably map alone. The second is the chronic overmapping of FTOH, an already confusing map class. The FTOH map class is defined as the forest that interfaces between drier oak forests and deciduous forest swamps. Mapped as narrow bands between drier oak forests and deciduous forest swamps in the map, AA found many of the tested FTOH polygons to be either drier oak forests or, more commonly, deciduous forest swamps. This could result from either poor mapping or AA teams unprepared to "split the difference" between the upland and wetland forest, which the FTOH map class was designed to do.

Suggestion: Collapse FAHS/FRMS, FHLS, and FTOH into a single map class.

Consequences: Collapsing these map classes will result in a poorer resolution of the different hardwood swamp types, but will provide a much clear presentation of deciduous swamp across the landscape. This collapse will result in deciduous swamp polygons directly interfacing with deciduous upland forest polygons, but AA results show that reliably mapping the interface between these types is not possible for this project.

Park Staff Decision: Accept collapsing FAHS/FRMS, FHLS, and FTOH into a single map class.

S. SMSF and SLBN

Confusion between emergent shrub wetlands in the north-central corridor

Problem: Initially, mappers believed these two map classes would split based on general species composition and how robust the vegetation was. Both SMSF and SLBN are shrub swamps with SMSF being sweetgale (*Myrica gale*) dominated and SLBN being leatherleaf (*Chamaedaphne calyculata*) dominated, though both may have the other species. On the surface, both map classes meet VMI Program standards, but on closer inspection, it is apparent that there is a generalized and consistent confusion between these two map classes.

Suggestion: Collapse SMSF and SLBN into a single map class.

Consequences: Resolution of different emergent shrub wetlands in the northern portion of the corridor will be slightly degraded, but the overall ability to differentiate these wetlands from other shrub wetlands will be increased.

Park Staff Decision: Accept collapsing SMSF and SLBN into a single map class.

T. FSMF and FHFS

Confusion between hardwood floodplain forests in the north-central corridor

Problem: Initially, mappers believed these two map classes would split based on landscape position and canopy composition. Both FSMF and FHFS are deciduous forested floodplain map classes with FSMF being silver maple (*Acer saccharinum*) dominated, and FHFS being mixed-hardwood tree dominated. The FSMF map class was mapped very well, but the FHFS map class was highly overmapped. This overmapping is spread among four (postcollapse) map classes with FSMF being the most logical place to collapse FHFS into.

Suggestion: Collapse FSMF and FHFS into a single map class.

Consequences: Resolution of different hardwood tree floodplain forest types in the northern portion of the corridor will be slightly degraded, but the overall ability to differentiate hardwood tree floodplain forests from nonfloodplain forests will be increased.

Park Staff Decision: Accept collapsing FSMF and FHFS into a single map class.

U. Low FXOH Users' Accuracy

FXOH has a users' accuracy slightly below VMI Program standards

Problem: The users' accuracy UL–CI for the FXOH map class is 79%, while the straight producers' accuracy is 86%. This results from a slight overmapping of the FXOH map class spread among five (postcollapse) other map classes.

Suggestion: While an artificial collapse for FXOH could be engineered, this map class very nearly meets VMI Program standards and collapsing it would result in degrading an otherwise well-mapped map class.

Consequences: None.

Park Staff Decision: Leave FXOH as an independent map class and accept a lower users' accuracy.

V. Low FNHW Producers' Accuracy

FNHW has a producers' accuracy slightly below VMI Program standards

Problem: The producers' accuracy UL–CI for the FNHW map class is 75%, while the straight users' accuracy is 84%. This results from a slight undermapping of the FNHW map class spread among 10 (postcollapse) other map classes.

Suggestion: While an artificial collapse for FNHW could be engineered, this map class nearly meets VMI Program standards and collapsing it would result in degrading an otherwise well-mapped map class.

Consequences: None.

Park Staff Decision: Leave FNHW as an independent map class and accept a lower producers' accuracy.

W. FHBO and FOTC

Confusion between central eastern hemlock - mixed-hardwood forests

Problem: Initially mappers believed these two similar map classes, both composed of northern red oak and eastern hemlock, could be split based on the presence of either American beech (*Fagus grandifolia*) or tuliptree. However, AA determined that undermapped FHBO and overmapped FOTC crossed, and that there was sufficient confusion to warrant merging these relatively similar map classes.

Suggestion: Collapse FHBO and FOTC into a single map class.

Consequences: A slight reduction in the ability for the map to resolve different types of northern red oak - eastern hemlock forests, but an increased ability for the map to resolve northern red oak - eastern hemlock forest in general.

Park Staff Decision: Accept collapsing FHBO and FOTC into a single map class.

X. FMCS and FMFS and Low Users' Accuracy

Confusion between northern hardwood - conifer swamps and users' accuracy slightly below VMI Program standards

Problem: Initially, mappers expected to be able to separate these two swamp map classes based on relative conifer cover in each, as both map classes have some degree of conifer cover, but the overlap proved to be too great. An additional issue is that both map classes were initially overmapped, which is exacerbated by their collapse, leaving the final users' accuracy UL–CI at 74%. This wide overmapping of the combined map class would spread among 11 (postcollapse) other map classes with no logical additional collapse option that would rectify this over-mapping. An alternative is to leave FMCS and FMFS separate. Both map classes have accuracy problems, but all UL-CI's are 73% or better, similar to the proposed collapsed map class.

Suggestion: Determine whether the map will benefit more from a generalized conifer swamp map class or two more specific conifer map classes.

Consequences: Collapsing FMCS and FMFS provides only a marginal improvement in the map accuracy at the expense of the ability to differentiate different swamp forests in the northern part of the corridor while leaving them separate does provide a better ability to differentiate swamp forests in the northern part of the corridor at the expense of a slightly more accurate map.

Park Staff Decision: Leave FMCS and FMFS as independent map classes and accept a lower users' accuracy.

Y. FOHN, FMHO, and FMOH and Low Users' Accuracy

Confusion between north-central mixed oak and oak-hickory forests and a slightly below-standard final users' accuracy

Problem: Initially, mappers believed they could separate these three map classes based on the presence and relative dominance or absence of various hardwood tree species, including hickory and sugar maple (*Acer saccharum*). However, AA determined this was insufficiently consistent and that this resulted in the general undermapping FMOH to FOHN and FMHO. This was likely caused by instances of FMOH that contained significant hardwood tree cover that was inappropriate for FOHN or FMHO. The end result is confusion between the three dry-mesic to mesic oak forests found in the northern portion of the corridor. Additionally, the producers' accuracy is still slightly below VMI Program standards postcollapse with an UL–CI of 79%.

Suggestion: Collapse FOHN, FMHO, and FMOH into a single map class and accept a slightly lower producers' accuracy.

Consequences: Collapsing FOHN, FMHO, and FMOH will decrease the resolution of different oak-dominated forests in the northern portions of the corridor, but increase the ability to discern oak forests in general.

Park Staff Decision: Accept collapsing FOHN, FMHO, and FMOH into a single map class.

Z. FSFL and Low Users' Accuracy

FSFL has a producers' accuracy below VMI Program standards

Problem: The producers' accuracy UL–CI for the FSFL map class is 69% while the straight users' accuracy is 86%. This results from two problems. The first is slight undermapping of the FSFL map class spread among 5 (postcollapse) other map classes; of these five FPHS has the greatest degree of confusion with FSFL. The second is an artifact of the AA sample design that resulted in only 14 AA sites being sampled for this map class, rather than the expected 30. This results in an amplification of producers' error as compared to the commonness of the map class across the landscape.

Suggestion: Accept a lower users' accuracy for FSFL. While an artificial collapse for FSFL could be engineered, this map class would likely meet VMI Program standards with a correct sample size and collapsing it would result in degrading an otherwise well-mapped map class.

Consequences: While collapsing FPHS and FSFL would provide a more reliable presentation of where lower-elevation conifer forests occur in the northern portion of the corridor, the collapsed map class would result in a reduced capacity for the map to show the northern-most extent of eastern hemlock.

Park Staff Decision: Leave FSFL as an independent map class and accept a lower producers' accuracy.

AA. FWCS and FCPS

Confusion between northern white-cedar forest in the northern portion of the corridor

Problem: Both FWCS and FCPS are northern white-cedar (*Thuja occidentalis*) dominated swamps that generally occupy different locations in the landscape. Mappers believed they could use this difference to split them apart, but AA found that the locational concept was not sufficiently accurate and FWCS was overmapped to FCPS. While FWCS could stand alone, FCPS cannot and near half the sites determined to be FCPS during AA are mapped as FWCS.

Suggestion: Collapse FWCS and FCPS into a single map class.

Consequences: There will be a reduction in the ability to differentiate northern white-cedar swamp forest types in the map, but a much better ability to differentiate northern white-cedar swamp forest in general.

Park Staff Decision: Accept collapsing FWCS and FCPS into a single map class.

AB. Low L/NFSFS Users' Accuracy

L/NFSFS has a users' accuracy slightly below VMI Program standards

Problem: The users' accuracy UL–CI for the L/NFSFS map class is 79% while the straight producers' accuracy is 85%. This results from a slight overmapping of the L/NFSFS map class.

Suggestion: While an artificial collapse for L/NFSFS could be engineered, this map class very nearly meets VMI Program standards and collapsing it would result in degrading an otherwise well-mapped map class.

Consequences: Map users will need to understand that over the range of the L/NFSFS map class, the map is slightly less common than the map indicates.

Park Staff Decision: Leave L/NFSFS as an independent map class and accept a lower users' accuracy.

AC. SXBM and HXRC

Confusion between reed canarygrass wetlands in the northern portion of the corridor

Problem: Mappers initially believed they would be able to reliably split the two reed canarygrass (*Phalaris arundinacea*) dominated map classes apart based on shrub cover, but AA found that many of the sites mapped as HXRC had sufficient shrub cover to be SXBM. This likely relates from an inability to reliably gauge low shrub cover in mainly herbaceous marshes, which is still sufficient to qualify as an herbaceous shrub marsh.

Suggestion: Collapse SXBM and HXRC into a single map class.

Consequences: As both map classes represent ruderal reed canarygrass marshes the ability to reliably discern this vegetation in the map will increase. However, this increased reliability will be at the expense of discerning the shrubbier versions, which may be later-successional in nature.

Park Staff Decision: Accept collapsing SXBM and HXRC into a single map class.

AD. WSRH and LWTAL

Confusion between oak woodlands in the north-central portion of the corridor

Problem: Initially, mappers believed that the degree of canopy cover and landscape position would differentiate LWTAL from WSRH, but AA found LWTAL to be consistently overmapped to WSRH.

Suggestion: Collapse LWTAL and WSRH into a single map class.

Consequences: Collapsing LWTAL and WSRH will have minimal impact as both are oak woodlands over open rocky substrate.

Park Staff Decision: Accept collapsing LWTAL and WSRH into a single map class.

AE. NWTAL, NVBAC, and CEGL006064

Discovery of CEGL006064 in NWTAL and NVBAC

Problem: During the AA process, two instances of the association CEGL006064 were discovered. Mappers created a map class for CEGL006064 (SAST), but never found any area they believe sufficiently large to map. The AA process found one instance in NVBAC and one instance in NWTAL that AA determined to be equal to or greater than the minimum mapping unit of 0.5 ha. This association now needs to go somewhere and there are two options. The better option seems to be NWTAL, which is a woodland map class, rather than NVBAC, which is a sparsely vegetated map class, though placing CEGL006064 in either NWTAL or NVBAC is possible.

Suggestion: Add CEGL006064 to NWTAL rather than NVBAC.

Consequences: Having a rare shrubland in a woodland map class if added to NWTAL.

Park Staff Decision: Add CEGL006064 into the NWTAL map class.

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