Part 2. A Subset of the International Ecological Classification Standard: Terrestrial Ecological Classifications Covering Vegetation Associations and Ecological Systems in 11 parks in the National Park Service National Capital Region

National Park Service Vegetation Mapping Inventory Program: Vegetation Mapping of National Capital Region Parks in Maryland, Virginia, West Virginia, and the District of Columbia



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NatureServe

2550 South Clark Street, Suite 930
Arlington, VA 22202

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This subset of the International Ecological Classification Standard covers vegetation associations attributed to eleven parks in the National Capital Region (Antietam National Battlefield (ANTI), Catoctin Mountain Park (CATO), Chesapeake & Ohio Canal National Historical Park (CHOH), George Washington Memorial Parkway (GWMP), Harpers Ferry National Historical Park (HAFE), Manassas National Battlefield Park (MANA), Monocacy National Battlefield (MONO), National Capital Parks-East (NACE), Prince William Forest Park (PRWI), Rock Creek Park (ROCR), and Wolf Trap National Park for the Performing Arts (WOTR). For individual park subsets see Part 2A through Part 2K. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Final completion of this report was overseen by Judy Teague. Comments and suggestions regarding the contents of this subset should be directed to Don Faber-Langendoen, Senior Ecologist, NatureServe <mailto:don_faber-langendoen@natureserve.org>. See Part 2A for definitions used in this document and Part 3 for the nomenclature of plant community names used in the park vegetation maps.

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US National Vegetation Classification Descriptions

1. Forest & Woodland

Tropical, temperate and boreal forests, woodlands and tree savannas characterized by broadly mesomorphic (including scleromorphic) tree growth forms (including *broad-leaved*, *needle-leaved*, *sclerophyllous*, *palm*, *bamboo trees*, and *tree ferns*), typically with at least 10% cover (but tropical tree savannas up to 40% cover, when trees <8 m tall), irregular horizontal spacing of vegetation structure, and spanning humid to seasonally dry tropical to boreal and subalpine climates and wet to dry substrate conditions. Includes native forests, as well as managed, and some plantation forests where human management is infrequent.

1.B.1. Warm Temperate Forest & Woodland

Warm Temperate Forest & Woodland is dominated by broad-leaved evergreen trees, sometimes with dwarfed stems and small, sclerophyllous leaves (in Mediterranean climates), or various combinations of broad-leaved deciduous, broad-leaved evergreen and needle-leaved evergreen conifer trees. Winters are mild (mostly frost-free) and may be the rainiest season, springs are temperate-humid, summers are hot-dry, and autumn is often dry.

1.B.1.Na. Southeastern North American Forest & Woodland

This mixed broadleaf evergreen (oak, magnolia) and pine (longleaf) forest and woodlands occur in the southeastern U.S. Coastal Plain from southern Virginia, south to Florida and west to east Texas.

M305. Southeastern North American Ruderal Forest

This ruderal vegetation occurs in human-disturbed sites across the southeastern United States. This includes sites that were formerly cultivated ("old fields") as well as other areas where either the soil has been disturbed (primary succession) or where repeated removal of the natural forest cover for wood products has created conditions for a mixture of tree species which would be unlikely to occur under purely natural conditions of plant succession. The pathway to ruderal forest may be favored by a lack of fire which would favor fire-intolerant and exotic species. Some typical ruderal species include the evergreens *Pinus clausa* (sand pine), *Pinus elliottii* (slash pine), and *Pinus taeda* (loblolly pine) as well as the deciduous trees *Acer rubrum var. rubrum* (red maple), *Catalpa bignonioides* (southern catalpa), *Catalpa speciosa* (northern catalpa), *Celtis laevigata* (sugarberry), *Liquidambar styraciflua* (sweetgum), *Maclura pomifera* (osage orange), *Quercus hemisphaerica* (Darlington oak), *Quercus nigra* (water oak), and the exotics *Albizia julibrissin* (silktree), *Broussonetia papyrifera* (paper mulberry), *Quercus acutissima* (sawtooth oak), and *Triadica sebifera* (Chinese tallow). *Maclura pomifera* (osage orange) is native to a narrow region of the south-central U.S. but is so widely planted outside of this range that it is effectively exotic. These species may form monodominant stands or variable mixes, and typically have associated understory shrub and herb species that are also exotic or native generalists. Where the ground layer is native and the ruderal species listed above is native, the stand may be better placed into a successional phase of a native type.

G031. Southeastern Native Ruderal Forest

This ruderal native forest group occurs in old-field and other human-disturbed sites across the southeastern United States. The vegetation shows evidence of former and heavy human use, such as formerly cleared and/or planted sites, but which has been allowed to succeed more-or-less spontaneously, as determined by the vegetation being dominated (>80% cover) by ruderal native tree species. Understory shrub and herb species may be a mix of exotic species and native generalists. Some typical native ruderal species include conifer *Pinus taeda* (loblolly pine), and hardwoods *Catalpa bignonioides* (southern catalpa), *Catalpa speciosa* (northern catalpa), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Maclura pomifera* (osage orange), and *Quercus nigra* (water oak). Exotic associates may include *Albizia julibrissin* (silktree), *Broussonetia papyrifera* (paper mulberry), *Triadica sebifera* (Chinese tallow), and *Maclura pomifera* (osage orange). *Maclura pomifera* (osage orange) is a native species in a narrow region of the eastern U.S. but is so widely planted outside of its range that it is effectively exotic. Where both the ground layer and tree layer are native ruderals, the stand may overlap with degraded phases of other native forest types.

A3232 *Liquidambar styraciflua - Celtis laevigata - Quercus nigra* Ruderal Forest Alliance

This alliance includes a variety of semi-natural disturbance-related upland forests of the southeastern United States dominated by *Liquidambar styraciflua* (sweetgum), *Quercus nigra* (water oak), *Celtis laevigata* (sugarberry), and other hardwoods. These forests tend to develop after logging or agricultural cropping. Some associations may have *Carya tomentosa* (mockernut hickory), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus falcata* (southern red oak), *Quercus nigra* (water oak), *Quercus phellos* (willow oak), and *Quercus velutina* (black oak). In addition, *Pinus taeda* (loblolly pine) may be present and abundant. *Celtis laevigata* (sugarberry) semi-natural stands occur in highly disturbed soils in coastal areas of Georgia and possibly adjacent states. *Celtis laevigata* (sugarberry) is the strong canopy dominant in this community. However, exotic tree species such as *Melia azedarach* (Chinaberrytree), *Triadica sebifera* (Chinese tallow), and *Morus alba* (white mulberry) may be scattered throughout. Ground cover species are variable but may include *Rubus trivialis* (southern dewberry) and *Nekemias arborea* (peppervine).

[CEGL007216] *Liquidambar styraciflua* Ruderal Forest

Translated Name: **Sweetgum Ruderal Forest**
Common Name: **Ruderal Sweetgum Forest**

USNVC Classification

Division	Southeastern North American Forest & Woodland (1.B.1.Na)
Macrogroup	Southeastern North American Ruderal Forest (M305)
Group	Southeastern Native Ruderal Forest (G031)
Alliance	*Liquidambar styraciflua - Celtis laevigata - Quercus nigra* Ruderal Forest Alliance (A3232)

Element Concept

Global Summary: This early-successional upland forest of the southeastern U.S. occurs on a variety of environmental settings, resulting from succession following human activities such as logging and clearing or agriculture. Stands are dominated by *Liquidambar styraciflua* (sweetgum), sometimes to the exclusion of other species. *Pinus taeda* (loblolly pine) is a common associate. Other associated species are highly variable and depend on location and stand history.

Environmental Description

National Capital Parks-East Environment: This association may be found anywhere that land has been heavily impacted by agriculture or other severe disturbances and is recovering. Examples of this situation include abandoned agricultural fields and areas adjacent to former habitations, as well as along roadsides.
Global Environment: This association is found in uplands that have been heavily impacted by agriculture or other severe disturbances and are recovering.

Vegetation Description

National Capital Parks-East Vegetation: Stands are dominated by *Liquidambar styraciflua* (sweetgum), sometimes strongly so. The limited floristic data available for NACE indicate that the other canopy trees include *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Quercus falcata* (southern red oak), and *Quercus phellos* (willow oak). The subcanopy may contain smaller individuals of canopy taxa, as well as *Juniperus virginiana* (eastern red-cedar) and *Pinus virginiana* (Virginia pine). Shrubs include *Cornus florida* (flowering dogwood), *Elaeagnus* (oleaster) sp., *Fagus grandifolia* (American beech), *Ilex opaca var. opaca* (American holly), *Lonicera japonica* (Japanese honeysuckle), *Parthenocissus quinquefolia* (Virginia creeper), *Quercus falcata* (southern red oak), *Quercus phellos* (willow oak), and *Viburnum dentatum* (southern arrow-wood). Herbs include *Mitchella repens* (partridgeberry). These are typically early-successional, young stands.
Global Vegetation: Stands are dominated by *Liquidambar styraciflua* (sweetgum), sometimes to the exclusion of other species.
Global Dynamics: These communities represent successional stands of upland *Liquidambar styraciflua* (sweetgum). As the stands mature, they begin to assume the characteristics of more natural community types. Over time, *Liquidambar styraciflua* (sweetgum) declines and is replaced by oaks, hickories, and/or pines. In addition, small stream bottomland sweetgum stands in the Piedmont may recover quickly from disturbance and begin to approximate the characters of ~*Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin / Arisaema triphyllum* Floodplain Forest (CEGL004418)$$ 50 years or more after a stand-initiating disturbance.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Liquidambar styraciflua* (sweetgum)
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Liquidambar styraciflua* (sweetgum)

CHARACTERISTIC SPECIES

National Capital Parks-East: *Liquidambar styraciflua* (sweetgum)
Global: *Liquidambar styraciflua* (sweetgum)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (19-Aug-2002). This is an upland successional vegetation type composed of native species. Its conservation value is limited, but it may provide buffer for communities of greater conservation value.

RELATED CONCEPTS

Global Similar Types:
- *Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin / Arisaema triphyllum* Floodplain Forest (CEGL004418) a later-successional bottomland association.
- *Liquidambar styraciflua - Quercus (alba, falcata)* Ruderal Forest (CEGL007217) of interior provinces.
- *Liquidambar styraciflua - Quercus nigra - Pinus taeda / Vaccinium elliottii - Morella cerifera* Ruderal Forest (CEGL007726) a more diverse successional forest of the Coastal Plain.

Global Related Concepts:
- sweet gum successional forest (Collins and Anderson 1994) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
National Capital Parks-East Classification Comments: Ruderal Sweetgum Forest is also referred to as Successional Sweetgum Upland Forest.

ELEMENT DISTRIBUTION

National Capital Parks-East Range: Most of the observations of this type at NACE are at Piscataway; there is also one at the northern Baltimore-Washington Parkway. Similarly, most of the mapped extent is at Piscataway and nearby areas, but stands are found throughout the unit.
Global Range: This association may be found throughout the southeastern United States, in the coastal plains and interior ecoregions. It is also attributed to New Jersey with the merger of CEGL006927. The status in intervening states (e.g., Delaware, Maryland) needs to be assessed.
Nations: US
States/Provinces: AL:SNA, AR:SNA, DC?:SNA, DE:SNA, GA:SNA, KY:SNA, LA:SNA, MD:SNA, MS:SNA, NC:SNA, NJ:SNA, OK:SNA, SC:SNA, TN:SNA, VA:SNA
TNC Ecoregions: 31:P, 32:P, 40:P, 41:C, 42:C, 43:C, 44:C, 50:C, 51:P, 52:C, 53:P, 56:P, 57:C, 58:C, 62:C
USFS Ecoregions (2007): 221Hc:CCC, 223Ef:CCC, 223Fa:CCP, 223Fb:CCC, 223Fe:CCP, 231Aa:CCP, 231Ab:CCC, 231Ha:CCC, 231Hc:CCC, 231Hi:CCC, 232Ab:CCC, 232Ac:CCP, 232Ad:CCC, 232B:CC, 232Cb:CCP, M221Dc:???, M221Dd:???
Federal Lands: NPS (Big South Fork, Chickamauga-Chattanooga?, Colonial, Cowpens, George Washington Birthplace, Great Smoky Mountains, Guilford Courthouse, Horseshoe Bend, Kings Mountain, Mammoth Cave, Moores Creek, Natchez Trace, National Capital-East, Ninety Six, Petersburg, Shiloh, Thomas Stone, Vicksburg); USFS (Cherokee?, Oconee?, St. Francis); USFWS (Cape May, E.B. Forsythe, Patuxent, Prime Hook, Supawna Meadows)

ELEMENT SOURCES

National Capital Parks-East Plots: None.
National Capital Parks-East Description Author(s): M. Pyne
Global Description Author(s): R. White and M. Pyne
References: Collins and Anderson 1994, Coxe 2009, Lea et al. 2012, Lea et al. 2013, McCrain and Church 1985, McManamay et al. 2012a, NatureServe 2009, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman et al.

2011, Patterson 2008c, Patterson 2008d, Patterson 2008e, Pyne et al. 2010, Schotz pers. comm., Southeastern Ecology Working Group n.d.*, White 2004, White and Govus 2003, White and Govus 2005, White and Pyne 2003

1.B.2. Cool Temperate Forest & Woodland

Cool Temperate Forest & Woodland includes temperate deciduous forest and woodland, temperate needle-leaved forest and woodland, and temperate rainforest, dominated by broad-leaved or needle-leaved tree growth forms.

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

These eastern North American forests and woodlands are dominated by cold-deciduous broadleaf trees, sometimes mixed with conifers, with strong diagnostic tree species, including *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Carya* spp. (especially *Carya cordiformis* (bitternut hickory), *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory)), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Quercus* (oak) spp. (especially *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak)), and *Tilia americana* (American basswood).

M016. Southern & South-Central Oak - Pine Forest & Woodland

This wide-ranging vegetation type encompasses fire-dependent forests and woodlands found in a broad band across the southeastern United States and dominated by various combinations of *Quercus* (oak) species, *Pinus* (pine) species, and other hardwood trees. It occurs primarily in the unglaciated part of the Interior Low Plateaus, the Appalachian, Piedmont, Ozark-Ouachita, and upper coastal plain regions (north of the primary range of *Pinus palustris* (longleaf pine)), as well as to the west in eastern Oklahoma, southeastern Kansas, and the Inner Coastal Plain of central Texas. In many areas, this is the predominant natural upland vegetation of the landscape. Stands of these forests are dominated by combinations of upland *Quercus* (oak) spp., particularly *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak), *Quercus rubra* (northern red oak), *Quercus stellata* (post oak), and *Quercus velutina* (black oak), along with *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Carya pallida* (sand hickory), and other *Carya* (hickory) spp. In some drier examples on more acidic substrates, *Quercus montana* (chestnut oak) is typical. Pines may be abundant or even dominant in some examples, including *Pinus echinata* (shortleaf pine), *Pinus palustris* (longleaf pine) (rarely), *Pinus taeda* (loblolly pine), and *Pinus virginiana* (Virginia pine). Fire-intolerant species such as *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), and *Nyssa sylvatica* (blackgum) may be common in some examples. In the western part of the range, examples are dominated by short, stunted *Quercus stellata* (post oak) and/or *Quercus marilandica* (blackjack oak) with *Carya texana* (black hickory). These patches of forest and woodland are often interspersed with patches of tall- and midgrass prairie. On limestone-derived soils examples contain various combinations of *Fraxinus quadrangulata* (blue ash), *Juniperus virginiana* (eastern red-cedar), *Quercus muehlenbergii* (chinquapin oak), *Quercus pagoda* (cherrybark oak), and *Quercus shumardii* (Shumard oak). Shrub and herb layer species vary considerably, depending on 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. Substrates also vary widely, including soils derived from felsic and mafic metamorphic rocks; sedimentary limestones, sandstones, and shales; as well as some coastal plain poorly consolidated sediments of silts and clays, as well as more rarely shell deposits or limesands. These soils range from calcareous to acidic; soils may be very shallow and well- to excessively well-drained in the dry expressions, and moderately well-drained in the submesic to dry-mesic ones. Examples may also occur on dense clay hardpans over mafic rocks. Examples can occur on a variety of topographic and landscape positions, including ridgetops and upper and midslopes.

G165. Piedmont-Coastal Plain Oak Forest & Woodland

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* (oak) spp., sometimes with *Pinus* (pine) 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* (oak) spp., particularly *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak), *Quercus rubra* (northern red oak), *Quercus stellata* (post oak), and *Quercus velutina* (black oak), along with *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), and other *Carya* (hickory) spp. Other common tree species include *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Pinus echinata* (shortleaf pine), *Pinus taeda* (loblolly pine), and *Pinus virginiana* (Virginia pine).

A4438 *Quercus montana* - *Quercus alba* Piedmont Dry Forest Alliance

[CEGL008521] *Quercus alba - Quercus (coccinea, velutina, montana) / Gaylussacia baccata* Forest

Translated Name: **White Oak - (Scarlet Oak, Black Oak, Chestnut Oak) / Black Huckleberry Forest**
Common Name: **Piedmont-Central Appalachian Mixed Oak / Heath Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Piedmont-Coastal Plain Oak Forest & Woodland (G165)
Alliance	*Quercus montana* - *Quercus alba* Piedmont Dry Forest Alliance (A4438)

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, West Virginia and Maryland, but probably also occurs at similar sites in 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* (white oak), *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), and *Quercus montana* (chestnut oak). Various *Pinus* (pine) spp., including *Pinus virginiana* (Virginia pine), *Pinus echinata* (shortleaf pine), *Pinus strobus* (eastern white pine), and *Pinus rigida* (pitch pine), are frequent overstory associates, particularly following fire or logging disturbances. *Quercus falcata* (southern red oak), *Quercus stellata* (post oak), *Carya glabra* (pignut hickory), and *Carya tomentosa* (mockernut hickory) are infrequent canopy trees. *Nyssa sylvatica* (blackgum), *Amelanchier arborea* (common serviceberry) and, in the southern part of the range, *Oxydendrum arboreum* (sourwood) attain exceptional abundance and stature in these forests, dominating the subcanopy layers and occasionally reaching the overstory. *Acer rubrum* (red maple) and *Sassafras albidum* (sassafras) 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

Chesapeake & Ohio Canal National Historical Park Environment: This oak forest was sampled at two locations in the park. One site is an upper slope rolling upland (piedmont) with a south aspect, and the other is a steep mid sideslope with a northwest aspect. The soils are rapidly and well-drained sandy loam. The unvegetated surface is dominated by leaf litter (92-98% cover) with some small rocks (0-3%), wood (1-2%), bare soil (1-3%), and mosses and lichens (2-12%). Evidence of disturbance includes deer grazing/browsing and the presence of exotic species.

George Washington Memorial Parkway Environment: Low-Elevation Mixed Oak / Heath Forest is a dry, deciduous, oak-dominated forest occurring on local ridge crests and gentle upper slopes at the southern end of the park. Soils are acidic and infertile, with low pH values and low base saturation.

National Capital Parks-East Environment: This mixed oak forest was sample at two locations in the park. One site is flat, and the other is on a rolling upper slope. Soils are well-drained sandy loam. The unvegetated ground surface is dominated by leaf litter along with some wood. At one site, all the *Rhododendron periclymenoides* (pink azalea) was dead.

Prince William Forest Park Environment: This association is a dry, deciduous, oak-dominated forest occurring on broad ridge crests and upper slope convexities throughout Prince William Forest Park. Soils are acidic and infertile, with low pH values and low base saturation.
Rock Creek Park Environment: This mixed oak / heath forest is found on dry, flat and rolling hilltops in two geologic settings in Rock Creek Park. Most stands are underlain by remnants of ancient river terraces composed of cobbles, gravel and sand. Some stands are underlain by acidic bedrock and finer-textured mineral soils derived from it. As with Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299), the majority of the examples of this community occur on ancient river terraces. Where found over bedrock, this natural community is predominantly found on the metasedimentary Laurel Formation.
Wolf Trap National Park for the Performing Arts Environment: Low-Elevation Mixed Oak / Heath Forest is a dry, deciduous, oak-dominated forest occurring on upland ridges and gentle upland slopes throughout Wolf Trap National Park. Soils are strongly acidic and nutrient-poor.
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

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderate (60+% cover) tree canopy of the stands are usually 20-35 m tall, but if shorter (10-20 m tall) the subcanopy is not differentiated. The tree canopy is dominated by *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), and *Quercus montana* (chestnut oak), as is the sparse (40%) subcanopy (10-20 m), when present. Additional tree species which may be codominant include *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum), other less common trees include *Quercus rubra* (northern red oak), *Fagus grandifolia* (American beech), *Pinus pungens* (Table Mountain pine), *Pinus virginiana* (Virginia pine), *Pinus echinata* (shortleaf pine), *Pinus strobus* (eastern white pine), *Liriodendron tulipifera* (tuliptree), *Carya alba*, *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Betula lenta* (sweet birch), *Prunus serotina* (black cherry), and *Sassafras albidum. Acer rubrum* and *Nyssa sylvatica* (blackgum) are also prominent in the sparse (20%) tall-shrub layer (6-10 m). Other tall shrubs include *Amelanchier arborea* (common serviceberry), *Cornus florida* (flowering dogwood), *Fagus grandiflora*, *Kalmia latifolia* (mountain laurel), *Carya glabra* (pignut hickory), *Rhododendron periclymenoides* (pink azalea), *Hamamelis virginiana* (American witch-hazel), and saplings of the other canopy trees. Short shrubs in the herbaceous/field layer (20-60%) include *Gaylussacia baccata* (black huckleberry), *Smilax rotundifolia* (roundleaf greenbrier), *Ostrya virginiana* (hophornbeam), *Sassafrass albidum*, *Viburnum acerifolium* (mapleleaf viburnum), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium stamineum* (deerberry). Herbaceous plants include *Chimaphila maculata* (striped prince's pine), *Aristolochia serpentaria* (Virginia snakeroot), *Danthonia spicata* (poverty oatgrass), *Dichanthelium boscii* (Bosc's panicgrass), *Dichanthelium commutatum* (variable panicgrass), *Dichanthelium depauperatum* (starved panicgrass), *Carex albicans* (whitetinge sedge), *Carex digitalis* (slender woodland sedge), *Carex laxiculmis* (spreading sedge), *Carex swanii* (Swan's sedge), *Carex willdenowii* (Willdenow's sedge), *Carex pensylvanica* (Pennsylvania sedge), *Carex tonsa* (shaved sedge), *Chimaphila maculata* (striped prince's pine), *Comandra umbellata ssp. umbellata* (bastard toadflax), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Eragrostis hypnoides* (teal lovegrass), *Galium circaezans* (licorice bedstraw), *Hieracium venosum* (rattlesnakeweed), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Dioscorea quaternata* (fourleaf yam), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Potentilla canadensis* (dwarf cinquefoil), *Eurybia divaricata* (white wood aster), *Polygonatum biflorum* (smooth Solomon's seal), *Thelypteris noveboracensis* (New York fern), *Viola canadensis* (Canadian white violet), *Dichanthelium dichotomum* (cypress panicgrass), *Heuchera americana* (American alumroot), and *Deschampsia flexuosa var. flexuosa* (wavy hairgrass), Nonvascular species cover up to 20% of the ground surface. Only one exotic species were reported from sampled stands.
George Washington Memorial Parkway Vegetation: The canopy is primarily dominated by *Quercus montana* (chestnut oak) but can also have significant cover of *Quercus alba* (white oak) and *Quercus falcata* (southern red oak) and, to a lesser extent *Quercus coccinea* (scarlet oak). Frequent canopy and subcanopy associates include

Nyssa sylvatica (blackgum), *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Ilex opaca var. opaca* (American holly), *Diospyros virginiana* (common persimmon), and *Sassafras albidum* (sassafras). *Pinus virginiana* (Virginia pine) can be scattered throughout the canopy, particularly following recent disturbance. The shrub layer may be patchy to dense and continuous and is typically dominated by the ericaceous shrubs *Gaylussacia baccata* (black huckleberry), *Vaccinium stamineum* (deerberry), and/or *Vaccinium pallidum* (Blue Ridge blueberry). Other shrubs often include saplings of canopy species, *Kalmia latifolia* (mountain laurel), *Rhododendron periclymenoides* (pink azalea), *Smilax rotundifolia* (roundleaf greenbrier), and *Toxicodendron radicans* (eastern poison-ivy). Herbs are typically sparse and include *Chimaphila maculata* (striped prince's pine), *Mitchella repens* (partridgeberry), and *Danthonia spicata* (poverty oatgrass). Species richness is typically low, with an average of 20 species per 400-square-meter quadrat.

National Capital Parks-East Vegetation: The dense (up to 90% cover) canopy (20-35 m tall) and moderate (40%) subcanopy (10-20 m) are dominated by oaks, including *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak), and *Quercus velutina* (black oak); additional tree species in the subcanopy include *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), and *Sassafras albidum* (sassafras). The sparse to dense (20-80%) shrub layers (0.5-10 m) are dominated by canopy tree saplings along with *Castanea pumila var. pumila* (chinquapin), *Ilex opaca var. opaca* (American holly), *Vaccinium fuscatum* (black highbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium stamineum* (deerberry). Both sites have very dense cover of the short shrub *Gaylussacia baccata* (black huckleberry). Herbs are very sparse; the majority of the herb layer being composed of tree and shrub seedlings.

Prince William Forest Park Vegetation: The canopy has variable dominance by *Quercus alba* (white oak), *Quercus montana* (chestnut oak), and, to a lesser extent, *Quercus coccinea* (scarlet oak), with some stands mixed and others exhibiting strong dominance by one species or the other. Frequent canopy and subcanopy associates include *Quercus velutina* (black oak), *Nyssa sylvatica* (blackgum), *Acer rubrum* (red maple), *Ilex opaca var. opaca* (American holly), *Carya tomentosa* (mockernut hickory), *Cornus florida* (flowering dogwood), and *Sassafras albidum* (sassafras). *Pinus virginiana* (Virginia pine) can be scattered throughout the canopy, particularly following recent disturbance. *Pinus rigida* (pitch pine) and *Pinus pungens* (Table Mountain pine) are rare canopy associates in areas that have a history of fires. The shrub layer may be patchy to dense and continuous and is typically dominated by the ericaceous shrubs *Gaylussacia baccata* (black huckleberry), *Vaccinium stamineum* (deerberry), and/or *Vaccinium pallidum* (Blue Ridge blueberry). Other shrubs often include saplings of canopy species, *Kalmia latifolia* (mountain laurel), *Rhododendron periclymenoides* (pink azalea), and *Smilax rotundifolia* (roundleaf greenbrier). Herbs are typically sparse and include *Chimaphila maculata* (striped prince's pine), *Mitchella repens* (partridgeberry), and *Danthonia spicata* (poverty oatgrass). Species richness is typically low, with an average of 20 species per 400-square-meter quadrat.

Rock Creek Park Vegetation: The canopy is codominated by a mixture of oaks. Common canopy trees include *Quercus alba* (white oak), *Quercus prinus*, *Quercus coccinea* (scarlet oak), and *Quercus rubra* (northern red oak). The canopy may also contain *Quercus velutina* (black oak), *Quercus falcata* (southern red oak), *Pinus virginiana* (Virginia pine), and *Pinus pungens* (Table Mountain pine). Common understory trees and large shrubs include *Prunus serotina* (black cherry), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), *Carya alba*, and *Acer rubrum* (red maple). *Fagus grandifolia* (American beech) is becoming more common. Cover of shrubs and vines is variable, and sometimes very low. When shrubs are present, common species include *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), *Amelanchier arborea* (common serviceberry), *Hamamelis virginiana* (American witch-hazel), and *Viburnum acerifolium* (mapleleaf viburnum). The field layer is typically sparse except for tree seedlings. The understory may occasionally contain *Cornus florida* (flowering dogwood), *Ilex opaca* (American holly), *Fagus grandifolia* (American beech), *Rhododendron periclymenoides*, and *Kalmia latifolia* (mountain laurel). Occasional herbs found in the field layer include *Chimaphila maculata* (striped prince's pine), *Mitchella repens* (partridgeberry), and *Eurybia divaricata* (white wood aster). Some occurrences of this community have scattered *Pinus virginiana* (Virginia pine) in the canopy, probably indicating a past disturbance. A few *Pinus pungens* (Table Mountain pine) (rare outside of the Appalachian mountains) are also scattered in this community at Rock Creek Park. Many of the pines are gradually dying out from old age and as they are overtopped by oaks. *Castanea dentata* once grew in the mostly oak canopy of this dry natural community (although it probably would have been more common in more mesic communities (G. Fleming pers. comm. 2007). *Castanea dentata* sprouts can be observed in the tall-shrub layer of one occurrence of this community at Rock Creek Park off the Western Ridge Trail near Picnic Area 19. These sprouts can develop into small trees, but the chestnut blight, an introduced fungus, prevents non-resistant trees from maturing much beyond the sapling stage.

Wolf Trap National Park for the Performing Arts Vegetation: The canopy is mixed with variable dominance by *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Quercus montana* (chestnut oak). Frequent

canopy and subcanopy associates include *Quercus coccinea* (scarlet oak), *Nyssa sylvatica* (blackgum), *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), and *Sassafras albidum* (sassafras). *Pinus virginiana* (Virginia pine) is often scattered throughout the canopy, particularly following recent disturbance. The shrub layer may be patchy to dense and continuous and is usually dominated by the deciduous ericaceous shrubs *Gaylussacia baccata* (black huckleberry), *Vaccinium stamineum* (deerberry), and/or *Vaccinium pallidum* (Blue Ridge blueberry). Other shrubs often include saplings of canopy species, *Viburnum acerifolium* (mapleleaf viburnum), *Diospyros virginiana* (common persimmon), *Ilex opaca var. opaca* (American holly), and *Smilax rotundifolia* (roundleaf greenbrier). Herbs are typically sparse and include *Chimaphila maculata* (striped prince's pine), *Mitchella repens* (partridgeberry), *Medeola virginiana* (Indian cucumber), *Danthonia spicata* (poverty oatgrass), and *Polygonatum biflorum* (smooth Solomon's seal).

Global Vegetation: The vegetation is a closed to very open oak forest with mixed and variable canopy dominance by *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), and *Quercus montana* (chestnut oak). Various *Pinus* (pine) spp., including *Pinus virginiana* (Virginia pine), *Pinus echinata* (shortleaf pine), *Pinus strobus* (eastern white pine), and *Pinus rigida* (pitch pine), are frequent overstory associates, particularly following fire or logging disturbances. *Quercus falcata* (southern red oak), *Quercus stellata* (post oak), *Carya glabra* (pignut hickory), and *Carya tomentosa* (mockernut hickory) are infrequent canopy trees. *Nyssa sylvatica* (blackgum), *Amelanchier arborea* (common serviceberry) and, in the southern part of the range, *Oxydendrum arboreum* (sourwood) attain exceptional abundance and stature in these forests, dominating the subcanopy layers and occasionally reaching the overstory. *Acer rubrum* (red maple) and *Sassafras albidum* (sassafras) are other common understory trees. The shrub layer is typically dominated by deciduous ericaceous species, with *Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), and/or *Vaccinium stamineum* (deerberry) consistently forming dense colonies. Less abundant or constant shrubs and vines include *Castanea pumila* (chinquapin), *Quercus ilicifolia* (bear oak), *Kalmia latifolia* (mountain laurel), *Rhododendron periclymenoides* (pink azalea), *Lyonia ligustrina* (maleberry), *Vaccinium stamineum* (deerberry), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), and *Cornus florida* (flowering dogwood). Despite high shrub densities, a number of low-cover herbs and subshrubs occur in the type, including *Chimaphila maculata* (striped prince's pine), *Isotria verticillata* (large whorled pogonia), *Uvularia puberula* (mountain bellwort), *Epigaea repens* (trailing arbutus), *Pteridium aquilinum var. latiusculum* (western brackenfern), *Cypripedium acaule* (moccasin flower), *Gentiana villosa* (striped gentian), *Comandra umbellata* (bastard toadflax), *Angelica venenosa* (hairy angelica), and *Iris verna* (dwarf violet iris). Mean species richness of 54 Virginia, Maryland, and District of Columbia plot samples is 25 taxa per 400 m2.

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* (American beech), *Acer rubrum* (red maple), and *Ilex opaca* (American holly) are rapidly invading the understories of many Piedmont stands from which fire has been excluded for many decades.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus* spp.
Tree canopy	Broad-leaved deciduous tree	*Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak)
Tree subcanopy	Broad-leaved deciduous tree	*Amelanchier arborea* (common serviceberry), *Oxydendrum arboreum* (sourwood)
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Gaylussacia baccata* (black huckleberry), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), *Quercus velutina* (black oak)

George Washington Memorial Parkway: *Gaylussacia baccata* (black huckleberry), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry)

National Capital Parks-East: *Gaylussacia baccata* (black huckleberry), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak), *Quercus velutina* (black oak), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry)

Prince William Forest Park: *Gaylussacia baccata* (black huckleberry), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry)

Rock Creek Park: *Gaylussacia baccata* (black huckleberry), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Vaccinium pallidum* (Blue Ridge blueberry)
Wolf Trap National Park for the Performing Arts: *Gaylussacia baccata* (black huckleberry), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry)
Global: *Amelanchier arborea* (common serviceberry), *Castanea pumila* (chinquapin), *Gaylussacia baccata* (black huckleberry), *Isotria verticillata* (large whorled pogonia), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), *Quercus velutina* (black oak), *Rhododendron periclymenoides* (pink azalea)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium)
Rock Creek Park: Invasive/Exotic Plants: *Berberis thunbergii* (Japanese barberry, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Viburnum dilatatum* (linden arrow-wood)

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 (montana, 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* (southern red oak).
- *Quercus montana - (Quercus coccinea) / Carya pallida / Vaccinium arboreum - Vaccinium pallidum* Forest (CEGL008431)
- *Quercus montana - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299) of the Central Appalachians and northern Piedmont.

Global Related Concepts:
- *Quercus (coccinea, falcata) - Pinus (taeda, virginiana) / Gaylussacia baccata - Vaccinium stamineum / Chimaphila maculata* Forest (Walton et al. 2001) =
- *Quercus alba - Quercus (coccinea, velutina, prinus) / Gaylussacia baccata* Forest (Fleming et al. 2007b) =
- *Quercus alba - Quercus (coccinea, velutina, prinus) / Gaylussacia baccata* Forest (Fleming and Taverna 2006) =
- *Quercus alba - Quercus (coccinea, velutina, prinus) / Gaylussacia baccata* Forest [Eastern Foothills Oak / Heath Forest] (Vanderhorst 2017d) =
- *Quercus alba - Quercus coccinea - Quercus velutina / Amelanchier arborea / Gaylussacia baccata* Forest (Young et al. 2007a) =
- *Quercus alba - Quercus coccinea - Quercus velutina / Gaylussacia baccata - Vaccinium stamineum* Forest (Fleming 2002a) =
- *Quercus alba - Quercus falcata - Carya tomentosa / Cornus florida* Association (Rawinski et al. 1996) **?**
- *Quercus alba - Quercus montana / Gaylussacia baccata* Forest (McCoy and Fleming 2000) =
- *Quercus alba - Quercus velutina - Quercus coccinea / Gaylussacia baccata - Vaccinium stamineum* Forest (Fleming and Patterson 2003) <
- *Quercus coccinea - Quercus velutina - Quercus alba / Amelanchier arborea / Gaylussacia baccata* Forest (Fleming and Coulling 2001) <

- *Quercus montana - Quercus alba / Vaccinium pallidum - Gaylussacia baccata* Forest (Fleming and Patterson 2003) <
- *Quercus prinus - Quercus alba / Vaccinium pallidum - (Gaylussacia baccata)* Forest (Fleming 2002a) =
- White Oak - Black Oak - Northern Red Oak: 52 (Eyre 1980) >
- White Oak - Scarlet Oak - Pine Type (Schmalzer and DeSelm 1982) =

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
George Washington Memorial Parkway Classification Comments: Low-Elevation Mixed Oak / Heath Forest may be difficult to distinguish from Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299) since both are frequently dominated by *Quercus montana* (chestnut oak). Low-Elevation Mixed Oak / Heath Forest can be distinguished by its location on gentle ridge crests and slopes (rather than steep slopes), the presence of a low ericaceous shrub layer, and the absence or lower cover of *Kalmia latifolia* (mountain laurel).
George Washington Memorial Parkway Other Comments: *Fagus grandifolia* (American beech) is actively invading the shrub and subcanopy layers of Low-Elevation Mixed Oak / Heath Forest. Its recent emergence in oak / heath forests is usually attributed to fire exclusion.
Prince William Forest Park Classification Comments: Low-Elevation Mixed Oak / Heath Forest can be distinguished from Piedmont Dry-Mesic Acidic Oak - Hickory Forest (CEGL008475) by the presence of a dense, almost continuous ericaceous shrub layer, the absence or lower frequency of *Carya* (hickory) species, and the absence or very low cover of herbaceous species. Low-Elevation Mixed Oak / Heath Forest may be difficult to distinguish from Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest (CEGL6919) since it can have patches of high *Kalmia latifolia* (mountain laurel) cover. Low-Elevation Mixed Oak / Heath Forest can be distinguished by its location on gentle ridge crests and flats (rather than steep slopes along streams) and oak-dominated canopy generally lacking *Fagus grandifolia* (American beech).
Prince William Forest Park Other Comments: Stand composition can vary based on the relative abundance of canopy dominants (e.g., *Quercus alba* (white oak) versus *Quercus prinus*), as well as on the coverage of ericaceous shrubs.
Rock Creek Park Classification Comments: As this community's common name suggests, it can be recognized by the diverse mix of oaks in the forest canopy, and the *Vaccinium pallidum* (Blue Ridge blueberry) and *Gaylussacia baccata* (black huckleberry) bushes (heaths) growing in the understory. Diagnostic features include a mix of oaks such as *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus prinus*, *Quercus velutina* (black oak), and *Quercus coccinea* (scarlet oak) in the canopy. *Quercus falcata* (southern red oak) is sometimes present, as are the occasional *Pinus virginiana* (Virginia pine) or *Pinus pungens. Fagus grandifolia* and *Liriodendron tulipifera* (tuliptree) are generally absent from the canopy. Typical small trees include *Sassafras albidum* (sassafras) (with its multi-shaped leaves), *Prunus serotina* (black cherry), beautiful *Cornus florida* (flowering dogwood), and *Amelanchier arborea* (common serviceberry) (whose berries are popular with animals). Stunted blueberry and huckleberry bushes are nearly always present (unless deer have browsed them down). *Kalmia latifolia* (mountain laurel) is less common but sometimes present. Herbaceous plants are uncommon. It occupies similar landscape positions as Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299), but is distinguished from it by having a mix of dry-site oaks in the canopy, a general lack of *Kalmia latifolia* (mountain laurel) but a mixture of other heath shrubs in the understory (though browse and other stressors can make these inconspicuous). In contrast to Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest (CEGL006919), this community occurs on rolling hilltops, not on steep slopes, lacks dense patches of *Kalmia latifolia* (mountain laurel), and lacks *Fagus grandifolia* (American beech) in the canopy. In contrast to Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075), it has noticeable amounts of Heath Family shrubs such as *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), and *Rhododendron* (rhododendron, azalea) spp., has virtually no *Lindera benzoin* (northern spicebush) or *Polystichum acrostichoides* (Christmas fern), and little or no *Liriodendron tulipifera* (tuliptree), and is often underlain by remnants of ancient river terraces.
Rock Creek Park Other Comments: As with Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299), dry environmental conditions make it difficult for all but the toughest exotic plants to invade. Even so, some sites are plagued by non-native plants such as multiflora rose that withstand the dry, acidic soils better than most other invasive plants. It is likely that stands of this forest burned occasionally in the past. This shaped the selection of plant species that characterizes this natural community by weeding out fire-intolerant plants such as *Fagus grandifolia* (American beech), *Ilex opaca* (American holly), and *Acer rubrum* (red maple). The presence of these species today in this hilltop environment shows how the lack of natural disturbance can alter a forest over

time: without a fire disturbance to remove thin-barked trees and shrubs such as these from the understory, certain fire-intolerant species can successfully establish themselves under the closed canopy of this community. Pines, especially *Pinus virginiana* (Virginia pine), were much more common in Rock Creek Park's dry hilltop stands in the 1970s (when burning, logging, or plowing on these sites was more recent history) than they are today (Anderson et al. 1977). As the old pines die out, new pine seedlings will be unable to get established and replace them without disturbances that introduce sunlight and expose mineral soil on the forest floor.

Wolf Trap National Park for the Performing Arts Classification Comments: The canopy of Low-Elevation Mixed Oak / Heath Forest can be similar to Central Appalachian-Northern Piedmont Chestnut Oak Forest. It can be distinguished from that community by its location on gentle slopes and ridges, its dense low-shrub layer dominated by *Gaylussacia baccata* (black huckleberry) and *Vaccinium* (blueberry) spp., and the absence or low cover of *Kalmia latifolia* (mountain laurel).

Wolf Trap National Park for the Performing Arts Other Comments: Stands can vary based on canopy dominants (*Quercus alba* (white oak) versus *Quercus prinus*) and coverage of the various deciduous heath species (ericaceous shrubs).

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* (white oak), 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* (southern red oak) and *Quercus stellata* (post oak) further distinguish the type. *Quercus montana* (chestnut oak) and *Kalmia latifolia* (mountain laurel), although present and occasionally abundant, are not as important in this unit as in related Central Appalachian oak/heath vegetation types, particularly Central Appalachian-Northern Piedmont Chestnut Oak 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 montana* (chestnut oak) have proven unworkable because significant environmental or floristic differences between the putative groups are lacking.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled near Roundtop Hill and Kasecamp Neck Road. It was sampled and mapped near Canal mile 38 (Marble Quarry) and mapped near Canal mile 43 (Indian Flats). It also occurs in many locations between Canal mile 130 (Leopards Mill/Lock 53) and Canal mile 172 (upstream of Pigmans Ferry).

George Washington Memorial Parkway Range: Low-Elevation Mixed Oak / Heath Forest occurs at two sites in the park: on the higher slopes of Fort Hunt Park and on upland slopes near Mount Vernon.

National Capital Parks-East Range: This forest association was sampled at Greenbelt Park in Prince Georges County, Maryland. The additional points and mapped polygons of this type are primarily north of Suitland Parkway, at Greenbelt, Suitland Parkway, the northern Baltimore-Washington Parkway, Oxon Hill Parkway, Fort Washington, and the central area.

Prince William Forest Park Range: Low-Elevation Mixed Oak / Heath Forest forms large patches on dry ridge crests and upper slopes throughout the park. There are 150 polygons mapped, ranging in size from 0.13 to 30.83 hectares, and covering a total of 803.12 hectares (1984.55 acres). The most extensive examples occur at Oak Ridge Campground and directly to the east along the park loop road.

Rock Creek Park Range: This community is relatively uncommon at Rock Creek Park. Some good examples are located (1) on the Meadow Link Trail at the top of the hill, (2) on the White Horse Trail near the Nature Center, at the top of the hill just southeast of the Rock Creek Park Horse Center, (3) along the eastern side of the Western Ridge Trail near Picnic Area 19, and (4) on several hilltops between Wise Road and Bingham Drive. This forest association occupies similar landscape positions as Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299) but is slightly more common and covers larger patches of the landscape.

Wolf Trap National Park for the Performing Arts Range: Discrete patches of Low-Elevation Mixed Oak / Heath Forest occur on slopes throughout Wolf Trap National Park.

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 West Virginia.
Nations: US
States/Provinces: DC:SNR, KY:SNR, MD:SNR, PA:SNR, SC:SNA, TN:SNR, VA:S5, WV:S2S3
TNC Ecoregions: 50:C, 52:C, 57:C, 58:C, 59:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, 221Dd:CCC, 221De:CCC, 221Hc:CCC, 221He:CC?, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ad:CCC, 232Ha:CC?, 232Hb:CCC, 232Ib:CCC, 232Je:C??, M221Aa:CCP, 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

Chesapeake & Ohio Canal National Historical Park Plots: (2 plots): CHOH.069, CHOH.074.
George Washington Memorial Parkway Plots: GWMP.13.
National Capital Parks-East Plots: (2 plots: NACE.001, NACE.002).
Prince William Forest Park Plots: PRWI.35, PRWI.37, PRWI.40, PRWI.41.
Rock Creek Park Plots: ROCR.1, ROCR.4.
Wolf Trap National Park for the Performing Arts Plots: WOTR.2.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo, C.W. Nordman
George Washington Memorial Parkway Description Author(s): K. Taverna and G. Fleming
National Capital Parks-East Description Author(s): M.J. Russo
Prince William Forest Park Description Author(s): K. Taverna
Rock Creek Park Description Author(s): J. Teague
Wolf Trap National Park for the Performing Arts Description Author(s): K. Taverna
Global Description Author(s): G.P. Fleming, P. Coulling, L.A. Sneddon
References: Anderson et al. 1977, Eastern Ecology Working Group n.d., 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 Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Hall and Mathews 1974, Harbor 1996, Harrison 2004, Harrison 2011, Lea et al. 2012, McCoy and Fleming 2000, Nelson 1986, Patterson 2008a, Patterson 2008c, Patterson 2008e, Rawinski et al. 1996, Schmalzer and DeSelm 1982, Taverna and Patterson 2008, Vanderhorst 2017d, WVNHP unpubl. data, Walton et al. 2001, Young et al. 2006, Young et al. 2007a, Young et al. 2009

A3293 *Quercus rubra - Quercus alba - Carya* spp. Piedmont Forest Alliance

These are dry-mesic to mesic upland oak forests dominated by *Quercus alba* (white oak) and/or *Quercus rubra* (northern red oak), with or without *Carya* (hickory) 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* (white oak) usually dominates, either alone or in combination with *Quercus falcata* (southern red oak) (especially on drier sites), *Quercus rubra* (northern red oak) (especially on moister sites), and sometimes *Quercus velutina* (black oak). *Carya* (hickory) species (particularly *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), or *Carya ovata* (shagbark hickory)) are typically common either in the canopy or subcanopy. Other associated species include *Acer leucoderme* (chalk maple), *Acer rubrum* (red maple), *Calycanthus floridus* (eastern sweetshrub), *Cornus florida* (flowering dogwood), *Fraxinus americana* (white ash), *Kalmia latifolia* (mountain laurel), *Nyssa sylvatica* (blackgum), *Ostrya virginiana* (hophornbeam), *Oxydendrum arboreum* (sourwood), *Pyrularia pubera* (buffalo nut), 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.

[CEGL008475] *Quercus alba - Quercus rubra - Carya tomentosa / Vaccinium stamineum / Desmodium nudiflorum* Piedmont Forest

Translated Name: **White Oak - Northern Red Oak - Mockernut Hickory / Deerberry / Naked-flower Tick-trefoil Piedmont**

Forest
Common Name: **Piedmont Dry-Mesic Acidic 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-Coastal Plain Oak Forest & Woodland (G165)
Alliance	*Quercus rubra - Quercus alba - Carya* spp. Piedmont Forest Alliance (A3293)

ELEMENT CONCEPT

Global Summary: This forest is found on submesic to subxeric upland sites throughout the Piedmont of Georgia, the Carolinas, Virginia, and south-central Maryland. It favors mid- to upper-slope positions with northerly or easterly aspects, or mid- to lower slopes with more southerly aspects. In drier landscapes, this type occupies habitats considered relatively mesic (e.g., concave slopes, lower slopes, shallow ravines). These sites are described as dry to intermediate in soil moisture. The soils are moderately to strongly acidic and nutrient-poor, being weathered primarily from felsic metamorphic, metasedimentary, and sedimentary rocks, or composed of unconsolidated sediments. At some sites, soils are weathered from interbedded metasedimentary and mafic rocks, resulting in soil chemistry that is intermediate or slightly basic. Stands of this forest are closed to somewhat open and are dominated by mixtures of oaks and hickories, with *Quercus alba* (white oak) being most prevalent, along with *Quercus rubra* (northern red oak), *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Quercus falcata* (southern red oak), *Carya tomentosa* (mockernut hickory), *Carya ovalis* (red hickory), and *Carya glabra* (pignut hickory). In forests with a history of disturbance, such as selective logging or windstorms, early-successional species such as *Liriodendron tulipifera* (tuliptree) or *Pinus* (pine) sp. may codominate. In addition, *Pinus* (pine) spp., *Liriodendron tulipifera* (tuliptree), *Liquidambar styraciflua* (sweetgum), and *Acer rubrum* (red maple) may be common. Understory species include *Acer rubrum* (red maple), *Cornus florida* (flowering dogwood), *Oxydendrum arboreum* (sourwood), *Ilex opaca* (American holly), and *Nyssa sylvatica* (blackgum). Shrubs include *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum rafinesqueanum* (downy arrow-wood), and *Euonymus americanus* (bursting-heart). The woody vines *Vitis rotundifolia* (muscadine) and *Toxicodendron radicans* (eastern poison-ivy) often are present. Herbs vary from sparse to moderately dense, with dry-mesophytic, acid-tolerant species such as *Hexastylis* (heartleaf) spp., *Goodyera pubescens* (downy rattlesnake plantain), *Chimaphila maculata* (striped prince's pine), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Maianthemum racemosum* (feathery false lily of the valley), *Polygonatum biflorum* (smooth Solomon's seal), *Viola hastata* (halberdleaf yellow violet), *Tipularia discolor* (crippled cranefly), and *Hieracium venosum* (rattlesnakeweed) prevalent. This association occupies less nutrient-rich habitats than ~*Quercus rubra - Quercus alba - Carya glabra / Geranium maculatum* Forest (CEGL007237)$$.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This oak-hickory forest was sampled once in the park. The site is a gentle colluvial upper slope (piedmont). The soil is well-drained clay loam derived from Triassic siltstone, with a quartzite cobble colluvium cap from a gravel terrace above. The unvegetated surface is dominated by leaf litter (95% cover) with some large rocks (2%), wood (3%), bare soil (1%), and mosses and lichens (1%). Evidence of disturbance includes heavy deer grazing/browsing and the presence of exotic species.
George Washington Memorial Parkway Environment: Piedmont Dry-Mesic Acidic Oak - Hickory Forest is an uncommon community in the Potomac Gorge section of the George Washington Memorial Parkway, reaching optimal development on dry sideslopes and ridges in Great Falls Park. Small, isolated patches also occur in Turkey Run Park and the Arlington bluffs section of the parkway below Chain Bridge. Sites favored by this community are convex middle or upper slopes and ridge crests with relatively high values for solar exposure and relatively low moisture potential. Soils are very strongly to extremely acidic, infertile, medium-brown or orange-brown silty clay loams. However, mean values for calcium, magnesium, and total base saturation are distinctly higher than those of soils representing Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075), with which this type is often closely associated on the landscape. Parent materials at most sites are acidic metasedimentary rocks of the Mather Gorge and Sykesville formations. At two sites along Difficult Run in Great Falls Park, the type occurs on or close to narrow dikes of amphibolite, and in these areas, soil calcium and base saturation reach their highest levels among plots.
Manassas National Battlefield Park Environment: Piedmont Dry-Mesic Acidic Oak - Hickory Forest is widespread in the park on soils weathered from Ball's Bluff siltstone. Stands occupy low ridges and rolling to flat uplands, usually on slopes that are convex in at least one direction. Surface substrate of most sampling sites consist

of thin leaf litter, with small patches of bare mineral soil. Small siltstone boulders or stones are often exposed. Soils are typically very strongly acidic silt or silty clay loams with low to medium base status. Stands occurring on more base-saturated soils tend to have higher cover of herbaceous species, while stands over more nutrient-poor soils tend to have patchy cover of herbaceous species and scattered ericaceous shrubs.

Monocacy National Battlefield Environment: This community is limited in extent at Monocacy National Battlefield. It occurs on a slope underlain by metasiltstone of the Araby Formation. This formation weathers into more acidic soils than the limestone that underlies most of the rest of the park.

Prince William Forest Park Environment: Piedmont Dry-Mesic Acidic Oak - Hickory Forest is a deciduous forest that occurs on rolling uplands scattered throughout Prince William Forest Park over deep, well-drained soils. Stands occurring on more fertile soils tend to have higher cover of herbaceous species, while stands over more acidic soils tend to have patchy cover of herbaceous species and scattered ericaceous shrubs.

Global Environment: The sites on which this vegetation is found are described as "intermediate" in soil moisture (Jones 1988a, 1988b). Soils are less nutrient-rich than *~Quercus alba - Quercus rubra - Carya (ovata, carolinae-septentrionalis) / Cercis canadensis* Forest (CEGL007232)$$. Virginia stands occur on submesic to subxeric uplands with acidic, moderately nutrient-poor soils weathered from felsic metamorphic, metasedimentary, and sedimentary rocks (especially Triassic siltstones), and unconsolidated sediments. However, Virginia soils supporting this type are demonstrably more fertile than those supporting very species-poor mixed oak forests with dense ericaceous shrub layers. At some sites, soils are weathered from interbedded metasedimentary and mafic rocks, resulting in soil chemistry that is intermediate or slightly basic. This type frequently occupies somewhat mesic habitats (e.g., concave slopes, lower slopes, shallow ravines) in dry landscapes where mixed oak/heath types are prevalent. It is a large-patch or matrix type in some parts of Virginia but is not as abundant in the Piedmont as mixed oak/heath forests (G. Fleming pers. comm. 2001). In North Carolina, this is a matrix type, probably the most common forest type remaining in the Piedmont.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: The very dense (80+% cover) tree canopy, 20-35 m tall, is dominated by *Carya glabra* (pignut hickory) and *Quercus coccinea* (scarlet oak) along with lesser amounts of *Fraxinus americana* (white ash), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), and *Quercus velutina* (black oak). The moderate (40%) subcanopy (10-20 m) includes *Acer saccharum var. saccharum* (sugar maple) and *Carya tomentosa* (mockernut hickory). The sparse (20%) tall-shrub layer (6-10 m) and very sparse (10%) short-shrub layer (1-6 m) include *Amelanchier arborea* (common serviceberry), *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), and *Fagus grandifolia* (American beech). The herbaceous layer (10%) contains sparse amounts of *Dichanthelium boscii* (Bosc's panicgrass), *Paronychia canadensis* (smooth forked nailwort), and *Vaccinium pallidum* (Blue Ridge blueberry), among others. Two exotic species were reported from sampled stands.

George Washington Memorial Parkway Vegetation: This community is a somewhat open to closed-canopy forest, with the largest trees generally >65 cm (26 inches) dbh and mean maximum canopy height of 33 m (108 feet). *Quercus alba* (white oak) is the most important overstory tree, with by far the largest basal area and highest density of stems. Overstory composition varies from strong dominance by *Quercus alba* (white oak), to mixed dominance by several species. *Quercus rubra* (northern red oak), *Carya glabra* (pignut hickory), *Carya tomentosa* (mockernut hickory), and *Quercus velutina* (black oak) are the most constant and important overstory trees behind *Quercus alba* (white oak), while *Liriodendron tulipifera* (tuliptree) is a minor but constant gap invader. Minor overstory associates include *Carya ovalis* (red hickory), *Quercus montana* (chestnut oak), *Quercus stellata* (post oak), and *Nyssa sylvatica* (blackgum). Although still quite numerous, *Cornus florida* (flowering dogwood) was formerly abundant in the understory prior to the advent of the fungal pathogen dogwood anthracnose (*Discula destructiva*); most plots now contain infected trees and snags, along with some apparently healthy individuals. The current understory is codominated by *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum), which attain densities up to 300 and 400 stems/ha, respectively. *Fagus grandifolia* (American beech) also has fairly high density and cover in the understory of several plots.

The herb layer is typically very open and patchy (26% mean stratum cover), with considerable cover contributed by low patches of *Vaccinium pallidum* (Blue Ridge blueberry), *Viburnum acerifolium* (mapleleaf viburnum), and tree seedlings. However, many dry-mesophytic, low-cover forbs and graminoids are also present in undisturbed stands, and overall species-richness can be impressively high for a dry forest growing on nutrient-poor soils (range = 59 to 114 taxa per 400 square m). *Galium circaezans* (licorice bedstraw), *Solidago caesia* (wreath goldenrod), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Uvularia perfoliata* (perfoliate bellwort), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Carex digitalis* (slender woodland sedge),

Polygonatum biflorum var. biflorum (smooth Solomon's seal), *Dichanthelium boscii* (Bosc's panicgrass), *Cardamine concatenata* (cutleaf toothwort), *Danthonia spicata* (poverty oatgrass), *Stellaria pubera* (star chickweed), *Carex rosea* (rosy sedge), and *Agrostis perennans* (upland bentgrass) are the most constant herbaceous species. Less constant species that have relatively high fidelity to the type in the Potomac Gorge include *Prenanthes serpentaria* (cankerweed), *Scutellaria elliptica* (hairy skullcap), *Houstonia purpurea var. purpurea* (Venus' pride), *Doellingeria infirma* (cornel-leaf whitetop), *Viola triloba var. triloba* (three-lobe violet), *Carex cephalophora* (oval-leaf sedge), *Carex willdenowii* (Willdenow's sedge), *Viola hirsutula* (southern woodland violet), and *Vernonia glauca* (broadleaf ironweed). Many additional herbs occur in the plot-sampled stands. However, many stands of this type are heavily disturbed by herbivory pressure from exceedingly high deer populations. Such stands may have a rather sparse representation of low shrubs and herbs.

Manassas National Battlefield Park Vegetation: This association is a mixed oak or oak-hickory forest in which *Quercus alba* (white oak) is the leading overstory dominant. *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), *Carya tomentosa* (mockernut hickory), *Carya ovalis* (red hickory), *Carya glabra* (pignut hickory), and *Quercus coccinea* (scarlet oak) are frequent but comparatively minor overstory associates. Subcanopy tree layers are usually dominated by hickories, but *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Sassafras albidum* (sassafras) may be locally abundant. Minor understory trees include *Fraxinus americana* (white ash) and *Juniperus virginiana var. virginiana* (eastern red-cedar), neither of which is nearly as important as in Basic Oak-Hickory Forest. Characteristic species in the shrub layer are *Cornus florida* (flowering dogwood), *Amelanchier arborea* (common serviceberry), young hickories, and *Vaccinium stamineum* (deerberry). The herb layer of this association is characterized by patch-dominance of several low, ericaceous (heath family) shrubs, particularly *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), and, to a lesser extent, *Gaylussacia baccata* (black huckleberry). A number of xerophytic herbs occur frequently among these heaths, including *Agrostis perennans* (upland bentgrass), *Antennaria plantaginifolia* (woman's tobacco), *Carex albicans var. australis* (stellate sedge), *Carex hirsutella* (fuzzy wuzzy sedge), *Chimaphila maculata* (striped prince's pine), *Cunila origanoides* (common dittany), *Danthonia spicata* (poverty oatgrass), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Hieracium venosum* (rattlesnakeweed), *Houstonia purpurea* (Venus' pride), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), and *Polygonatum biflorum var. biflorum* (smooth Solomon's seal). Mean species richness of plot-sampled stands was 45 taxa per 400 square meters.

Monocacy National Battlefield Vegetation: See Global Vegetation.

Prince William Forest Park Vegetation: Overstory composition varies somewhat from stand to stand, but it is typically dominated by mixtures of oaks and hickories, such as *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Carya tomentosa* (mockernut hickory), and *Carya glabra* (pignut hickory). Variants of the association with little or no hickory, or with a nearly monospecific overstory of *Quercus alba* (white oak), also occur in the park. Other frequent canopy trees include *Liriodendron tulipifera* (tuliptree), *Quercus falcata* (southern red oak), *Quercus coccinea* (scarlet oak), and *Nyssa sylvatica* (blackgum). *Acer rubrum* (red maple), *Cornus florida* (flowering dogwood), *Nyssa sylvatica* (blackgum), and *Ilex opaca var. opaca* (American holly) are common understory/tall-shrub species. Other mesic species such as *Fagus grandifolia* (American beech) and *Asimina triloba* (pawpaw) are occasionally scattered throughout the understory. The shrub stratum varies from open to quite dense, with species from the overstory often occurring as woody saplings. Other common shrubs include *Viburnum acerifolium* (mapleleaf viburnum) and ericaceous species such as *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), and *Gaylussacia baccata* (black huckleberry). The ericaceous shrubs can exhibit small-scale patch-dominance, but do not dominate the entire shrub layer, as is typical with associations in the Mixed Oak - Heath Forest map class. The herb layer is generally sparse or patchy but can be quite species-rich; it supports diverse mixtures of both mesophytic and dry-site species. Some typical herb species found in this association include *Desmodium nudiflorum* (nakedflower ticktrefoil), *Mitchella repens* (partridgeberry), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Carex digitalis* (slender woodland sedge), *Dichanthelium boscii* (Bosc's panicgrass), *Carex laxiflora var. laxiflora* (broad looseflower sedge), *Galium circaezans* (licorice bedstraw), *Danthonia spicata* (poverty oatgrass), *Chimaphila maculata* (striped prince's pine), and *Polygonatum biflorum* (smooth Solomon's seal).

Global Vegetation: Stands of this forest are closed to somewhat open, and are dominated by mixtures of oaks and hickories, with *Quercus alba* (white oak) being most prevalent, along with *Quercus rubra* (northern red oak), *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Carya tomentosa* (mockernut hickory), *Carya ovalis* (red hickory), and *Carya glabra* (pignut hickory). *Carya* (hickory) spp. are common in this type but often most abundant in the understory. In Virginia examples, *Quercus montana* (chestnut oak) and *Quercus falcata* (southern red oak) are inconstant but sometimes important. In addition, *Pinus* (pine) spp., *Liriodendron tulipifera* (tuliptree),

Liquidambar styraciflua (sweetgum), and *Acer rubrum* (red maple) may be common, especially in disturbed stands. Understory species include *Acer rubrum* (red maple), *Cornus florida* (flowering dogwood), *Oxydendrum arboreum* (sourwood), *Ilex opaca* (American holly), and *Nyssa sylvatica* (blackgum). Shrubs include *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum rafinesqueanum* (downy arrow-wood), and *Euonymus americanus* (bursting-heart). In Virginia, *Vaccinium pallidum* (Blue Ridge blueberry) and *Vaccinium stamineum* (deerberry) are the principal ericads of patchy low-shrub layers (G. Fleming pers. comm. 2004). The woody vines *Vitis rotundifolia* (muscadine) and *Toxicodendron radicans* (eastern poison-ivy) often are present. Herbs vary from sparse to moderately dense, with dry-mesophytic species such as *Hexastylis* (heartleaf) spp., *Goodyera pubescens* (downy rattlesnake plantain), *Chimaphila maculata* (striped prince's pine), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Maianthemum racemosum* (feathery false lily of the valley), *Polygonatum biflorum* (smooth Solomon's seal), *Viola hastata* (halberdleaf yellow violet), *Tipularia discolor* (crippled cranefly), *Carex albicans* (whitetinge sedge), and *Hieracium venosum* (rattlesnakeweed) prevalent (Schafale and Weakley 1990). Although not lush, these forests can be impressively species-rich, with high woody diversity and many low-cover herbaceous species occurring. Species richness of 116 Virginia plots averages 53 taxa per 400 m2, varying from a low of 17 to a high of 114. Low species richness in this type is most often the result of long-term overgrazing by large deer populations. At least some of the stands with high species richness are located on sites where deer populations are effectively controlled.

Global Dynamics: Disturbed areas have increased amounts of pines and weedy hardwoods such as *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), and *Liquidambar styraciflua* (sweetgum), with the amounts depending on the degree of canopy opening. Areas that were cultivated are generally dominated by even-aged pine stands which are replaced by the climax oaks and hickories only as the pines die. Logged areas may have a mixture of hardwoods and pines (Schafale and Weakley 1990). Under natural conditions, these forests are uneven-aged, with old trees present. Reproduction occurs primarily in canopy gaps. Rare, severe natural disturbances such as wind storms may allow pulses of increased regeneration and allow the less shade-tolerant species to remain in the community. However, Skeen et al. (1980) argued that even the shade-intolerant *Liriodendron* (tuliptree) could reproduce enough in gaps to persist in the climax Piedmont forests. The natural fire regime of the Piedmont is not known, but fires certainly occurred periodically. Most of the component trees are able to tolerate light surface fires with little effect. In addition, the recruitment of oaks and hickories generally benefits from periodic fires. However, *Acer rubrum* (red maple) is fairly intolerant of fire (especially when young) and often appears to be out-competing the regeneration of oaks in long-unburned stands. In Virginia, *Fagus grandifolia* (American beech) and *Ilex opaca var. opaca* (American holly) are additional thin-barked, fire-intolerant species that have invaded many fire-suppressed oak-hickory forests. Regular fire may have created a more open forest, with gaps persisting longer than at present and perhaps forming more frequently (Schafale and Weakley 1990).

MOST ABUNDANT SPECIES

Global Stratum	**Lifeform**	**Species**
Tree canopy	Broad-leaved deciduous tree	*Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Carya tomentosa* (mockernut hickory), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak)
Tree subcanopy	Broad-leaved deciduous tree	*Cornus florida* (flowering dogwood), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood)
Tree subcanopy	Broad-leaved evergreen tree	*Ilex opaca* (American holly)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Carya tomentosa* (mockernut hickory), *Quercus rubra* (northern red oak)

George Washington Memorial Parkway: *Carya tomentosa* (mockernut hickory), *Cornus florida* (flowering dogwood), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Dichanthelium boscii* (Bosc's panicgrass), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak), *Quercus rubra* (northern red oak)

Manassas National Battlefield Park: *Carex albicans* var. *australis* (stellate sedge), *Carya glabra* (pignut hickory), *Carya tomentosa* (mockernut hickory), *Cornus florida* (flowering dogwood), *Danthonia spicata* (poverty oatgrass), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak)

Prince William Forest Park: *Carex digitalis* (slender woodland sedge), *Carya glabra* (pignut hickory), *Carya tomentosa* (mockernut hickory), *Cornus florida* (flowering dogwood), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak)
Global: *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Carya tomentosa* (mockernut hickory), *Chimaphila maculata* (striped prince's pine), *Cornus florida* (flowering dogwood), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Euonymus americanus* (bursting-heart), *Goodyera pubescens* (downy rattlesnake plantain), *Hexastylis* sp., *Hieracium venosum* (rattlesnakeweed), *Ilex opaca* (American holly), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Maianthemum racemosum* (feathery false lily of the valley), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Polygonatum biflorum* (smooth Solomon's seal), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Tipularia discolor* (crippled cranefly), *Toxicodendron radicans* (eastern poison-ivy), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum rafinesqueanum* (downy arrow-wood), *Viola hastata* (halberdleaf yellow violet), *Vitis rotundifolia* (muscadine)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb)
George Washington Memorial Parkway: Invasive/Exotic Plants: *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera maackii* (Amur honeysuckle, High), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Prince William Forest Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (15-Feb-2007). This is not a rare community type, although stands older than about 80 years old are probably rare. Most of the rolling upland landscape of the Piedmont and other regions where this occurs have been logged more than once since European settlement. This is a large-patch or matrix type in some regions of Virginia (G. Fleming pers. comm. 2001). In North Carolina, this is a matrix type, probably the most common forest type remaining in the Piedmont.

RELATED CONCEPTS

Global Similar Types:
- *Pinus echinata - Quercus alba - Quercus stellata / Vaccinium pallidum* Woodland (CEGL007096)
- *Quercus (alba, rubra, velutina) - Carya* spp. / *Viburnum acerifolium* Forest (CEGL006336) northern analogue from Maryland to New England.
- *Quercus alba - Carya glabra* / Mixed Herbs Coastal Plain Forest (CEGL007226) of the Coastal Plain.
- *Quercus alba - Carya tomentosa / Euonymus americanus / Hexastylis arifolia* Forest (CEGL006227) similar with a more southerly range.
- *Quercus alba - Carya tomentosa / Oxydendrum arboreum / Gaylussacia frondosa* Coastal Plain Forest (CEGL004321)
- *Quercus alba - Quercus montana - Carya glabra / Cornus florida / Vaccinium pallidum* Forest (CEGL008515)
- *Quercus alba - Quercus nigra / Ilex opaca / Clethra alnifolia - Arundinaria tecta* Forest (CEGL007862) of the Coastal Plain.
- *Quercus alba - Quercus rubra - Carya (ovata, carolinae-septentrionalis) / Cercis canadensis* Forest (CEGL007232) occurs in the same region but on basic soils weathered from mafic rocks.
- *Quercus falcata - Quercus alba - Carya tomentosa* / *Oxydendrum arboreum* Interior Low Plateau Forest (CEGL007244) is a drier community of similar substrates, with more *Quercus falcata* (southern red oak) or *Quercus stellata* (post oak) than *Quercus rubra* (northern red oak) codominating with *Quercus alba* (white oak).
- *Quercus rubra - Quercus alba - Carya glabra / Geranium maculatum* Forest (CEGL007237)
- *Quercus rubra / Magnolia tripetala - Cercis canadensis / Actaea racemosa - Tiarella cordifolia* Forest (CEGL003949)

Global Related Concepts:
- *Quercus (velutina, alba) - Fagus grandifolia / Cornus florida* Forest (Walton et al. 2001) =
- *Quercus alba - Carya (alba, glabra) / Cornus florida / Vaccinium pallidum* Forest (McCoy and Fleming 2000) =
- *Quercus alba - Quercus coccinea - Carya (glabra, alba) / Vaccinium pallidum* Forest (Fleming 2002a) =
- *Quercus alba - Quercus coccinea - Carya glabra / Cornus florida / Viburnum acerifolium* Forest (Fleming and Patterson 2003) =
- *Quercus alba - Quercus rubra - Carya (alba, glabra) / Cornus florida / Vaccinium stamineum* Forest (Fleming and Patterson 2003) =
- *Quercus alba - Quercus rubra - Carya (alba, glabra) / Cornus florida / Vaccinium stamineum* Forest (Fleming pers. comm.) **?**
- *Quercus alba - Quercus rubra - Carya (alba, ovalis) / Carpinus caroliniana / Desmodium nudiflorum* Forest (Fleming 2002a) =
- *Quercus alba - Quercus rubra - Carya alba / Carpinus caroliniana / Desmodium nudiflorum - Maianthemum racemosum* Forest (Fleming and Patterson 2003) =
- *Quercus alba - Quercus velutina - Carya (alba, glabra) / Cornus florida / Vaccinium stamineum* Forest (Fleming 2002a) =
- *Quercus alba - Quercus velutina - Carya alba / Cornus florida / Vaccinium stamineum* Forest (Fleming and Weber 2003) =
- *Quercus montana - Quercus alba - Carya glabra / Cornus florida* Forest (Fleming 2002b) =
- *Quercus prinus - Quercus rubra - Carya (ovalis, glabra) / Viburnum acerifolium* Forest (Fleming 2002a) =
- IA6i. Interior Upland Dry-Mesic Oak - Hickory Forest (Allard 1990) >
- White oak - northern red oak - false Solomon's seal (*Quercus alba - Quercus rubra - Smilacina racemosa*) community type (Jones 1988b) **?**
- White oak - northern red oak - false Solomon's seal (*Quercus alba - Quercus rubra - Smilacina racemosa*) community type (Jones 1988a) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
George Washington Memorial Parkway Classification Comments: Within the park, Piedmont Dry-Mesic Acidic Oak - Hickory Forest is sometimes referred to as Dry-Mesic Acidic Oak - Hickory Forest. Distinguishing features of this community include its occurrence on dry-mesic to dry, middle- to upper-slope and ridge-crest sites with warm exposures; dominance of *Quercus alba* (white oak) and the relatively high importance of *Carya* (hickory) spp. in mixed overstories; and an open, species-rich herb layer. Among the upland forests, *Quercus alba* (white oak) and *Carya* (hickory) spp. (in aggregate) reach maximum statistical importance in this type, the latter sometimes occurring more numerously in the understory than in the overstory. This community intergrades with Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075) along both topographic and compositional/successional gradients. Co-occurring stands of these communities often have indistinct boundaries, although *Fagus grandifolia* (American beech) usually decreases and oaks increase with higher slope position and lower soil moisture. The relationship between the types, however, is further confounded by the lack of oak recruitment and abundance of young *Fagus grandifolia* (American beech) in the understories of some Piedmont Dry-Mesic Acidic Oak - Hickory Forest, suggesting possible future replacement of these stands with Mid-Atlantic Mesic Mixed Hardwood Forest. The expansion of young *Fagus grandifolia* (American beech) into submesic or subxeric, oak-dominated habitats is a widespread phenomenon in the region and may be the result of a prolonged period in which fire and other disturbances that favor oaks have been excluded.
Manassas National Battlefield Park Classification Comments: Within the park, Piedmont Dry-Mesic Acidic Oak - Hickory Forest is sometimes referred to as Dry-Mesic Acidic Oak - Hickory Forest. This community is distinguished by the strong overstory dominance of *Quercus alba* (white oak) and the patch-dominance of the low ericaceous shrubs *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), and *Gaylussacia baccata* (black huckleberry). In some respects, this community is quite similar to Basic Oak-Hickory Forest, but is somewhat drier and has less diverse shrub and herb layers that lack significant cover of nutrient-demanding species such as *Cercis canadensis var. canadensis* (eastern redbud), *Ostrya virginiana* (hophornbeam), *Ulmus rubra* (slippery elm), *Muhlenbergia sobolifera* (rock muhly), and *Elymus hystrix var. hystrix* (eastern bottlebrush grass). This unit is apparently confined to soils weathered from siltstone, whereas Basic Oak-Hickory Forest is largely (but not entirely) associated with soils weathered from diabase.

Prince William Forest Park Classification Comments: Piedmont Dry-Mesic Acidic Oak - Hickory Forest (sometimes referred to as Dry-Mesic Acidic Oak - Hickory Forest) can be distinguished from Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075) by the absence of *Fagus grandifolia* (American beech) as a canopy or subcanopy dominant, although *Fagus grandifolia* (American beech) can be present in the shrub layer (even locally dominant). This forest is distinguished from forests mapped as Low-Elevation Mixed Oak / Heath Forest (CEGL008521) by greater floristic diversity in all layers and the absence of a more-or-less continuous, dense ericaceous shrub layer.
Global Classification Comments: At the northern end of the range, the classification is supported by analysis of a 1250-plot regional dataset assembled for the National Capital Region and Mid-Atlantic national parks vegetation mapping project. In that analysis, this association was represented by 116 Virginia plots and several from Montgomery County, Maryland.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: A plot of this community was sampled at Chilton Woods. Occurs at Canal mile 9 (Seven Locks), 11 (Carderock), 12-14 (Great Falls), 18-22 (Pennyfield), 30-32 (Edwards Ferry), 38-39 (Marble Quarry and Woods Lock), and 41-42 (Spinks Ferry).
George Washington Memorial Parkway Range: Piedmont Dry-Mesic Acidic Oak - Hickory Forest is an uncommon community in the Potomac Gorge, reaching optimal development on dry sideslopes and ridges in Great Falls Park. Small, isolated patches also occur in Turkey Run Park and the Arlington bluffs section of the parkway below Chain Bridge.
Manassas National Battlefield Park Range: Two of the best examples of this community in the park are located just west of the field at Battery Heights and on the ridge just south of the park Visitor Center on Henry Hill.
Monocacy National Battlefield Range: This community was observed in one area of the park, on a hill east of Lewis Farm Road.
Prince William Forest Park Range: Piedmont Dry-Mesic Acidic Oak - Hickory Forest occurs as scattered, mostly small patches throughout the park, with most examples located in the northern and central portions. It predominantly occurs on drier sideslopes, often adjacent to areas mapped as Mid-Atlantic Mesic Mixed Hardwood (CEGL006075) or Low-Elevation Mixed Oak / Heath Forest (CEGL008521).
Global Range: This association occurs throughout the Piedmont of the Carolinas, Virginia, and south-central Maryland. Two plots attributable to this type were sampled from the Piedmont of Georgia. In northern Virginia and Maryland, it also occurs occasionally in the Coastal Plain.
Nations: US
States/Provinces: DC:SNR, GA:SNR, MD:SNR, NC:SNR, SC:SNR, VA:S4S5
TNC Ecoregions: 52:C, 57:C, 58:C, 59:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, 221Dd:CCC, 221De:CCC, 231Aa:CCP, 231Af:CC?, 231Ib:CCC, 231Ic:CCC, 231Id:CCP, 231If:CCC, 232Ad:CCC, 232Ha:CC?, 232Hb:CCC, 232Hd:CC?, 232Ib:CCC, 232Je:C??, M221Da:CCC
Federal Lands: DOD (Fort Pickett, Kerr Reservoir); NPS (Appomattox Court House, Booker T. Washington, C&O Canal, Colonial, Fredericksburg-Spotsylvania, George Washington Parkway, Guilford Courthouse, Kennesaw Mountain, Kings Mountain, Manassas, Monocacy, Ninety Six, Petersburg, Prince William, Richmond); USFS (Oconee?, Sumter, Sumter (Piedmont), Uwharrie)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (1 plot): CHOH.238.
George Washington Memorial Parkway Plots: GFNP_008, GFNP_011, GFNP_037, GFNP_042, GFNP_043, GFNP_044, GFNP_046, GWMP_006.
Manassas National Battlefield Park Plots: MANA.9, MANA.13, MANA.20, MANA.21, MANA.23, MANA.26, MANA.30, MANA.33.
Monocacy National Battlefield Plots: None
Prince William Forest Park Plots: PRWI.25, PRWI.27, PRWI.34, PRWI.38, PRWI.44.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
Monocacy National Battlefield Description Author(s): J. Teague
Prince William Forest Park Description Author(s): K. Taverna
Global Description Author(s): M.P. Schafale and G.P. Fleming

References: Allard 1990, Fleming 2002a, Fleming 2002b, Fleming 2007, Fleming and Patterson 2003, Fleming and Taverna 2006, Fleming and Weber 2003, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Harrison 2004, Harrison 2011, Jones 1988a, Jones 1988b, McCoy and Fleming 2000, McManamay 2015, NRCS 2006b, Nelson 1986, Patterson 2008a, Patterson 2008b, Patterson 2008c, Patterson 2008e, Patterson 2008f, Patterson pers. comm., Schafale 2012, Schafale and Weakley 1990, Skeen et al. 1980, Southeastern Ecology Working Group n.d.*, Taverna and Patterson 2008, Walton et al. 2001, White and Govus 2003, White and Govus 2005, White and Pyne 2003

M502. Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland

This northeastern macrogroup comprises forests characterized by a number of dry-site oak and pine species occurring on a variety of well-drained substrates. Acidic parent materials of low fertility support forests dominated by *Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak), *Quercus muehlenbergii* (chinquapin oak), *Quercus montana* (chestnut oak), *Quercus velutina* (black oak), as well as other hardwoods such as *Liriodendron tulipifera* (tuliptree), *Sassafras albidum* (sassafras), and pines, including *Pinus rigida* (pitch pine), *Pinus pungens* (Table Mountain pine), *Pinus strobus* (eastern white pine), and *Pinus virginiana* (Virginia pine), often overtopping a well-developed heath shrub layer comprising species of *Gaylussacia* (huckleberry), *Rhododendron* (rhododendron, azalea), *Vaccinium* (blueberry), and others. Less acidic or high base status parent materials support many of the same oak species (*Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak), *Quercus muehlenbergii* (chinquapin oak), *Quercus montana* (chestnut oak), *Quercus velutina* (black oak)), in combination with a variety of hickory species (*Carya* (hickory) spp.), *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), and *Fagus grandifolia* (American beech). *Quercus muehlenbergii* (chinquapin oak) is particularly characteristic of parent materials of higher base status. Vegetation of this macrogroup occurs on a variety of substrates, ranging from dry sandy soils supporting pine barrens and maritime scrub vegetation, to exposed bedrock and shale barrens.

G016. Appalachian-Northeast Chinquapin Oak - Red-cedar Alkaline Forest & Woodland

This group encompasses relatively dry calcareous forests and woodlands of temperate eastern North America, in which *Quercus muehlenbergii* (chinquapin oak) is associated with a variety of hardwoods and/or *Juniperus virginiana* (eastern red-cedar). 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

This alliance comprises woodlands of the northeastern U.S., possibly reaching southeastern Canada, characterized by *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), *Juniperus virginiana* (eastern red-cedar), *Ostrya virginiana* (hophornbeam), and *Quercus rubra* (northern red oak). 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.

[CEGL006047] *Juniperus virginiana / Bouteloua curtipendula - Carex eburnea* Wooded Grassland

Translated Name: **Eastern Red-cedar / Sideoats Grama - Bristleleaf Sedge Wooded Grassland**
Common Name: **Northeastern Red-cedar Limestone Glade**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian-Northeast Chinquapin Oak - Red-cedar Alkaline Forest & Woodland (G016)
Alliance	*Juniperus virginiana - Fraxinus americana - Carya* spp. Woodland Alliance (A3107)

ELEMENT CONCEPT

Global Summary: This small-patch calcareous slope or rocky summit community occurs in southern New England and portions of the northern Piedmont. These xeric, south-facing calcareous slopes or outcrops support small grassland openings characterized by *Schizachyrium scoparium* (little bluestem) and *Bouteloua curtipendula* (sideoats grama). *Juniperus virginiana var. virginiana* (eastern red-cedar) is usually present as a stunted, sparse canopy. Other possible woody associates may include *Fraxinus americana* (white ash), *Ostrya virginiana* (hophornbeam), or *Quercus muehlenbergii* (chinquapin oak). Shrubs are sparse but when present may include *Celtis occidentalis* (common hackberry) or *Cornus alternifolia* (alternateleaf dogwood). The herbaceous composition is quite diverse and variable among occurrences but often includes such species as *Carex eburnea* (bristleleaf sedge), *Anemone cylindrica* (candle anemone), *Solidago bicolor* (white goldenrod), *Panicum virgatum* (switchgrass), *Carex pensylvanica* (Pennsylvania sedge), *Lespedeza violacea* (violet lespedeza), *Lespedeza capitata* (roundhead lespedeza), *Asclepias viridiflora* (green comet milkweed), *Asclepias verticillata* (whorled milkweed), *Muhlenbergia sobolifera* (rock muhly), *Sporobolus compositus* (composite dropseed), *Triosteum aurantiacum* (orangefruit horse-gentian), *Patis racemosa* (blackseed ricegrass), *Pycnanthemum incanum* (hoary mountainmint), *Sorghastrum nutans* (Indiangrass), *Onosmodium* (marbleseed) spp., *Packera aurea* (golden ragwort), *Packera obovata* (roundleaf ragwort), and others. This community occurs in association with forests characterized by *Quercus muehlenbergii* (chinquapin oak).

ENVIRONMENTAL DESCRIPTION

Harpers Ferry National Historical Park Environment: Northeastern Red-cedar Limestone Glade is a rare community, occurring on thin-soiled, rocky limestone slopes at a single site in the western end of the park. It occurs as small, grassy openings on southwest-facing upper slopes underlain by dolomite. The soil is rich with exceedingly high values for soil pH, Mg, Mn, and Ca.

Global Environment: This sparse woodland occurs primarily on xeric calcareous ridgetops, summits and hillsides in the mid-Atlantic region. Sites where this community occurs are moderately steep-sloped hillsides or ridgetops on calcareous bedrock such as limestone, dolomite, calcareous shale or marble. Soils are characteristically thin and rocky, with little or no profile development. Aspect is typically south or southwest.

VEGETATION DESCRIPTION

Harpers Ferry National Historical Park Vegetation: The community is predominately herbaceous but does have woody vegetation dominated by *Juniperus virginiana var. virginiana* (eastern red-cedar) (up to 50% cover). In the park, its typical expression is a mosaic of grassy openings and dense patches of red-cedar. *Quercus muehlenbergii* (chinquapin oak) is a common associate, but typically has <10% cover. Additional woody species scattered throughout the glades with low cover include *Cornus florida* (flowering dogwood), *Viburnum prunifolium* (blackhaw), *Robinia pseudoacacia* (black locust), *Carya cordiformis* (bitternut hickory), *Juglans nigra* (black walnut), and *Rhus aromatica var. aromatica* (fragrant sumac). The herbaceous openings are densely dominated by the perennial warm-season bunchgrasses *Bouteloua curtipendula* (sideoats grama) and *Schizachyrium scoparium* (little bluestem). Other characteristic herbaceous species include *Galactia volubilis* (downy milkpea), *Brickellia eupatorioides var. eupatorioides* (false boneset), *Clinopodium vulgare* (wild basil), *Daucus carota* (Queen Anne's lace), *Solidago nemoralis* (gray goldenrod), *Centaurea stoebe ssp. micranthos* (spotted knapweed), *Galium pilosum* (hairy bedstraw), *Salvia lyrata* (lyreleaf sage), and *Tridens flavus* (purpletop tridens).

Global Vegetation: This community occurs as exposed, mainly herbaceous, openings on calcareous slopes and ridgetops. Occurrences are generally less than 0.1 ha in size and usually bordered by open woodlands or forest. Tree cover is sparse, ranging from 10-30% cover with *Juniperus virginiana var. virginiana* (eastern red-cedar) being the most constant canopy tree. Other woody species usually present include *Carya glabra* (pignut hickory), *Celtis occidentalis* (common hackberry), *Cercis canadensis* (eastern redbud), *Fraxinus americana* (white ash), and *Ostrya virginiana* (hophornbeam). The presence of these species is somewhat dependent on the composition of the surrounding woodland. A few shrubs including *Rosa carolina* (Carolina rose), *Amelanchier* (serviceberry) spp., *Rhus aromatica* (fragrant sumac), and *Symphoricarpos albus* (common snowberry) occur as scattered individuals. The herbaceous layer covers 12-70% of the ground and is usually dominated by *Schizachyrium scoparium* (little bluestem) and *Bouteloua curtipendula* (sideoats grama). Numerous other herbaceous species and graminoids occur in this community. In addition to the species mentioned previously, this type often includes *Carex eburnea* (bristleleaf sedge), *Anemone cylindrica* (candle anemone), *Solidago bicolor* (white goldenrod), *Panicum virgatum* (switchgrass), *Carex pensylvanica* (Pennsylvania sedge), *Lespedeza violacea* (violet lespedeza), *Lespedeza capitata* (roundhead lespedeza), *Asclepias viridiflora* (green comet milkweed), *Asclepias verticillata* (whorled milkweed), *Muhlenbergia sobolifera* (rock muhly), *Sporobolus compositus* (composite dropseed), *Triosteum aurantiacum* (orangefruit horse-gentian), *Patis racemosa* (blackseed ricegrass), *Pycnanthemum incanum* (hoary mountainmint),

Sorghastrum nutans (Indiangrass), *Onosmodium* (marbleseed) spp., *Packera aurea* (golden ragwort), *Packera obovata* (roundleaf ragwort), *Danthonia spicata* (poverty oatgrass), *Carex pensylvanica* (Pennsylvania sedge), *Solidago ulmifolia* (elmleaf goldenrod), *Poa compressa* (Canada bluegrass), *Saxifraga michauxii* (Michaux's saxifrage), *Lithospermum canescens* (hoary puccoon), *Opuntia humifusa* (devil's-tongue), *Aquilegia canadensis* (red columbine), *Arabis lyrata* (lyrate rockcress), *Elymus hystrix* (eastern bottlebrush grass), *Houstonia longifolia* (longleaf summer bluet), and many others. No single species is restricted to this community. Several rare species occur in this community, including *Astragalus neglectus* (Cooper's milkvetch), *Monarda fistulosa var. brevis* (wild bergamot), *Delphinium exaltatum* (tall larkspur), *Paronychia virginica* (yellow nailwort), *Paxistima canbyi* (Canby's mountain-lover), *Pycnanthemum torrei* (Torrey's mountainmint), and *Pycnanthemum clinopodioides* (basil mountainmint).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana* (eastern red-cedar)
Tree canopy	Broad-leaved deciduous tree	*Ostrya virginiana* (hophornbeam)
Herb (field)	Graminoid	*Schizachyrium scoparium* (little bluestem)

CHARACTERISTIC SPECIES

Harpers Ferry National Historical Park: *Bouteloua curtipendula* (sideoats grama), *Galactia volubilis* (downy milkpea), *Juniperus virginiana* (eastern red-cedar), *Quercus muehlenbergii* (chinquapin oak), *Schizachyrium scoparium* (little bluestem)
Global: *Antennaria plantaginifolia* (woman's tobacco), *Asclepias verticillata* (whorled milkweed), *Bouteloua curtipendula* (sideoats grama), *Carex eburnea* (bristleleaf sedge), *Helianthus divaricatus* (woodland sunflower), *Juniperus virginiana* (eastern red-cedar), *Minuartia michauxii* (Michaux's stitchwort), *Ostrya virginiana* (hophornbeam), *Packera obovata* (roundleaf ragwort), *Schizachyrium scoparium* (little bluestem)

OTHER NOTEWORTHY SPECIES

Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Centaurea stoebe* ssp. *micranthos* (spotted knapweed, High/Medium), *Daucus carota* (Queen Anne's lace, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium)
Global: Vulnerable Plants: *Delphinium exaltatum* (tall larkspur, G3), *Monarda fistulosa* var. *brevis* (wild bergamot, G5T1T2), *Paxistima canbyi* (Canby's mountain-lover, G2?), *Pycnanthemum clinopodioides* (basil mountainmint, G1G2), *Pycnanthemum torrei* (Torrey's mountainmint, G2); **Other Plants**: *Astragalus neglectus* (Cooper's milkvetch, G4), *Paronychia virginica* (yellow nailwort, G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1G2 (30-Nov-1998). Fewer than 100 occurrences are estimated to occur for this community rangewide. Total acreage is likely less than 200 acres. The thin soil and sloping terrain are undesirable for agriculture, but where this community occurs close to urban centers, it is vulnerable to residential and commercial development. It is also threatened by mining. In New Jersey, for example, the two known occurrences are thought to be remnants of vegetation that was lost to mining. GRank is changed from G2 to G1G2 after further consideration of threat, patch size, and range.

RELATED CONCEPTS

Global Related Concepts:
- *Schizachyrium scoparium - Bouteloua curtipendula* medium-tall grasslands (Metzler and Barrett 2006) =
- SNE Calcareous Rocky summit/ Rock Outcrop Community (Rawinski 1984a) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Harpers Ferry National Historical Park Classification Comments: Northeastern Red-cedar Limestone Glade (also referred to as Limestone Red-cedar Glade) is clearly distinguishable in the park, occurring as small grassy openings with scattered woody species dominated by *Juniperus virginiana var. virginiana* (eastern red-cedar). It is quite different from the other woodland types in the park, Central Appalachian Basic Woodland (CEGL003683) and Central Appalachian Chestnut Oak - Virginia Pine Woodland (CEGL008540). The former occurs as open woodland dominated by *Fraxinus americana* (white ash) and *Carya glabra* (pignut hickory) with a herbaceous layer

dominated by xerophytic grasses and forbs. The latter is dominated by *Quercus prinus* and *Pinus virginiana* (Virginia pine). The calciphilic prairie grass *Bouteloua curtipendula* (sideoats grama) is restricted to Northeastern Red-cedar Limestone Glade and is therefore a strong diagnostic of the community.
Harpers Ferry National Historical Park Other Comments: The association was once treated as a strictly herbaceous type, but significant cover by *Juniperus virginiana var. virginiana* (eastern red-cedar) and *Quercus muehlenbergii* (chinquapin oak) in 400-square-meter plots indicates that the graminoid openings are too small to be considered discrete communities.
Global Classification Comments: These communities are closely related to several other sparse woodlands in the *Juniperus virginiana* (eastern red-cedar) alliance. They also intergrade substantially with limestone/calcareous woodlands. Several of the more northern occurrences of this community are essentially small, successional, herbaceous patches occurring within *Quercus muehlenbergii* (chinquapin oak) woodlands. Floristically they may be considered depauperate versions of the more extensive occurrences of this community in West Virginia. New York may contain some examples of this community which they classify under the name "red cedar rocky summit community."

ELEMENT DISTRIBUTION

Harpers Ferry National Historical Park Range: Northeastern Red-cedar Limestone Glade is documented at only one site in the park, in the southwestern end at Jackson's Right Flank, near the town of Millville. It occurs as three small patches totaling less than 0.5 hectare.
Global Range: This community has been described from calcareous regions in western Connecticut, eastern Pennsylvania, northeastern New Jersey, and the Ridge and Valley Province of northeastern West Virginia. A few examples may occur in New York and Virginia.
Nations: US
States/Provinces: CT:SNR, MA?:SNA, MD?:SNA, NJ:S1, NY:SNR, PA:SNR, VA?:SNA, WV:S1
TNC Ecoregions: 49:P, 59:C, 61:C
USFS Ecoregions (2007): 221A:CC, 221Ea:CPP
Federal Lands: NPS (Harpers Ferry); USFS (Monongahela)

ELEMENT SOURCES

Harpers Ferry National Historical Park Plots: HAFE.29, HAFE.30.
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Global Description Author(s): M. Anderson, S.L. Neid and G.P. Fleming
References: Bartgis 1985a, Bartgis 1993, Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d.*, Edinger 2003a, Edinger et al. 2014a, Fike 1999, Grossman et al. 1994, Harrison 2004, Harrison 2011, Metzler and Barrett 2006, Rawinski 1984a, Smith n.d.a, Swain and Kearsley 2014, WVNHP unpubl. data

[CEGL006231] *Quercus muehlenbergii - Cercis canadensis / Packera obovata - Lithospermum canescens* Woodland

Translated Name: **Chinquapin Oak - Eastern Redbud / Roundleaf Ragwort - Hoary Puccoon Woodland**
Common Name: **Chinquapin Oak - Juniper Limestone Woodland**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian-Northeast Chinquapin Oak - Red-cedar Alkaline Forest & Woodland (G016)
Alliance	*Juniperus virginiana - Fraxinus americana - Carya* spp. Woodland Alliance (A3107)

ELEMENT CONCEPT

Global Summary: This open calcareous glade occurs in the Central Appalachians in the Ridge and Valley of northeastern West Virginia, western Virginia, and in central southeastern Pennsylvania. The vegetation occurs on moderate slopes at elevations ranging from 400-730 m (1300-2400 feet). Slopes are typically south- or southwest-facing and about 20-30° but may be much steeper. Soils are shallow, dry, stony, calcareous loams derived from limestone or dolomite bedrock. Trees are generally widely spaced and relatively short (3-10 m). *Quercus muehlenbergii* (chinquapin oak) is the dominant tree, with associates including *Cercis canadensis* (eastern redbud), *Juniperus virginiana* (eastern red-cedar), *Celtis tenuifolia* (dwarf hackberry), *Fraxinus americana* (white ash), and *Ostrya virginiana* (hophornbeam) usually present. Shrubs are often of sparse cover but may include *Rhus aromatica*

(fragrant sumac) and *Rosa tenuifolia*?. *Cornus florida* (flowering dogwood) may be a common woody associate in West Virginia and Pennsylvania. The herbaceous layer is patchy but may be quite diverse. Graminoids include *Bouteloua curtipendula* (sideoats grama), *Carex eburnea* (bristleleaf sedge), *Elymus hystrix* (eastern bottlebrush grass), *Carex pensylvanica* (Pennsylvania sedge), *Poa compressa* (Canada bluegrass), *Danthonia spicata* (poverty oatgrass). Associated forbs include *Anemone virginiana* (tall thimbleweed), *Symphyotrichum undulatum* (wavyleaf aster), *Symphyotrichum oblongifolium* (aromatic aster), *Asclepias verticillata* (whorled milkweed), *Houstonia longifolia* (longleaf summer bluet), *Penstemon hirsutus* (hairy beardtongue), *Viola* (violet) spp., *Antennaria plantaginifolia* (woman's tobacco), *Phlox subulata* (moss phlox), *Lithospermum canescens* (hoary puccoon), *Cynoglossum officinale* (gypsyflower), *Allium cernuum* (nodding onion), *Solidago ulmifolia* (elmleaf goldenrod), *Solidago arguta var. harrisii* (Harris' goldenrod), *Packera obovata* (roundleaf ragwort), *Blephilia ciliata* (downy pagoda-plant), *Galium pilosum* (hairy bedstraw), *Arabis lyrata* (lyrate rockcress), *Heuchera americana* (American alumroot), *Draba ramosissima* (branched draba), *Pycnanthemum incanum* (hoary mountainmint), *Aquilegia canadensis* (red columbine), *Helianthus divaricatus* (woodland sunflower), *Scutellaria ovata* (heartleaf skullcap), *Silene caroliniana ssp. pensylvanica* (Pennsylvania catchfly), *Sisyrinchium mucronatum* (needletip blue-eyed grass), *Minuartia michauxii* (Michaux's stitchwort), *Euphorbia corollata* (flowering spurge), *Paronychia montana* (mountain nailwort), and *Paronychia virginica* (yellow nailwort).

Environmental Description

Global Environment: This open calcareous glade occurs in the Central Appalachians in the Ridge and Valley of northeastern West Virginia, western Virginia, and in central southeastern Pennsylvania. The vegetation occurs on moderate slopes at elevations ranging from 400-730 m (1300-2400 feet). Slopes are typically south- or southwest-facing and about 20-30° but may be much steeper. Soils are shallow, dry, stony, calcareous loams derived from limestone or dolomite bedrock. Trees are generally widely spaced and relatively short (3-10 m).

Throughout the global range of this type, sites are located on limestone and dolomitic slopes at elevations ranging from <300-800 m (<1000-2600 feet). Soils are shallow, stony, calcareous loams and clay loams. In Virginia, this vegetation type is generally associated with exposed, xeric cliffs and other large outcrops of carbonate rock. Sites are typically on the upper portions or spur crests of sideslopes undercut by rivers or large streams. Slopes are predominantly and sometimes dramatically convex, with rugged, complex, and variable microtopography. Surface cover of exposed bedrock and loose stones is high (mean = 50%) in plot-sampled stands, with most plants rooted in crevices and on thin-soiled ledges. The surficial rock and associated edaphic stresses often limit both vegetation cover and species richness, which is comparatively low (n = 52) among community types on calcareous substrates. Soil samples collected from plots representing this type are circumneutral to moderately alkaline (mean pH = 7.2) with very high calcium levels (mean = 3127 ppm) and moderately to very high magnesium levels (mean = 559 ppm). Periodic drought stress appears to result in occasional mortality of trees and shrubs in these habitats.

Vegetation Description

Global Vegetation: Over most of the type's range, *Quercus muehlenbergii* (chinquapin oak) is the dominant tree, with associates including *Cercis canadensis* (eastern redbud), *Juniperus virginiana* (eastern red-cedar), *Celtis tenuifolia* (dwarf hackberry), *Fraxinus americana* (white ash), and *Ostrya virginiana* (hophornbeam) usually present. Trees are generally widely spaced and relatively short (3-10 m). Shrubs often contribute sparse cover but may include *Rhus aromatica* (fragrant sumac) and *Rosa carolina* (Carolina rose). The herb layer is patchy but frequently quite diverse. Graminoids include *Bouteloua curtipendula* (sideoats grama), *Carex eburnea* (bristleleaf sedge), *Elymus hystrix* (eastern bottlebrush grass), *Carex pensylvanica* (Pennsylvania sedge), *Poa compressa* (Canada bluegrass), and *Danthonia spicata* (poverty oatgrass). Associated forbs include *Anemone virginiana* (tall thimbleweed), *Symphyotrichum undulatum* (wavyleaf aster), *Symphyotrichum oblongifolium* (aromatic aster), *Asclepias verticillata* (whorled milkweed), *Houstonia longifolia* (longleaf summer bluet), *Penstemon hirsutus* (hairy beardtongue), *Viola* (violet) spp., *Antennaria plantaginifolia* (woman's tobacco), *Phlox subulata* (moss phlox), *Lithospermum canescens* (hoary puccoon), *Cynoglossum officinale* (gypsyflower), *Allium cernuum* (nodding onion), *Solidago ulmifolia* (elmleaf goldenrod), *Solidago arguta var. harrisii* (Harris' goldenrod), *Packera obovata* (roundleaf ragwort), *Blephilia ciliata* (downy pagoda-plant), *Galium pilosum* (hairy bedstraw), *Arabis lyrata* (lyrate rockcress), *Heuchera americana* (American alumroot), *Draba ramosissima* (branched draba), *Pycnanthemum incanum* (hoary mountainmint), *Aquilegia canadensis* (red columbine), *Helianthus divaricatus* (woodland sunflower), *Scutellaria ovata* (heartleaf skullcap), *Silene caroliniana ssp. pensylvanica* (Pennsylvania catchfly), *Sisyrinchium mucronatum* (needletip blue-eyed grass), *Minuartia michauxii* (Michaux's stitchwort), *Euphorbia corollata* (flowering spurge), *Paronychia montana* (mountain nailwort), and *Paronychia virginica* (yellow nailwort).

Most plot-sampled Virginia stands form open to very sparse woodlands with stunted trees 6-10 m tall contributing 25-40% cover. Stands in the most stressful microhabitats often assume shrubland stature. *Juniperus*

virginiana (eastern red-cedar) is the most abundant and characteristic woody species in both the small tree and shrub layers, with *Quercus muehlenbergii* (chinquapin oak) and *Quercus rubra* (northern red oak) more or less constant associates. *Cercis canadensis* (eastern redbud) and *Ostrya virginiana* (hophornbeam) are constant shrub associates, while *Philadelphus hirsutus* (streambank mock orange) (hairy mock-orange) and *Fraxinus quadrangulata* (blue ash) (blue ash) are important shrubs at southern end of the range in the Cumberland Mountains. The herb layer is very open (usually <40% stratum cover), with low shrubs and vines such as *Rhus aromatica* (fragrant sumac), *Parthenocissus quinquefolia* (Virginia creeper), and *Toxicodendron radicans* (eastern poison-ivy) contributing constant but low cover. Lithophytes prevail among herbaceous species; relatively constant and/or locally abundant herbs include *Aquilegia canadensis* (red columbine), *Asplenium resiliens* (blackstem spleenwort), *Carex eburnea* (bristleleaf sedge), *Carex pensylvanica* (Pennsylvania sedge), *Draba ramosissima* (branched draba), *Heuchera americana* (American alumroot), *Minuartia michauxii* (Michaux's stitchwort), *Pellaea atropurpurea* (purple cliffbrake), *Phlox subulata* (moss phlox), *Packera obovata* (roundleaf ragwort), and *Symphyotrichum oblongifolium* (aromatic aster). Exotic weeds are occasionally present in small numbers but do not thrive in the thin, rocky soils.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Cercis canadensis* (eastern redbud), *Quercus muehlenbergii* (chinquapin oak)

CHARACTERISTIC SPECIES

Global: *Andropogon virginicus* (broomsedge bluestem), *Asplenium ruta-muraria* var. *cryptolepis* (wallrue), *Carex eburnea* (bristleleaf sedge), *Cercis canadensis* (eastern redbud), *Fraxinus quadrangulata* (blue ash), *Galium boreale* (northern bedstraw), *Juniperus virginiana* (eastern red-cedar), *Lithospermum canescens* (hoary puccoon), *Minuartia michauxii* (Michaux's stitchwort), *Packera obovata* (roundleaf ragwort), *Pellaea atropurpurea* (purple cliffbrake), *Quercus muehlenbergii* (chinquapin oak), *Solidago arguta* var. *harrisii* (Harris' goldenrod), *Symphyotrichum oblongifolium* (aromatic aster), *Taenidia integerrima* (yellow pimpernel)

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Melica nitens* (threeflower melicgrass, G5, VA state-rare), *Paxistima canbyi* (Canby's mountain-lover, G2?), *Sporobolus compositus* (composite dropseed, G5, VA state-rare), *Sporobolus neglectus* (puffsheath dropseed, G5, VA state-rare), *Symphoricarpos albus* (common snowberry, G5, VA state-rare); **Invasive/Exotic Plants**: *Cynoglossum officinale* (gypsyflower, Medium/Low), *Poa compressa* (Canada bluegrass, High/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (27-Dec-2000). This association occurs in northeastern West Virginia, western Virginia and the calcareous region in central and southeastern Pennsylvania. Thirty occurrences or more are estimated in Virginia, due to the large number of limestone / dolomite cliffs along major ridge and valley rivers. Many of the occurrences are probably 1-2 acres but some exceed 10 acres on the more massive cliffs. It is restricted to calcareous soils derived from limestone or dolomite bedrock.

RELATED CONCEPTS

Global Similar Types:

- *Fraxinus quadrangulata - Juniperus virginiana / Schizachyrium scoparium - Lithospermum canescens* Woodland (CEGL007994)
- *Juniperus virginiana - Fraxinus quadrangulata / Symphyotrichum oblongifolium - Panicum flexile - Sedum pulchellum* Woodland (CEGL004271)
- *Quercus muehlenbergii - (Juniperus virginiana)* Unglaciated Bluff Woodland (CEGL004267)
- *Quercus muehlenbergii - Quercus (alba, velutina) - (Juniperus virginiana)* Driftless Bluff Woodland (CEGL002144)

Global Related Concepts:

- *Juniperus virginiana var. virginiana - Quercus muehlenbergii / Carex eburnea* Woodland (4.2) (Fleming 1999) =
- Chinquapin oak-redbud calcareous woodland (northern type?) (CAP pers. comm. 1998) **?**
- Glade Woodland (Bartgis 1993) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: Field survey of this vegetation and its cliff habitats can be a dangerous undertaking and many stands have not been thoroughly explored or plot-sampled. Most Virginia occurrences are small (0.1-1.0 ha) but some exceed 4.0 ha (10 acres) on the more massive cliffs. This community type is distinct from prairie-like calcareous "barrens" occurring on steep hillslopes and dominated by warm-season perennial grasses (e.g., *Schizachyrium scoparium* (little bluestem), *Andropogon gerardii* (big bluestem), *Bouteloua curtipendula* (sideoats grama), *Sorghastrum nutans* (Indiangrass)) with scattered woody scrub. These barrens are represented in western Virginia by two community types, neither of which is known to occur in the George Washington and Jefferson national forests.

At present, this type is a broadly defined unit that encompasses a variety of rocky calcareous habitats. Virginia stands of this vegetation have a strong restriction to cliffs and rocky escarpments, as well as a composition that differs somewhat from stands in other portions of the range. These differences are reflected in the State Name, which is more useful for field identification and descriptive purposes in Virginia. However, there is some compositional and environmental heterogeneity among the plot samples supporting our interpretation of this vegetation, with six plots representing strict cliff/outcrop vegetation on limestone and three plots representing clifftop habitats on dolomite. The latter subgroup has habitats with considerable areas of exposed mineral soil and has much higher mean species richness (n = 83 taxa per 400 m2 vs. 37 taxa per 100 m2). Additional data collection and analysis over the full geographic range and in Virginia is clearly warranted and will likely result in splitting of this type.

A *Juniperus virginiana - Quercus muehlenbergii / Carex eburnea* Woodland community identified by Fleming (1999) appears to be a segregate associated with xeric cliffs.

ELEMENT DISTRIBUTION

Global Range: This community is found in the ridge and valley region of northeastern West Virginia, western Virginia, and calcareous areas in central and southeastern Pennsylvania. Its range in West Virginia is limited.
Nations: US
States/Provinces: MD:SNR, OH:SNR, PA:SNR, VA:S2, WV:S2
TNC Ecoregions: 49:C, 50:P, 59:C
USFS Ecoregions (2007): 211Ea:CCC, 221D:C?, 221Ec:CC?, M211A:CC, M221Aa:CCP, M221Ab:CCP, M221Ac:CCC, M221Be:CCC
Federal Lands: NPS (C&O Canal); USFS (Monongahela)

ELEMENT SOURCES

Global Description Author(s): G. Fleming and P. Coulling
References: Bartgis 1993, CAP pers. comm. 1998, Eastern Ecology Working Group n.d.*, Fike 1999, Fleming 1999, Fleming and Patterson 2009b, Fleming and Taverna 2006, Fleming et al. 2017, Grossman et al. 1994, Harrison 2004, Harrison 2011, Sneddon and Menard 2002, WVNHP unpubl. data

A2047 *Quercus muehlenbergii - Acer saccharum - Tilia americana* Forest Alliance

This alliance includes a variety of dry and dry-mesic forests characterized by *Quercus muehlenbergii* (chinquapin oak) and *Acer saccharum* (sugar maple), with associates including *Carya ovalis* (red hickory), *Carya ovata* (shagbark hickory), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Quercus alba* (white oak), and *Tilia americana* (American basswood). Common subcanopy trees include *Cercis canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), and *Ostrya virginiana* (hophornbeam). The shrub layer is often sparse and may contain *Cornus alternifolia* (alternateleaf dogwood), *Hamamelis virginiana* (American witch-hazel), *Staphylea trifolia* (American bladdernut), *Viburnum prunifolium* (blackhaw), *Viburnum rafinesqueanum* (downy arrow-wood), and *Zanthoxylum americanum* (common pricklyash). The herbaceous layer may contain *Arabis laevigata* (smooth rockcress), *Asclepias quadrifolia* (fourleaf milkweed), *Clematis occidentalis* (western blue virginsbower), *Packera obovata* (roundleaf ragwort), *Phryma leptostachya* (American lopseed), *Saxifraga virginiensis* (early saxifrage), and *Triosteum aurantiacum* (orangefruit horse-gentian). 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.

[CEGL004793] *Quercus muehlenbergii - Quercus (alba, rubra) - Carya cordiformis / Viburnum prunifolium* Forest

Translated Name: **Chinquapin Oak - (White Oak, Northern Red Oak) - Bitternut Hickory / Blackhaw Forest**
Common Name: **Ridge and Valley Limestone 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	Appalachian-Northeast Chinquapin Oak - Red-cedar Alkaline Forest & Woodland (G016)
Alliance	*Quercus muehlenbergii - Acer saccharum - Tilia americana* Forest Alliance (A2047)

Element Concept

Global Summary: These are rich forests of moderately steep slopes in the Ridge and Valley and adjacent provinces over various limestone and dolomitic formations. The canopy ranges from closed to partly open and is dominated by a mixture of *Quercus muehlenbergii* (chinquapin oak), other oaks (particularly *Quercus alba* (white oak) and *Quercus rubra* (northern red oak)), and several hickories (*Carya cordiformis* (bitternut hickory), *Carya glabra* (pignut hickory), and *Carya ovalis* (red hickory)). *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Acer saccharum* (sugar maple), *Quercus velutina* (black oak), *Ulmus rubra* (slippery elm), *Tilia americana* (American basswood), and *Juglans nigra* (black walnut) may also be present in the canopy. Disturbed stands may have a higher proportion of *Fraxinus americana* (white ash), *Celtis occidentalis* (common hackberry), and other early-successional species in the overstory. The relatively open subcanopy may contain *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), and *Juniperus virginiana var. virginiana* (eastern red-cedar), as well as smaller individuals of *Fraxinus americana* (white ash) and *Carya* (hickory) spp. *Viburnum prunifolium* (blackhaw), *Cercis canadensis var. canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Ulmus rubra* (slippery elm), *Ostrya virginiana* (hophornbeam), *Viburnum prunifolium* (blackhaw), and *Asimina triloba* (pawpaw) are present as tall shrubs or small trees. Low shrubs include *Rhus aromatica var. aromatica* (fragrant sumac), *Dirca palustris* (eastern leatherwood), *Staphylea trifolia* (American bladdernut), and *Toxicodendron radicans* (eastern poison-ivy). Herbs present include *Ageratina altissima* (white snakeroot), *Amphicarpaea bracteata* (American hogpeanut), *Asclepias quadrifolia* (fourleaf milkweed), *Bromus pubescens* (hairy woodland brome), *Brachyelytrum erectum* (bearded shorthusk), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Collinsonia canadensis* (richweed), *Dichanthelium boscii* (Bosc's panicgrass), *Dioscorea quaternata* (fourleaf yam), *Desmodium glutinosum* (pointedleaf ticktrefoil), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Euphorbia mercurialina* (mercury spurge), *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Geranium maculatum* (spotted geranium), *Hexastylis arifolia var. ruthii* (Ruth's littlebrownjug), *Houstonia longifolia* (longleaf summer bluet), *Hydrophyllum virginianum* (eastern waterleaf), *Maianthemum racemosum* (feathery false lily of the valley), *Oxalis grandis* (great yellow woodsorrel), *Packera obovata* (roundleaf ragwort), *Polystichum acrostichoides* (Christmas fern), *Sanicula odorata* (clustered blacksnakeroot), *Sanguinaria canadensis* (bloodroot), *Sedum ternatum* (woodland stonecrop), *Thaspium barbinode* (hairyjoint meadowparsnip), *Viola x palmata* (early blue violet), and *Viola pubescens* (downy yellow violet). Some small patches of *Arundinaria gigantea* (giant cane) are also present in stands at the southern end of the range.

Environmental Description

Antietam National Battlefield Environment: This oak-hickory forest occurs on east-facing rolling uplands between 130 and 160 m in elevation. Soils are somewhat xeric to submesic, well-drained medium brown silt loam derived from limestone and dolomite. The forest floor is characterized by leaf litter (90-96% cover) with some bedrock (1-2%), large rocks (0-5%), small rocks (0-1%), wood (1%), bare soil (1-3%), and bryophytes and lichens (1-2%). Small limestone outcrops may be present at some sites. Deer browse is typically severe in this forest type, evidenced by numerous intersecting deer trails and scat. Groundhog holes can also be abundant.

Chesapeake & Ohio Canal National Historical Park Environment: This oak-hickory forest was sampled at four locations in the park. Sites are steep to extremely steep mid and lower sideslopes and gaps with western and southern aspects. Soils are rapidly to well-drained silt loam and clay loam. The unvegetated surface is dominated by leaf litter (73-90% cover) with some exposed bedrock (0-10%), large rocks (2-15%), small rocks (0-2%), wood (1-3%), bare soil (5-10%), and mosses and lichens (1-5%). Evidence of disturbance includes erosion of soil and rocks, trash, deer grazing/browsing, and heavy infestation of exotic plant species.

Harpers Ferry National Historical Park Environment: Ridge and Valley Limestone Oak - Hickory Forest is confined to a small upland area in the southwest corner of the park. This submesic to mesic forest occurs on

low-elevation (<365 m [1200 feet]) slopes with highly calcium-enriched soils weathered from dolomite or limestone. The habitat appears to be moist and well-drained, with deep, friable, silt loam soils. Soils are typically moderately acidic, with high Ca, Mg, and Mn levels, indicating high fertility.

Manassas National Battlefield Park Environment: This vegetation is confined in the park to short, steep bluffs bordering the inner edge of the Bull Run floodplain. Bedrock underlying the bluff is siltstone of the Ball's Bluff Formation. The habitat appears to be moist and well-drained, with deep, friable, silt loam soils. Soil samples are moderately acidic, with high calcium, magnesium, and manganese levels, indicating high fertility.

Monocacy National Battlefield Environment: The Ridge and Valley Limestone Oak - Hickory Forest is uncommon at Monocacy National Battlefield. The fertile soils (very high in calcium and magnesium) supporting this community weather from limestone bedrock.

Global Environment: This type is strongly associated with carbonate rock substrates and calcareous soils of the Ridge and Valley province. A few rare, disjunct Piedmont stands also occur in the northern Virginia Triassic (Culpeper) Basin in association with bluffs of calcareous siltstone. Examples of this community in Tennessee and southwestern Virginia occur on gentle to steep, south- to east-facing slopes underlain by limestone. Sites are submesic, with locally shallow soils over flat-lying limestones. Plot-sampled stands in Virginia, West Virginia, and Maryland are located on gentle to steep slopes with variable aspects. Underlying bedrock in all but one case is limestone or dolomite. Middle and upper slope topographic positions are prevalent but stands also occur on lower gorge slopes. Most sites have been disturbed in the past by cutting, clearing, and/or grazing. Surface substrate at sampling sites are not very rocky (mean cover of bedrock and loose rocks = 6%), have an average of 17% bare mineral soil, and are mostly covered by leaf litter and other organic matter. Soil samples collected from plots are nearly circumneutral (mean pH = 6.6) with very high calcium (mean = 3374 ppm) and magnesium (mean = 408 ppm) content, as well as nearly complete (97%) total base saturation. Habitats are subjectively assessed as submesic to mesic.

VEGETATION DESCRIPTION

Antietam National Battlefield Vegetation: The closed tree canopy is dominated by *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Quercus muehlenbergii* (chinquapin oak), *Quercus rubra* (northern red oak), and *Carya ovalis* (red hickory). Canopy trees reach 20-35 m in height. The sparse to moderately dense (10-75%) tree subcanopy (10-20 m) is dominated by canopy species, particularly *Celtis occidentalis* (common hackberry). The moderate to dense (50-100%) midstory (6-10 m) is dominated by canopy species and may include *Acer negundo* (box-elder), *Acer saccharum var. saccharum* (sugar maple), *Carya cordiformis* (bitternut hickory), *Quercus alba* (white oak), and *Quercus velutina* (black oak). The absent to moderately dense (0-75%) tall-shrub layer (1-6 m), when present, includes *Asimina triloba* (pawpaw), *Cercis canadensis var. canadensis* (eastern redbud), *Lindera benzoin* (northern spicebush), and *Ulmus rubra* (slippery elm). The very sparse (2-5%) short-shrub layer (0.5-1 m) includes *Rubus phoenicolasius* (wine raspberry). The moderate to dense (50-100%) herbaceous layer (<0.5 m) is dominated by exotic species *Alliaria petiolata* (garlic mustard) and *Lonicera japonica* (Japanese honeysuckle), along with *Viola pubescens var. pubescens* (downy yellow violet) and *Viola sororia* (common blue violet). Less disturbed sites can have a rich, diverse herbaceous layer. A total of 86 taxa were recorded from two plots.

Chesapeake & Ohio Canal National Historical Park Vegetation: The dense to very dense (60-80+% cover) tree canopy, 20-35 m tall, is dominated by *Celtis occidentalis* (common hackberry) and *Quercus muehlenbergii* (chinquapin oak), as is the sparse to moderate (20-60%) subcanopy (10-20 m). Additional tree species may include *Acer negundo* (box-elder), *Acer saccharum var. saccharum* (sugar maple), *Carya cordiformis* (bitternut hickory), *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), *Juglans cinerea* (butternut), *Quercus rubra* (northern red oak), and *Thuja occidentalis* (arborvitae). The moderate (40-60%) tall-shrub layer (6-10 m) and moderate (60%) short-shrub layer (1-6 m) include canopy species along with *Asimina triloba* (pawpaw), *Staphylea trifolia* (American bladdernut), and *Viburnum prunifolium* (blackhaw). Vines of *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), and *Vitis aestivalis var. aestivalis* (summer grape) climb into the shrub and tree canopies. Common and/or abundant species in the herbaceous layer (40-80+%) include *Asarum canadense* (Canadian wildginger), *Ageratina altissima* (white snakeroot), *Dicentra cucullaria* (Dutchman's breeches), *Festuca subverticillata* (nodding fescue), *Galium aparine* (stickywilly), *Jeffersonia diphylla* (twinleaf), *Mertensia virginica* (Virginia bluebells), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), *Stellaria media* (common chickweed), *Toxicodendron radicans* (eastern poison-ivy), *Veronica hederifolia* (ivyleaf speedwell), *Viola pubescens var. pubescens* (downy yellow violet), and exotics *Alliaria petiolata* (garlic mustard), *Allium vineale* (wild garlic), and *Lonicera japonica* (Japanese honeysuckle). Nonvascular species cover up to 5% of the ground surface. A total of 15 exotic species were reported from sampled

stands. In addition, this community also supports Maryland state-critically imperiled *Thuja occidentalis* (arborvitae) and *Zanthoxylum americanum* (common pricklyash), state-imperiled *Hydrophyllum macrophyllum* (largeleaf waterleaf), and 8 state-vulnerable species.

Harpers Ferry National Historical Park Vegetation: Vegetation of this association is a mixed mesophytic hardwood forest with overstory codominance by *Carya cordiformis* (bitternut hickory), *Fraxinus americana* (white ash), *Celtis occidentalis* (common hackberry), *Quercus muehlenbergii* (chinquapin oak), *Quercus rubra* (northern red oak), *Juglans nigra* (black walnut), and *Quercus velutina* (black oak). The understory tree layers can be quite open but include *Juniperus virginiana var. virginiana* (eastern red-cedar), *Acer negundo* (box-elder), and *Ulmus rubra* (slippery elm). The shrub layer contains moderate to high cover of *Viburnum prunifolium* (blackhaw), *Cercis canadensis var. canadensis* (eastern redbud), and *Lindera benzoin* (northern spicebush). The herb layer is lush with nutrient-demanding species and characterized by patch-dominance of *Ageratina altissima* (white snakeroot), *Verbesina alternifolia* (wingstem), *Sanicula odorata* (clustered blacksnakeroot), and *Elymus hystrix var. hystrix* (eastern bottlebrush grass). Exotic species are often quite prevalent with the most abundant typically *Alliaria petiolata* (garlic mustard), *Lonicera japonica* (Japanese honeysuckle), and *Stellaria media* (common chickweed). Other herb species include *Viola pubescens* (downy yellow violet), *Arisaema triphyllum* (Jack in the pulpit), *Polygonum virginianum* (jumpseed), *Carex digitalis* (slender woodland sedge), and *Cryptotaenia canadensis* (Canadian honewort).

Manassas National Battlefield Park Vegetation: Forest vegetation of this association is a mixed mesophytic hardwood forest with overstory codominance by *Carya cordiformis* (bitternut hickory), *Fraxinus americana* (white ash), *Celtis occidentalis* (common hackberry), *Quercus muehlenbergii* (chinquapin oak), *Quercus rubra* (northern red oak), and *Ulmus rubra* (slippery elm). The understory tree layers are sparse, but the shrub layer contains moderate to high cover of *Asimina triloba* (pawpaw), *Cercis canadensis var. canadensis* (eastern redbud), *Lindera benzoin* (northern spicebush), and *Staphylea trifolia* (American bladdernut). In undisturbed stands, the herb layer is lush with nutrient-demanding species and characterized by patch-dominance of *Cystopteris protrusa* (lowland bladderfern), *Hydrophyllum virginianum* (eastern waterleaf), *Carex jamesii* (James' sedge), *Asarum canadense* (Canadian wildginger), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), and *Festuca subverticillata* (nodding fescue). Other noteworthy herbaceous species found in this community include *Hybanthus concolor* (eastern greenviolet), *Myosotis macrosperma* (largeseed forget-me-not), and *Triosteum perfoliatum* (feverwort). Disturbed stands usually have sparse to dense, weedy herb layers with a high proportion of exotics such as *Alliaria petiolata* (garlic mustard) and *Lonicera japonica* (Japanese honeysuckle).

Monocacy National Battlefield Vegetation: Characteristic trees include *Quercus muehlenbergii* (chinquapin oak) (chinquapin oak), *Carya cordiformis* (bitternut hickory) (bitternut hickory), *Celtis occidentalis* (common hackberry), and *Fraxinus americana* (white ash). Shrubs include *Asimina triloba.* Non-native invasive plants are common and abundant, dominating the herbaceous layer.

Global Vegetation: Stands are dominated by a mixture of *Quercus muehlenbergii* (chinquapin oak), other oaks (particularly *Quercus alba* (white oak) and *Quercus rubra* (northern red oak)), and several hickories (*Carya cordiformis* (bitternut hickory), *Carya glabra* (pignut hickory), and *Carya ovalis* (red hickory)). *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Acer saccharum* (sugar maple), *Quercus velutina* (black oak), *Ulmus rubra* (slippery elm), *Tilia americana* (American basswood), and *Juglans nigra* (black walnut) may also be present in the canopy. Disturbed stands may have a higher proportion of *Fraxinus americana* (white ash), *Celtis occidentalis* (common hackberry), and other early-successional species in the overstory. The relatively open subcanopy may contain *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), and *Juniperus virginiana var. virginiana* (eastern red-cedar), as well as smaller individuals of *Fraxinus americana* (white ash) and *Carya* (hickory) spp. *Viburnum prunifolium* (blackhaw), *Cercis canadensis var. canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Ulmus rubra* (slippery elm), *Ostrya virginiana* (hophornbeam), *Viburnum prunifolium* (blackhaw), and *Asimina triloba* (pawpaw) are present as tall shrubs or small trees. Low shrubs include *Rhus aromatica var. aromatica* (fragrant sumac), *Dirca palustris* (eastern leatherwood), *Staphylea trifolia* (American bladdernut), and *Toxicodendron radicans* (eastern poison-ivy). Herbs present include *Ageratina altissima* (white snakeroot), *Amphicarpaea bracteata* (American hogpeanut), *Asclepias quadrifolia* (fourleaf milkweed), *Bromus pubescens* (hairy woodland brome), *Brachyelytrum erectum* (bearded shorthusk), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Collinsonia canadensis* (richweed), *Dichanthelium boscii* (Bosc's panicgrass), *Dioscorea quaternata* (fourleaf yam), *Desmodium glutinosum* (pointedleaf ticktrefoil), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Euphorbia mercurialina* (mercury spurge), *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Geranium maculatum* (spotted geranium), *Hexastylis arifolia var. ruthii* (Ruth's littlebrownjug), *Houstonia longifolia* (longleaf summer bluet), *Hydrophyllum virginianum* (eastern waterleaf), *Maianthemum racemosum* (feathery false lily of the valley), *Oxalis grandis* (great yellow woodsorrel), *Packera*

obovata (roundleaf ragwort), *Polystichum acrostichoides* (Christmas fern), *Sanicula odorata* (clustered blacksnakeroot), *Sanguinaria canadensis* (bloodroot), *Sedum ternatum* (woodland stonecrop), *Thaspium barbinode* (hairyjoint meadowparsnip), *Viola x palmata* (early blue violet), and *Viola pubescens* (downy yellow violet). Some small patches of *Arundinaria gigantea* (giant cane) are also present in stands at the southern end of the range. Additional species characteristic of plot samples at the northern end of the range are *Festuca subverticillata* (nodding fescue), *Viola sororia* (common blue violet), *Cardamine concatenata* (cutleaf toothwort), *Geum canadense* (white avens), *Arisaema triphyllum* (Jack in the pulpit), *Actaea racemosa* (black baneberry), *Dicentra cucullaria* (Dutchman's breeches), *Claytonia virginica* (Virginia springbeauty), *Polygonum virginianum* (jumpseed), *Corydalis flavula* (yellow fumewort), *Eurybia divaricata* (white wood aster), *Podophyllum peltatum* (mayapple), and *Viola striata* (striped cream violet). Several species that are more typical of basic mesic forests (e.g., *Asarum canadense* (Canadian wildginger), *Jeffersonia diphylla* (twinleaf), *Hybanthus concolor* (eastern greenviolet), and *Dicentra canadensis* (squirrel corn)) occasionally exhibit strong patch-dominance in this community, although none of these species occurs with high constancy. In Lee County, VA, *Hydrastis canadensis* (goldenseal) frequently forms large clones in this forest. Additional, relatively inconstant herbs that occasionally cover >1% of an individual stand include *Sanicula odorata* (clustered blacksnakeroot), *Bromus pubescens* (hairy woodland brome), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Sanguinaria canadensis* (bloodroot), *Galium concinnum* (shining bedstraw), *Hepatica nobilis var. obtusa* (roundlobe hepatica), *Polymnia canadensis* (whiteflower leafcup), *Stellaria pubera* (star chickweed), and *Carex jamesii* (James' sedge). Many additional herbs occur at low cover and constancy.

Global Dynamics: Contemporary examples of this vegetation type are probably quite different from mature stands that existed prior to the extensive post-settlement landscape alterations that occurred in the fertile limestone portions of the Ridge and Valley province. Codominance by trees such as *Celtis occidentalis* (common hackberry) and *Fraxinus americana* (white ash) is generally regarded as an indicator of heavy past disturbances and secondary succession. In a large and relatively mature stand (Frederick County, Virginia) that had experienced past cutting but no agricultural impacts, the overstory codominants were (in roughly descending order of importance) *Quercus muehlenbergii* (chinquapin oak), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Carya cordiformis* (bitternut hickory), *Carya ovalis* (red hickory), and *Fraxinus americana* (white ash); *Quercus velutina* (black oak) was also common in certain parts of the site that seemed a little drier and stonier. The ubiquity of invasive weeds (e.g., *Alliaria petiolata* (garlic mustard) and *Lonicera japonica* (Japanese honeysuckle)) in most sampled and observed stands adds to the evidence that most examples are degraded. Moreover, at least in Virginia, where almost all of the prime habitats for this vegetation are located on private lands, inventory and documentation of the type have been very poor. All of these factors make characterization difficult. However, existing data and observations suggest that the type is widely distributed in the Ridge and Valley from western Maryland to Tennessee. Although opportunistic, early- and mid-successional species such as *Celtis occidentalis* (common hackberry) and *Fraxinus americana* (white ash) may persistently codominate many stands; oaks and hickories are likely to be the climax species in the absence of human disturbances.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus muehlenbergii* (chinquapin oak)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash)

Chesapeake & Ohio Canal National Historical Park: *Quercus muehlenbergii* (chinquapin oak), *Viburnum prunifolium* (blackhaw)

Harpers Ferry National Historical Park: *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Elymus hystrix* var. *hystrix* (eastern bottlebrush grass), *Quercus muehlenbergii* (chinquapin oak), *Viburnum prunifolium* (blackhaw)

Manassas National Battlefield Park: *Carex jamesii* (James' sedge), *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Hydrophyllum virginianum* (eastern waterleaf), *Quercus muehlenbergii* (chinquapin oak), *Staphylea trifolia* (American bladdernut)

Monocacy National Battlefield: *Carya cordiformis* (bitternut hickory), *Quercus muehlenbergii* (chinquapin oak)

Global: *Bromus pubescens* (hairy woodland brome), *Cercis canadensis* (eastern redbud), *Quercus muehlenbergii* (chinquapin oak)

OTHER NOTEWORTHY SPECIES

Antietam National Battlefield: Vulnerable Plants: *Symphyotrichum shortii* (Short's aster, G5, MD state-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Dactylis glomerata* (orchardgrass, Medium/Insignificant), *Daucus carota* (Queen Anne's lace, Low), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Festuca rubra* (red fescue, Unknown), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Ligustrum vulgare* (European privet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Stellaria media* (common chickweed, Low), *Veronica hederifolia* (ivyleaf speedwell); **Other Plants**: *Lindera benzoin* (northern spicebush, G5)
Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Clematis viorna* (vasevine, G5, MD-vulnerable), *Delphinium tricorne* (dwarf larkspur, G5, MD-vulnerable), *Galium concinnum* (shining bedstraw, G5, MD-vulnerable), *Geum laciniatum* (rough avens, G5, MD-vulnerable), *Hybanthus concolor* (eastern greenviolet, G5, MD-vulnerable), *Hydrophyllum macrophyllum* (largeleaf waterleaf, G5, MD-imperiled), *Juglans cinerea* (butternut, G3, MD-vulnerable), *Ribes cynosbati* (eastern prickly gooseberry, G5, MD-vulnerable), *Symphyotrichum shortii* (Short's aster, G5, MD-vulnerable), *Thuja occidentalis* (arborvitae, G5, MD-critically imperiled), *Zanthoxylum americanum* (common pricklyash, G5, MD-critically imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Berberis thunbergii* (Japanese barberry, High/Medium), *Cardamine hirsuta* (hairy bittercress), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera maackii* (Amur honeysuckle, High), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Prunus avium* (sweet cherry, High/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Stellaria media* (common chickweed, Low), *Veronica hederifolia* (ivyleaf speedwell)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Stellaria media* (common chickweed, Low)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Monocacy National Battlefield: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Global: Vulnerable Plants: *Allium oxyphilum* (lillydale onion, G2), *Monarda fistulosa* var. *brevis* (wild bergamot, G5T1T2)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (01-Oct-2006). This association is potentially widespread across the Ridge and Valley province of four states. However, this region has a long and extensive history of settlement and agriculture. As a result, few high-quality occurrences of this community exist, and most contemporary stands have been impacted by multiple disturbances, including clearing, cutting, and grazing. Moreover, the fertile soils occupied by this community are particularly prone to invasion by aggressive introduced weeds, whose abundance degrades the quality of many existing stands.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Quercus muehlenbergii / Cercis canadensis* Forest (CEGL006017) clearly related but more xeric and without oak dominance.
- *Quercus rubra - Quercus muehlenbergii / Hamamelis virginiana / Polymnia canadensis* Forest (CEGL007215)

Global Related Concepts:
- *Fraxinus americana - Carya cordiformis - Quercus muhlenbergii / Staphylea trifolia / Hydrophyllum virginianum* Forest (Fleming and Weber 2003) =
- *Quercus muhlenbergii - Quercus (alba, rubra) - Carya cordiformis / Viburnum prunifolium* Forest (Fleming and Taverna 2006) =
- IA6j. Interior Calcareous Oak-Hickory Forest (Allard 1990) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Antietam National Battlefield Classification Comments: Ridge and Valley Limestone Oak - Hickory Forest is sometimes referred to as Limestone Oak - Hickory Forest.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Ridge and Valley Limestone Oak - Hickory Forest is sometimes referred to as Limestone Oak - Hickory Forest.
Harpers Ferry National Historical Park Classification Comments: This community is distinguished by its mixed hardwood overstory dominated by upland oaks, hickories, and black walnut. The prevalence of *Quercus muehlenbergii* (chinquapin oak) is an important identifier as this species is rarely found elsewhere in the park. Ridge and Valley Limestone Oak - Hickory Forest is sometimes referred to as Limestone Oak - Hickory Forest.
Harpers Ferry National Historical Park Other Comments: Most stands sampled for the project are probably not representative of mature examples; the current prevalence of *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), and *Juglans nigra* (black walnut) in the canopy, along with >10% mean cover of exotics, are good indicators of heavy past disturbance and secondary succession.
Manassas National Battlefield Park Classification Comments: Although the shrub and herbaceous flora of undisturbed stands of this community is similar to those of Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073), the overstory is dominated by upland oaks, hickories, and white ash. This association can be readily distinguished by its steep, bluff-like habitat and the prevalence of *Quercus muehlenbergii* (chinquapin oak), a species rarely found elsewhere in the park. Ridge and Valley Limestone Oak - Hickory Forest is sometimes referred to as Limestone Oak - Hickory Forest.
Manassas National Battlefield Park Other Comments: Like the fertile floodplains, the habitat of this community is very favorable for shade-tolerant, invasive exotics, especially *Alliaria petiolata* (garlic mustard) and *Microstegium vimineum* (Nepalese browntop).
Monocacy National Battlefield Classification Comments: This community is known from only one location in the park but is distinguished by a tree canopy dominated by *Quercus muehlenbergii* (chinquapin oak) (chinquapin oak). Ridge and Valley Limestone Oak - Hickory Forest is sometimes referred to as Limestone Oak - Hickory Forest.
Global Classification Comments: This association has been observed on The Nature Conservancy's Powell River Preserve and in Cumberland Gap National Historical Park, both in Claiborne County, Tennessee, as well as in a number of Virginia sites in the Ridge and Valley province. Quantitative data from northwestern Virginia, eastern and southern West Virginia, and western Maryland have been analyzed for the National Park Service.

ELEMENT DISTRIBUTION

Antietam National Battlefield Range: This association is fairly common throughout the park in woodlots and in the Snavely's Woods area.
Chesapeake & Ohio Canal National Historical Park Range: This community was sampled at Big Woods, Jordan Junction, and Mountain Lock.
Harpers Ferry National Historical Park Range: This vegetation is restricted to calcium-enriched soils weathered from dolomite or limestone. The three stands documented in the park are found at one site in the southwestern end of the park, near the town of Millville.
Manassas National Battlefield Park Range: This vegetation is restricted to steep, linear bluffs bordering the Bull Run floodplain north and south of the Stone Bridge. This type is unique among park forests, has considerable floristic and ecological interest, and should be protected from disturbance. Currently, a horse trail traverses the north end of one stand as it drops from the upland into the Bull Run lowlands.
Monocacy National Battlefield Range: This community is known from only one location in the park.
Global Range: This association is found in the Ridge and Valley and adjacent areas of Tennessee, Virginia, West Virginia, and Maryland, with small disjunct occurrences in the northern Virginia Triassic (Culpeper) Basin.
Nations: US
States/Provinces: KY:SNR, MD:SNR, TN:SNR, VA:S3S4, WV:S3
TNC Ecoregions: 50:C, 52:C, 59:C
USFS Ecoregions (2007): 221Hc:CCC, 221Ja:CCC, M221Be:CCC
Federal Lands: NPS (Antietam, Big South Fork, Bluestone, C&O Canal, Cumberland Gap, Harpers Ferry, Manassas, Monocacy, New River Gorge); USFS (Monongahela); USFWS (National Conservation Training Center)

ELEMENT SOURCES

Antietam National Battlefield Plots: (2 plots): ANTI.1, ANTI.7.

Chesapeake & Ohio Canal National Historical Park Plots: (4 plots): CHOH.006, CHOH.010, CHOH.014, CHOH.032.
Harpers Ferry National Historical Park Plots: HAFE.31, HAFE.32.
Manassas National Battlefield Park Plots: MANA.17.
Antietam National Battlefield Description Author(s): M. Russo and S. Perles
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
Monocacy National Battlefield Description Author(s): J. Teague
Global Description Author(s): M. Pyne, R. White, G.P. Fleming and S.C. Gawler
References: Allard 1990, Fleming 2002b, Fleming and Patterson 2003, Fleming and Patterson 2009b, Fleming and Taverna 2006, Fleming and Weber 2003, Fleming et al. 2017, Harrison 2004, Lea 2004, NatureServe Ecology - Southeastern U.S. unpubl. data, Southeastern Ecology Working Group n.d.*, Vanderhorst et al. 2007, Vanderhorst et al. 2008, WVNHP unpubl. data, White 2006

A3106 *Quercus muehlenbergii* Appalachian Limestone Woodland Alliance

This alliance contains woodlands in which *Quercus muehlenbergii* (chinquapin oak) is a characteristic, and sometimes dominant, tree. Associated canopy species include *Carya ovata* (shagbark hickory), *Cercis canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Fraxinus americana* (white ash), *Juniperus virginiana* (eastern red-cedar), *Liriodendron tulipifera* (tuliptree), *Ostrya virginiana* (hophornbeam), and *Quercus alba* (white oak). Shrubs are scattered and may include *Ceanothus americanus* (New Jersey tea), *Rhus aromatica var. aromatica* (fragrant sumac), and *Rosa carolina* (Carolina rose). Characteristic herbs vary among sites but often include *Andropogon gerardii* (big bluestem), *Antennaria plantaginifolia* (woman's tobacco), *Bouteloua curtipendula var. curtipendula* (sideoats grama), *Carex pensylvanica* (Pennsylvania sedge), *Cynoglossum officinale* (gypsyflower), *Elymus hystrix* (eastern bottlebrush grass), *Helianthus divaricatus* (woodland sunflower), *Lithospermum canescens* (hoary puccoon), *Phlox subulata* (moss phlox), *Pycnanthemum incanum* (hoary mountainmint), *Schizachyrium scoparium* (little bluestem), *Solidago arguta var. harrisii* (Harris' goldenrod), and *Sorghastrum nutans* (Indiangrass). This vegetation occurs in the Central Appalachians and Southern Blue Ridge on moderate slopes on calcareous loams derived from limestone or dolomite.

[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	Appalachian-Northeast Chinquapin Oak - Red-cedar Alkaline Forest & Woodland (G016)
Alliance	*Quercus muehlenbergii* Appalachian Limestone Woodland Alliance (A3106)

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* (sugar maple) or occasionally *Acer nigrum* (black maple), *Quercus muehlenbergii* (chinquapin oak), *Fraxinus americana* (white ash), and *Ostrya virginiana* (hophornbeam). Associates include *Quercus alba* (white oak), *Tilia americana* (American basswood), *Acer nigrum* (black maple), *Ulmus rubra* (slippery elm), *Celtis occidentalis* (common hackberry), *Carya ovalis* (red hickory), and *Carya ovata* (shagbark hickory). *Quercus montana* (chestnut oak) may also be present in some examples. A variable subcanopy and shrub layer contains *Cornus florida* (flowering dogwood), *Cercis canadensis* (eastern redbud), *Hamamelis virginiana* (American witch-hazel), *Rosa carolina* (Carolina rose), *Rhus aromatica* (fragrant sumac),

Viburnum prunifolium (blackhaw), *Viburnum rafinesqueanum* (downy arrow-wood), *Viburnum rufidulum* (rusty blackhaw), and *Zanthoxylum americanum* (common pricklyash). The sparse to well-developed herb layer may contain *Danthonia spicata* (poverty oatgrass), *Elymus hystrix* (eastern bottlebrush grass), *Bouteloua curtipendula* (sideoats grama), *Ageratina altissima* (white snakeroot), *Antennaria plantaginifolia* (woman's tobacco), *Aquilegia canadensis* (red columbine), *Arabis laevigata* (smooth rockcress), *Asclepias quadrifolia* (fourleaf milkweed), *Clematis occidentalis* (western blue virginsbower) (to the north), *Houstonia longifolia* (longleaf summer bluet), *Polygonum scandens* (climbing false buckwheat), *Sanicula canadensis* (Canadian blacksnakeroot), *Saxifraga virginiensis* (early saxifrage), and *Packera obovata* (roundleaf ragwort). Some other herbs recorded in Virginia examples include *Agrimonia rostellata* (beaked agrimony), *Anemone virginiana var. virginiana* (tall thimbleweed), *Symphyotrichum patens var. patens* (late purple aster), *Bromus pubescens* (hairy woodland brome), *Dichanthelium boscii* (Bosc's panicgrass), *Erigeron pulchellus var. pulchellus* (robin's plantain), *Galium circaezans* (licorice bedstraw), *Sanicula canadensis* (Canadian blacksnakeroot), *Scutellaria elliptica* (hairy skullcap), and *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod). Some stands attributed to this type are mesic forests of steep slopes in the Southern Ridge and Valley which are dominated by *Acer saccharum* (sugar maple) and some combination of *Quercus alba* (white oak) and/or *Quercus muehlenbergii* (chinquapin oak) with *Liriodendron tulipifera* (tuliptree), *Carya* (hickory) spp., and *Aesculus flava* (yellow buckeye) 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

Chesapeake & Ohio Canal National Historical Park Environment: This calciphilic maple-oak forest was sampled at six locations in the park. Sites range from abrupt to moderately sloping mid and upper slopes and cliff tops of mostly eastern and western aspects. Soils are rapidly to well-drained silt loam; one site has stony (gravelly) sandy clay loam. The unvegetated surface is made up of leaf litter (55-90% cover), exposed bedrock (0-30%), large rocks (0-30%), small rocks (0-20%), wood (1-5%), bare soil (1-33%), and mosses and lichens (0-20%). Evidence of disturbance includes some erosion, deer grazing/browsing, trails, and the presence of exotic 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

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderately dense (40-60+% cover) tree canopy, 10-35 m tall, is dominated by *Acer saccharum var. saccharum* (sugar maple) and *Quercus muehlenbergii* (chinquapin oak) and may include substantial amounts of *Fraxinus americana* (white ash), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Quercus velutina* (black oak). The moderately dense (40-60+%) subcanopy (10-20 m) is made up of canopy species as well as *Juniperus virginiana* (eastern red-cedar), *Quercus montana* (chestnut oak), *Tilia americana* (American basswood), and *Vitis aestivalis var. aestivalis* (summer grape). The very sparse to moderate (10-60%) tall-shrub layer (6-10 m) and sparse to dense (20-80+%) short-shrub layer (1-6 m) are dominated by *Acer saccharum var. saccharum* (sugar maple), *Carya* (hickory) spp., *Celtis occidentalis* (common hackberry), *Cercis canadensis var. canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Fraxinus americana* (white ash), *Juniperus virginiana* (eastern red-cedar), *Ostrya virginiana* (hophornbeam), *Quercus rubra* (northern red oak), *Rhus aromatica var. aromatica* (fragrant sumac), *Tilia americana* (American basswood), *Viburnum prunifolium* (blackhaw), and *Vitis aestivalis var. aestivalis* (summer grape). Common and/or abundant species in the herbaceous layer (20-60%) include *Antennaria plantaginifolia* (woman's tobacco), *Bromus pubescens* (hairy woodland brome), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Galium circaezans*

(licorice bedstraw), *Lonicera japonica* (Japanese honeysuckle), *Muhlenbergia sobolifera* (rock muhly), *Parthenocissus quinquefolia* (Virginia creeper), *Symphyotrichum shortii* (Short's aster), *Toxicodendron radicans* (eastern poison-ivy), and *Viola sororia* (common blue violet). Nonvascular species cover up to 25% of the ground surface. A total of 15 exotic species were reported from sampled stands. In addition, this community also supports Maryland state-critically imperiled *Asplenium resiliens* (blackstem spleenwort) and *Thuja occidentalis* (arborvitae) and 10 Maryland state-vulnerable species.

Global Vegetation: The tall, closed-canopy stands are primarily composed of *Acer saccharum* (sugar maple), *Quercus muehlenbergii* (chinquapin oak), *Fraxinus americana* (white ash), and *Ostrya virginiana* (hophornbeam). Associates include *Quercus alba* (white oak), *Tilia americana* (American basswood), *Acer nigrum* (black maple), *Ulmus rubra* (slippery elm), *Aesculus flava* (yellow buckeye), *Celtis occidentalis* (common hackberry), *Carya ovalis* (red hickory), *Carya cordiformis* (bitternut hickory), and *Carya ovata* (shagbark hickory). *Quercus montana* (chestnut oak) 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* (flowering dogwood), *Cercis canadensis* (eastern redbud), *Carpinus caroliniana* (American hornbeam), *Lindera benzoin* (northern spicebush), *Hamamelis virginiana* (American witch-hazel), *Rosa carolina* (Carolina rose), *Rhus aromatica* (fragrant sumac), *Viburnum prunifolium* (blackhaw), *Viburnum rafinesqueanum* (downy arrow-wood), *Viburnum rufidulum* (rusty blackhaw), and *Zanthoxylum americanum* (common pricklyash). The sparse to well-developed herb layer is usually species-rich and may contain *Danthonia spicata* (poverty oatgrass), *Elymus hystrix* (eastern bottlebrush grass), *Bouteloua curtipendula* (sideoats grama), *Ageratina altissima* (white snakeroot), *Antennaria plantaginifolia* (woman's tobacco), *Aquilegia canadensis* (red columbine), *Arabis laevigata* (smooth rockcress), *Asclepias quadrifolia* (fourleaf milkweed), *Clematis occidentalis* (western blue virginsbower) (to the north), *Houstonia longifolia* (longleaf summer bluet), *Polygonum scandens* (climbing false buckwheat), *Sanicula canadensis* (Canadian blacksnakeroot), *Saxifraga virginiensis* (early saxifrage), and *Packera obovata* (roundleaf ragwort). Some other herbs recorded in Virginia examples include *Agrimonia rostellata* (beaked agrimony), *Anemone virginiana var. virginiana* (tall thimbleweed), *Symphyotrichum patens var. patens* (late purple aster), *Bromus pubescens* (hairy woodland brome), *Dichanthelium boscii* (Bosc's panicgrass), *Erigeron pulchellus var. pulchellus* (robin's plantain), *Galium circaezans* (licorice bedstraw), *Sanicula canadensis* (Canadian blacksnakeroot), *Scutellaria elliptica* (hairy skullcap), and *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod). Some additional taxa that are relatively constant in the broad type are *Asplenium platyneuron* (ebony spleenwort), *Botrychium virginianum* (rattlesnake fern), *Carex blanda* (eastern woodland sedge), *Actaea racemosa* (black baneberry), *Galium triflorum* (fragrant bedstraw), *Hybanthus concolor* (eastern greenviolet), *Maianthemum racemosum* (feathery false lily of the valley), *Polygonatum biflorum* (smooth Solomon's seal), *Polymnia canadensis* (whiteflower leafcup), *Ranunculus recurvatus* (blisterwort), and *Sanguinaria canadensis* (bloodroot). In addition, *Muhlenbergia sobolifera* (rock muhly) may dominate the herbaceous stratum of some stands.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum* (sugar maple)
Tree canopy	Broad-leaved deciduous tree	*Quercus alba* (white oak), *Quercus rubra* (northern red oak)
Tall shrub/sapling	Broad-leaved deciduous tree	*Cercis canadensis* (eastern redbud)
Herb (field)	Flowering forb	*Erigeron pulchellus* (robin's plantain), *Hepatica nobilis* var. *acuta* (sharplobe hepatica), *Packera obovata* (roundleaf ragwort), *Solidago ulmifolia* (elmleaf goldenrod)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Acer saccharum* var. *saccharum* (sugar maple), *Cercis canadensis* var. *canadensis* (eastern redbud), *Quercus muehlenbergii* (chinquapin oak)

Global: *Acer nigrum* (black maple), *Bromus pubescens* (hairy woodland brome), *Erigeron pulchellus* (robin's plantain), *Hybanthus concolor* (eastern greenviolet), *Muhlenbergia tenuiflora* (slimflower muhly), *Packera obovata* (roundleaf ragwort), *Quercus muehlenbergii* (chinquapin oak), *Solidago ulmifolia* (elmleaf goldenrod), *Thalictrum dioicum* (early meadowrue), *Ulmus rubra* (slippery elm)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Asplenium resiliens* (blackstem spleenwort, G5, MD-critically imperiled), *Carex albursina* (white bear sedge, G5, MD-vulnerable), *Clematis viorna* (vasevine, G5, MD-vulnerable), *Dodecatheon meadia* (pride of Ohio, G5, MD-vulnerable), *Eupatorium altissimum* (tall thoroughwort, G5, MD-vulnerable), *Geum laciniatum* (rough avens, G5, MD-vulnerable), *Hybanthus concolor* (eastern greenviolet, G5, MD-vulnerable), *Juglans cinerea* (butternut, G3, MD-vulnerable), *Ribes cynosbati* (eastern prickly gooseberry, G5, MD-vulnerable), *Scutellaria ovata* (heartleaf skullcap, G5, MD-vulnerable), *Symphyotrichum shortii* (Short's aster, G5, MD-vulnerable), *Thuja occidentalis* (arborvitae, G5, MD-critically imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Dactylis glomerata* (orchardgrass, Medium/Insignificant), *Elaeagnus umbellata* var. *parvifolia* (autumn olive), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Poa compressa* (Canada bluegrass, High/Low), *Prunus avium* (sweet cherry, High/Low), *Prunus mahaleb* (Mahaleb cherry, Medium/Insignificant), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Taraxacum officinale* (common dandelion), *Verbascum thapsus* (common mullein, Medium)

Global: Vulnerable Plants: *Arabis patens* (spreading rockcress, G3), *Berberis canadensis* (American barberry, G3G4), *Carex purpurifera* (purple sedge, G4?, VA state-rare), *Delphinium exaltatum* (tall larkspur, G3), *Desmodium cuspidatum* (largebract ticktrefoil, G5, VA state-rare), *Lithospermum latifolium* (American stoneseed, G4, VA state-rare), *Melica nitens* (threeflower melicgrass, G5, VA state-rare), *Monarda fistulosa* var. *brevis* (wild bergamot, G5T1T2)

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.

Global Related Concepts:

- *Acer saccharum - Quercus (alba, muehlenbergii)* Forest (Andreu and Tukman 1995) **?**
- *Acer saccharum - Quercus muehlenbergii / Cercis canadensis* Forest (Fleming and Patterson 2009a) **=**
- *Acer saccharum - Quercus muehlenbergii / Houstonia longifolia* Forest (Walton et al. 1997) **=**
- *Quercus muehlenbergii - Acer (nigrum, saccharum) / Ostrya virginiana / Erigeron pulchellus - Packera obovata* Forest (Fleming and Coulling 2001) **=**
- *Quercus muehlenbergii / Juniperus virginiana / Hybanthus concolor* Association (Rawinski et al. 1996) **<**
- *Quercus muhlenbergii - Acer (nigrum, saccharum var. saccharum) / Ostrya virginiana / Senecio obovatus* Forest, Type 3.1 (Fleming 1999) **=**
- Yellow oak-sugar maple-red bud forest of calcareous upper slopes and summits (CAP pers. comm. 1998) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Within this park, Appalachian Sugar Maple - Chinquapin Oak Limestone Forest is also referred to simply as Sugar Maple - Chinquapin Oak Limestone Forest.
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* (sugar maple) and some combination of *Quercus alba* (white oak) and/or *Quercus muehlenbergii* (chinquapin oak) with *Liriodendron tulipifera* (tuliptree), *Carya* (hickory) spp., and *Aesculus flava* (yellow buckeye) 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* (rock muhly), *Erigeron pulchellus var. pulchellus* (robin's plantain), *Bromus pubescens* (hairy woodland brome), *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod), *Brachyelytrum erectum* (bearded shorthusk), *Ulmus rubra* (slippery elm), *Packera obovata* (roundleaf ragwort), *Viburnum prunifolium* (blackhaw), *Parthenocissus quinquefolia* (Virginia creeper), *Quercus rubra* (northern red oak), *Ostrya virginiana* (hophornbeam), *Thalictrum dioicum* (early meadowrue), *Fraxinus americana* (white ash), and *Quercus muehlenbergii* (chinquapin oak).

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled at Cedar Grove, Dargan Bend Woods (Mountain Lock), Falling Water Road, and Roundtop Hill.
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?:SNA, GA:SNR, KY:SNR, MD:SNR, OH:SNR, PA:SNR, TN:SNR, VA:S3?, WV:S2
TNC Ecoregions: 44:C, 49:C, 50:C, 51:C, 59:C, 60:?, 61:?
USFS Ecoregions (2007): 211Fa:???, 211Ga:???, 211Gb:???, 221A:C?, 221D:C?, 221Ea:CCP, 221Ej:CCP, 221Hc:CCC, 221Ja:CCC, 221Jb:CCC, 223Fd:CCC, 231B:P?, 231Cc:PPP, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Bd:CP?, M221Be:CPP, M221Ca:CC?, M221Cb:CCC, M221Cc:CC?, M221Ce:CCP, 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

Chesapeake & Ohio Canal National Historical Park Plots: (6 plots): CHOH.020, CHOH.023, CHOH.039, CHOH.040, CHOH.106, CHOH.557.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Global Description Author(s): L.A. Sneddon, M. Pyne, G.P. Fleming, 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 Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, ONHD unpubl. data, Rawinski et al. 1996, Vanderhorst et al. 2007, WVNHP unpubl. data, Walton et al. 1997

A3914 *Thuja occidentalis* Appalachian Limestone Cliff Woodland Alliance

This alliance contains woodlands (with variable canopy closure) of calcareous bedrock outcrops and limestone cliffs or steep slopes on which *Thuja occidentalis* (arborvitae) is characteristic. The growth form is generally single-stemmed, but trees may be quite stunted. Associated canopy species can include *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Juniperus virginiana* (eastern red-cedar), *Ostrya virginiana* (hophornbeam), *Quercus muehlenbergii* (chinquapin oak), *Quercus rubra* (northern red oak), and *Tsuga canadensis* (eastern hemlock). Shrubs and small trees may also include *Cercis canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Dirca palustris* (eastern leatherwood), *Hydrangea arborescens* (wild hydrangea), *Ostrya virginiana* (hophornbeam), *Rhus aromatica* (fragrant sumac), and *Viburnum acerifolium* (mapleleaf viburnum). Herbaceous species vary with geography but include species favoring high base-status, such as *Asarum canadense* (Canadian wildginger), *Carex eburnea* (bristleleaf sedge), *Cypripedium reginae* (showy lady's slipper), *Cystopteris bulbifera* (bulblet bladderfern), and others, as well as other species tolerant of a wider base status, including *Chamaelirium luteum* (fairywand), *Collinsonia canadensis* (richweed), *Dioscorea quaternata* (fourleaf yam), *Hepatica nobilis var. obtusa* (roundlobe hepatica), *Solidago arguta* (Atlantic goldenrod), *Solidago curtisii* (mountain decumbent goldenrod), *Pellaea atropurpurea* (purple cliffbrake), and *Uvularia perfoliata* (perfoliate bellwort). This alliance occurs in the Central and Southern Appalachians and Alleghany Plateau on talus, limestone pavement, steep north-facing slopes, or calcareous cliffs, often associated with seepage. Moisture regime varies, with dry cliffs often interspersed with seepage areas.

[CEGL002596] *Thuja occidentalis / Carex eburnea - Pellaea atropurpurea* Cliff Woodland

Translated Name: **Northern White-cedar / Bristleleaf Sedge - Purple Cliffbrake Cliff Woodland**
Common Name: **Appalachian Northern White-cedar Cliff Woodland**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Appalachian-Northeast Chinquapin Oak - Red-cedar Alkaline Forest & Woodland (G016)
Alliance	*Thuja occidentalis* Appalachian Limestone Cliff Woodland Alliance (A3914)

ELEMENT CONCEPT

Global Summary: This white-cedar cliff woodland type is found in the Appalachian and Allegheny Plateau region of the United States. The type extends to near the southern limit of *Thuja occidentalis* (arborvitae), in the southeastern Highland Rim of Kentucky and Tennessee, where it tends to increase its distinctiveness from more northern communities. Stands occur on north-facing bluffs or cliffs of dolomite or limestone, where dip slopes provide slight seepage and maintain humidity higher than the regional average or provide a cooler-than-normal microclimate. In Ohio it occurs as pure isolated patches on steep calcareous cliffs. It is also found as mixed stands on the uplands above the cliffs. Stands are dominated by coniferous trees but can have a significant amount of deciduous species. The structure of this association can vary from a stunted, very open canopy of *Thuja* (arborvitae) to a mixed conifer-deciduous woodland approaching a forest structure. Canopy species other than *Thuja occidentalis* (arborvitae) vary with geography. The most abundant tree species are *Thuja occidentalis* (arborvitae), *Acer saccharum* (sugar maple), *Tsuga canadensis* (eastern hemlock), *Juniperus virginiana* (eastern red-cedar), *Quercus alba* (white oak), *Quercus muehlenbergii* (chinquapin oak), and *Quercus rubra* (northern red oak). Other associates include *Celtis occidentalis* (common hackberry) and *Ulmus rubra* (slippery elm) in more northern stands. Shrub and small tree species include *Cercis canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Hydrangea arborescens* (wild hydrangea), *Ostrya virginiana* (hophornbeam), and *Rhus aromatica* (fragrant sumac). Closed-canopy stands have very few vascular species in the lower strata, while stands with broken canopies contain scattered shrubs and a substantial number of herbaceous species. Composition of the herbaceous and shrub strata can also vary due to seepage influence. Composition is quite variable, but some of the most constant herbaceous plants include *Asarum canadense* (Canadian wildginger), *Carex eburnea* (bristleleaf sedge), *Cystopteris bulbifera* (bulblet bladderfern), and *Hepatica nobilis var. acuta* (sharplobe hepatica). In Kentucky, sites are small (0.1-1 acre), with scattered *Thuja occidentalis* (arborvitae) codominating with *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Ostrya virginiana* (hophornbeam), and *Philadelphus hirsutus* (streambank mock orange). Other associated species include *Juniperus virginiana var. virginiana* (eastern red-cedar), *Cercis canadensis var. canadensis* (eastern redbud), *Pachysandra procumbens* (Allegheny-spurge), *Hamamelis virginiana* (American witch-hazel), *Parthenocissus quinquefolia* (Virginia creeper), *Solidago flexicaulis* (zigzag goldenrod), *Solidago*

sphacelata (autumn goldenrod), *Symphyotrichum cordifolium* (common blue wood aster), and *Dioscorea quaternata* (fourleaf yam). Examples occurring along the C&O Canal in the Maryland Ridge and Valley have rather sparse vegetation, with plants growing from crevices or on shallow soil on ledges. Woody vegetation is composed of stunted trees, with *Thuja occidentalis* (arborvitae), *Ostrya virginiana* (hophornbeam), *Ulmus rubra* (slippery elm), and *Acer saccharum* (sugar maple) most frequent. *Hydrangea arborescens* (wild hydrangea) is a characteristic and frequent shrub, with *Ribes cynosbati* (eastern prickly gooseberry) less constant. Scrambling vines of *Toxicodendron radicans* (eastern poison-ivy) and/or *Parthenocissus quinquefolia* (Virginia creeper) are often present. The most frequent herbaceous species are *Cystopteris bulbifera* (bulblet bladderfern), *Sedum ternatum* (woodland stonecrop), *Aquilegia canadensis* (red columbine), *Asplenium trichomanes* (maidenhair spleenwort), *Asplenium rhizophyllum* (walking fern), *Eurybia divaricata* (white wood aster), *Heuchera americana* (American alumroot), *Arabis laevigata* (smooth rockcress), *Arabis hirsuta* (hairy rockcress), *Pilea pumila* (Canadian clearweed), *Polymnia canadensis* (whiteflower leafcup), *Solidago caesia* (wreath goldenrod), and various herbaceous species of shaded, rocky limestone forests. *Pellaea atropurpurea* (purple cliffbrake) is occasionally present but is absent from many examples and is more characteristic of xeric calcareous cliffs in Maryland.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This white-cedar cliff woodland was sampled at six plot locations in the park. Sites are extremely steep midslope escarpments with north and northwest aspects. The sites are rapidly drained. The unvegetated surface is dominated by exposed bedrock (80-95% cover) with mosses and lichens (30-60%), and some leaf litter (5-15%) and bare soil (1-5%). Evidence of disturbance includes the presence of exotic species.

Global Environment: This community is found primarily on steep calcareous cliffs, as well as on the uplands above the cliffs. The bedrock is typically limestone or dolomite (Braun 1928, Anderson 1996). Soils are shallow, dry, and calcareous, and plants often root in crevices or on narrow ledges, or adjacent clifftops and talus. In Ohio this woodland community occurs as pure, isolated patches on steep calcareous cliffs. It is also found as mixed stands on the uplands above the cliffs. The site of a glacial relict stand in Ohio is maintained by seepage springs from underground limestone formations (Kangas 1989). In Kentucky *Thuja occidentalis* (arborvitae) occurs within the Cumberland River drainage in the southeastern Highland Rim region. These woodlands are associated with steep, rocky, limestone, mostly north- and east-facing slopes along permanent streams. Some stands are associated with cold-air drainages.

In Virginia the type is evidently confined to north-facing cliffs and escarpments produced by incision of high-order streams and rivers into carbonate bedrock of the Ridge and Valley province. Often situated on steep cut-slopes on the outside bends of stream meanders, habitats are more-or-less open but have limited solar exposure because of their north aspects. Microtopography is rugged and complex, encompassing sheer faces, ledges, and crevices of variable configuration. Slopes range from 40-90° and exposed bedrock constitutes >90% of the surface substrate. Substrate moisture regime is generally subxeric but is ameliorated to some degree by frequent zones of ephemeral seepage and by sheltered north aspects that slow evaporation.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: The general appearance of this community is of a stunted woodland or shrubland with a very sparse to moderate (<5-40% cover) canopy/shrub layer (1-6 m tall) dominated by Maryland state-critically imperiled *Thuja occidentalis* (arborvitae); additional species may include *Acer saccharum var. saccharum* (sugar maple), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Quercus rubra* (northern red oak), and Tilia americana. The herbaceous layer (10-40%) is dominated by *Hydrangea arborescens* (wild hydrangea), *Parthenocissus quinquefolia* (Virginia creeper), *Polymnia canadensis* (whiteflower leafcup), *Rubus phoenicolasius* (wine raspberry), and *Toxicodendron radicans* (eastern poison-ivy). Nonvascular species are present in all stands and cover 30-60% of the ground surface. A total of 11 exotic species were reported from sampled stands. This community also supports six Maryland state-vulnerable species.

Global Vegetation: Stands are dominated by coniferous trees, but with a significant amount of deciduous species. The most abundant tree species are *Thuja occidentalis* (arborvitae), *Acer saccharum* (sugar maple), *Tsuga canadensis* (eastern hemlock), *Juniperus virginiana* (eastern red-cedar), *Quercus alba* (white oak), *Quercus muehlenbergii* (chinquapin oak), and *Quercus rubra* (northern red oak). Other associates include *Quercus coccinea* (scarlet oak) and *Liriodendron tulipifera* (tuliptree) in more southern stands, and *Celtis occidentalis* (common hackberry) and *Ulmus rubra* (slippery elm) in more northern stands. Where soils are deeper, hardwoods generally do better. Shrub and small tree species include *Cercis canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Hydrangea arborescens* (wild hydrangea), *Ostrya virginiana* (hophornbeam), and *Rhus aromatica* (fragrant sumac). Closed-canopy stands have very few vascular species in the lower strata, while stands with broken

canopies contain scattered shrubs and a substantial number of herbaceous species. Composition is quite variable, but some of the most constant herbaceous plants include *Asarum canadense* (Canadian wildginger), *Carex eburnea* (bristleleaf sedge), *Cystopteris bulbifera* (bulblet bladderfern), and *Hepatica nobilis var. acuta* (sharplobe hepatica) (Anderson 1996). In Kentucky, *Thuja occidentalis* (arborvitae) occurs within the Cumberland River drainage in the southeastern Highland Rim region. These woodlands are associated with steep, rocky, limestone, mostly north- and east-facing slopes along permanent streams. Some stands are associated with cold-air drainages. These sites are small (0.1-1 acre), with scattered *Thuja occidentalis* (arborvitae) codominating with *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Ostrya virginiana* (hophornbeam), and *Philadelphus hirsutus* (streambank mock orange). Other associated species include *Juniperus virginiana var. virginiana* (eastern red-cedar), *Cercis canadensis var. canadensis* (eastern redbud), *Pachysandra procumbens* (Allegheny-spurge), *Hamamelis virginiana* (American witch-hazel), *Parthenocissus quinquefolia* (Virginia creeper), *Solidago flexicaulis* (zigzag goldenrod), *Solidago sphacelata* (autumn goldenrod), *Symphyotrichum cordifolium* (common blue wood aster), and *Dioscorea quaternata* (fourleaf yam).

This vegetation type is represented in Virginia by open woodlands and sparse scrub occurring on nearly vertical limestone cliffs and their adjacent uplands above. Because these habitats cannot be fully accessed or plot-sampled, composition is described from qualitative examination of two stands. The dominant woody species is *Thuja occidentalis* (arborvitae). In the observed stands, specimens of this tree are shrubby and mostly <6 m tall. Associated woody species include *Hydrangea arborescens* (wild hydrangea) and stunted individuals of *Celtis tenuifolia* (dwarf hackberry), *Cercis canadensis* (eastern redbud), *Physocarpus opulifolius* (common ninebark), *Tilia americana* (American basswood) (including both *var. americana* and *var. heterophylla*), and *Ulmus rubra* (slippery elm). Vines of *Parthenocissus quinquefolia* (Virginia creeper) and *Toxicodendron radicans* (eastern poison-ivy) are abundant climbers on rock faces at both sites. *Carex eburnea* (bristleleaf sedge) is the most conspicuous, if not the most abundant, herbaceous species, forming dense turfs on ledges. Constant herbs in the two stands are *Aquilegia canadensis* (red columbine), *Asplenium resiliens* (blackstem spleenwort), *Asplenium rhizophyllum* (walking fern), *Carex eburnea* (bristleleaf sedge), *Cystopteris bulbifera* (bulblet bladderfern), *Draba ramosissima* (branched draba), *Eurybia divaricata* (white wood aster), *Pellaea atropurpurea* (purple cliffbrake), and *Sedum glaucophyllum* (cliff stonecrop). Of these, *Eurybia divaricata* (white wood aster), *Cystopteris bulbifera* (bulblet bladderfern), and *Sedum glaucophyllum* (cliff stonecrop) are relatively abundant locally.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Thuja occidentalis* (arborvitae)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Thuja occidentalis* (arborvitae)
Global: *Asplenium rhizophyllum* (walking fern), *Carex eburnea* (bristleleaf sedge), *Cystopteris bulbifera* (bulblet bladderfern), *Hydrangea arborescens* (wild hydrangea), *Sedum glaucophyllum* (cliff stonecrop), *Thuja occidentalis* (arborvitae)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Asplenium ruta-muraria* (wallrue, G5, MD-vulnerable), *Cystopteris bulbifera* (bulblet bladderfern, G5, MD-vulnerable), *Geum laciniatum* (rough avens, G5, MD-vulnerable), *Juglans cinerea* (butternut, G3, MD-vulnerable), *Ribes cynosbati* (eastern prickly gooseberry, G5, MD-vulnerable), *Symphyotrichum shortii* (Short's aster, G5, MD-vulnerable), *Thuja occidentalis* (arborvitae, G5, MD-critically imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Dactylis glomerata* (orchardgrass, Medium/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Poa compressa* (Canada bluegrass, High/Low), *Prunus mahaleb* (Mahaleb cherry, Medium/Insignificant), *Rubus phoenicolasius* (wine raspberry, Medium), *Taraxacum officinale* (common dandelion)
Global: Vulnerable Plants: *Paxistima canbyi* (Canby's mountain-lover, G2?)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (04-Aug-1998). There are probably fewer than 50 occurrences of this community rangewide. It is restricted to north-facing calcareous bedrock cliffs and summits in the Ridge and Valley section of the central Appalachians. About 15 occurrences are known in Virginia and West Virginia, with a total acreage of

about 120 acres. It is also known from Pennsylvania, Tennessee, and Maryland. Due to their location on small ledges of steep cliffs, these communities are difficult to survey, and few field surveys have been conducted. This community has probably always been rare, and there are no imminent threats. In Ohio, the type has apparently always been restricted to a few stands.

RELATED CONCEPTS

Global Similar Types:
- *Thuja occidentalis - Pinus strobus - Tsuga canadensis / Carex eburnea* Cliff Woodland (CEGL008426)
- *Thuja occidentalis / Carex eburnea* Forest (CEGL006021) is a similar upland white-cedar cliff community.
- *Tsuga canadensis - Betula alleghaniensis - Prunus serotina / Rhododendron maximum* Forest (CEGL006206)

Global Related Concepts:
- *Thuja occidentalis / Carex eburnea - Pellaea atropurpurea* Woodland (Faber-Langendoen 2001) =
- *Thuja occidentalis / Carex eburnea - Sedum glaucophyllum* Shrubland (Fleming 1999) <
- *Thuja occidentalis / Carex eburnea - Sedum glaucophyllum* Woodland (Fleming and Coulling 2001) <
- Arbor vitae forest (Braun 1928) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Appalachian Northern White-cedar Cliff Woodland is sometimes referred to as Cliff White-cedar Woodland.
Global Classification Comments: This type is simply defined by the presence of white-cedar or mixed white-cedar - hardwoods, and either forest or woodland canopy; hence all four physiognomic categories fall under this one type. Small-scale occurrences are worth documenting. The relationship between this type and *~Thuja occidentalis / Carex eburnea* Forest (CEGL006021)$$ should be examined and clarified. Stands on lower slopes often grade into swamps, especially those dominated by *Thuja occidentalis* (arborvitae). There are also many similarities between this vegetation and that in the *~Thuja occidentalis* (arborvitae) Acidic Forest Alliance (A3252)$$. In the Ridge and Valley of Virginia, *Thuja occidentalis* (arborvitae) communities occur in two situations: on rocky bluffs with admixtures of hardwood species and on mesic slopes with *Tsuga canadensis* (eastern hemlock) and *Pinus strobus* (eastern white pine) (G. Fleming pers. comm. 1999). Southern *Thuja* (arborvitae) stands are more genetically diverse than northern populations (Walker 1987). One Tennessee site is a proposed State Natural Area, Window Cliffs. This association is peripheral in the Southern Blue Ridge of Tennessee.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled near Ferry Hill, Cedar Grove, and Mountain Lock. It is mapped in the Ridge and Valley at Irons Mountain (Canal mile 175), and Hagerstown Valley at Opequon Junction (Canal mile 91 - 93), Lock 41 (Canal mile 87 - 89), and Shepherdstown Pike (Canal mile 73-74).
Global Range: This white-cedar cliff woodland type is found in the Appalachian and Allegheny Plateau regions of the United States.
Nations: US
States/Provinces: KY:SNR, MD:S1, OH:SNR, TN:SNR, VA:S2, WV:S2
TNC Ecoregions: 44:C, 45:C, 50:C, 51:C, 52:C, 59:C
USFS Ecoregions (2007): 221Ej:CCC, 222Ha:CCP, 222Hb:CCC, 222Hc:CCP, 223Ea:CCC, 223Eb:CCC, 223Fd:CCC, 231Ib:CCC, M221Aa:CCP, M221Ab:CCC, M221Bd:CC?, M221Be:CCC, M221Dd:CCC
Federal Lands: NPS (C&O Canal); USFS (Cherokee, George Washington, Monongahela)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (6 plots): CHOH.012, CHOH.013, CHOH.016, CHOH.017, CHOH.018, CHOH.021.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Global Description Author(s): J. Drake, M. Pyne, G. Fleming, P. Coulling, C. Lea
References: Anderson 1996, Braun 1928, Faber-Langendoen 2001, Faber-Langendoen 2001*, Fleming 1999, Fleming and Coulling 2001, Fleming and Patterson 2009b, Fleming et al. 2017, Fleming pers. comm., Harrison 2004, Harrison 2011, Kangas 1989, Midwestern Ecology Working Group n.d., ONHD unpubl. data, Palmer-Ball et al. 1988, TDNH unpubl. data 2018, WVNHP unpubl. data, Walker 1987

G650. CENTRAL APPALACHIAN-NORTHEAST OAK FOREST & WOODLAND

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* (white oak), *Quercus falcata* (southern red oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Fagus grandifolia* (American beech), *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Carya cordiformis* (bitternut hickory), *Carya tomentosa* (mockernut hickory), *Fraxinus americana* (white ash), and in the southern part of the range, *Liriodendron tulipifera* (tuliptree). 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* (sand hickory). Pines such as *Pinus rigida* (pitch pine), *Pinus echinata* (shortleaf pine), *Pinus virginiana* (Virginia pine) can contribute significant canopy cover in these settings.

A4436 *Quercus alba - Carya glabra - Fraxinus americana* Forest Alliance

[CEGL006209] *Carya glabra - Quercus (rubra, montana) - Fraxinus americana / Viburnum rafinesqueanum* Forest

Translated Name: **Pignut Hickory - (Northern Red Oak, Chestnut Oak) - White Ash / Downy Arrow-wood Forest**

Common Name: **Potomac River Bedrock Terrace 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	Central Appalachian-Northeast Oak Forest & Woodland (G650)
Alliance	*Quercus alba - Carya glabra - Fraxinus americana* Forest Alliance (A4436)

ELEMENT CONCEPT

Global Summary: This dry oak-hickory forest occurs on elevated bedrock terraces above the Potomac River for several miles below Great Falls. These level to gently sloping metamorphic bedrock terraces are 12-15 m (40-50 feet) above the river level and are subject to very rare (30- to 85-year) flood events. The community is a stunted open forest or woodland dominated by *Carya glabra* (pignut hickory), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Quercus montana* (chestnut oak) occurring with *Fraxinus americana* (white ash). Other characteristic woody species include *Juniperus virginiana* (eastern red-cedar), *Ostrya virginiana* (hophornbeam), *Chionanthus virginicus* (white fringetree), *Viburnum rafinesqueanum* (downy arrow-wood), *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), and *Ptelea trifoliata* (common hoptree). The herbaceous layer is dense to moderately dense, species-rich, and usually dominated by grasses and sedges, especially *Piptochaetium avenaceum* (blackseed speargrass), *Danthonia spicata* (poverty oatgrass), and *Carex albicans var. albicans* (whitetinge sedge). Spring ephemerals, such as *Cardamine angustata* (slender toothwort), *Erythronium americanum* (dogtooth violet), *Claytonia virginica* (Virginia springbeauty), *Corydalis flavula* (yellow fumewort), and *Phacelia dubia* (smallflower phacelia), are frequent, while lithophytes on and around rock outcrops include *Arabis lyrata* (lyrate rockcress), *Cardamine parviflora* (sand bittercress), *Scutellaria saxatilis* (smooth rock skullcap), and *Asplenium platyneuron* (ebony spleenwort). The introduced invasive plants *Microstegium vimineum* (Nepalese browntop), *Vinca minor* (common periwinkle), *Alliaria petiolata* (garlic mustard), and *Lonicera japonica* (Japanese honeysuckle) are problematic in most stands of the type. This community is distinguished by its unique environmental setting on ancient river terraces, its species composition indicative of high base substrate, and its high species richness, with values frequently ranging between 70 and 100 species per 400 m2.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: Potomac River Bedrock Terrace Oak - Hickory Forest has a very limited distribution on the Virginia side of the Potomac Gorge. It occupies the narrow top of the bedrock terrace from the vicinity of Great Falls to just below Sandy Landing, where the terrace pinches out and terminates. The total coverage of all patches on the Virginia side is less than 8 ha (20 acres). Although the habitat of this community is scoured by the largest flood events (mean return interval = 30 to 85 years

(Lea 2000)), droughty, sandy soil that is rocky and shallow to bedrock (0 to >40 cm [16 inches]) appears to be the primary environmental factor controlling the distribution and composition of the type. Bedrock is mapped as schist, metagraywacke, or migmatite of the Mather Gorge Formation (Southworth and Denenny 2006). For the most part, soils lack well-developed profiles and appear to be little-altered alluvial deposits. Wide variation in soil pH (range 4.5 to 6.8), calcium (range 250 to 1617 ppm), and total base saturation (range 8.6 to 100%) at these sites may reflect different rates in the leaching of these deposits. Alternatively, unmapped intrusive bodies of mafic rock and large quantities of mollusk shells (primarily of the introduced Asian clam *Corbicula fluminea*) deposited on the terrace tops in catastrophic floods may also be local calcium contributors. On the widest part of the Great Falls terrace, the topography is punctuated with shallow, deeper-soiled swales interlaced with more elevated rocky surfaces. This ridge-and-swale pattern is more pronounced and better developed across the river on Bear Island.

George Washington Memorial Parkway Environment: Potomac River Bedrock Terrace Oak - Hickory Forest has a very limited distribution on the Virginia side of the Potomac Gorge. It occupies the narrow top of the bedrock terrace from the vicinity of Great Falls to just below Sandy Landing, where the terrace pinches out and terminates. The total coverage of all patches on the Virginia side is less than 8 ha (20 acres). Although the habitat of this community is scoured by the largest flood events (mean return interval = 30 to 85 years (Lea 2000)), droughty, sandy soil that is rocky and shallow to bedrock (0 to >40 cm [16 inches]) appears to be the primary environmental factor controlling the distribution and composition of the type. Bedrock is mapped as schist, metagraywacke, or migmatite of the Mather Gorge Formation (Southworth and Denenny 2006). For the most part, soils lack well-developed profiles and appear to be little-altered alluvial deposits. Wide variation in soil pH (range 4.5 to 6.8), calcium (range 250 to 1617 ppm), and total base saturation (range 8.6 to 100%) at these sites may reflect different rates in the leaching of these deposits. Alternatively, unmapped intrusive bodies of mafic rock and large quantities of mollusk shells (primarily of the introduced Asian clam *Corbicula fluminea*) deposited on the terrace tops in catastrophic floods may also be local calcium contributors. On the widest part of the Great Falls terrace, the topography is punctuated with shallow, deeper-soiled swales interlaced with more elevated rocky surfaces. This ridge-and-swale pattern is more pronounced and better developed across the river on Bear Island.

Global Environment: This dry oak-hickory forest occupies level to gently sloping bedrock terraces of metamorphic rocks (schists and metagraywacke, with intrusions of amphibolite) along the stretch of the Potomac River below Great Falls. These terraces are 12-15 m (40-50 feet) above the average river level. Exposed bedrock may comprise from 1 to 45% of the surface. Sites are subjected to rare (average return interval of 30 to 85 years) scouring floods (Lea 2000). These catastrophic flood events are thought to deposit sediments rich in shell fragments which contribute to the high soil base status. However, soil samples collected from 15 plots were, on average, strongly or extremely acidic (mean pH = 4.6), with moderately low calcium and total base saturation levels. A few plots had much higher pH or calcium values, perhaps indicative of a somewhat heterogeneous soil environment induced by interbedded acidic and mafic rocks. Overall, soils are shallow, seasonally droughty sandy loams, with some organic horizon development.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: The vegetation of this community is an open, relatively short (mean canopy height = 19 m [62 feet]) forest with mean canopy cover <50% and mean cover contributed by all tree layers <75%. Maximum tree diameters are also small for the area, ranging from 40 to 55 cm (16-22 inches) dbh. *Carya glabra* (pignut hickory) is the leading dominant in both the canopy and subcanopy, occurring in mixed stands with codominant *Quercus rubra* (northern red oak), *Quercus montana* (chestnut oak), and *Fraxinus americana. Quercus alba* and *Quercus stellata* (post oak) are less frequent codominants. *Quercus falcata* (southern red oak), *Carya cordiformis* (bitternut hickory), *Nyssa sylvatica* (blackgum), and *Pinus virginiana* (Virginia pine) are very minor overstory associates. The subcanopy tree layers are composed largely of recruitment of the canopy species and *Juniperus virginiana var. virginiana* (eastern red-cedar), with *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) very minor components. The shrub layer is diverse and variable (45% mean stratum cover), with *Carpinus caroliniana* (American hornbeam), *Ostrya virginiana* (hophornbeam), *Viburnum rafinesquianum*, *Chionanthus virginicus* (white fringetree), *Cornus florida* (flowering dogwood), *Dirca palustris* (eastern leatherwood), *Viburnum prunifolium* (blackhaw), *Ptelea trifoliata* (common hoptree), and *Asimina triloba* (pawpaw) all characteristic. The latter is most abundant in the shallow, Pleistocene age swales on the widest part of the terrace near Great Falls.

The short-shrub and herb layers are open to dense (55% mean combined stratum cover) but usually interrupted by bedrock cover. Low patches of *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and *Rosa carolina var. carolina* (Carolina rose) frequently contribute up to 10% of the combined cover in these layers. Graminoids are prevalent, with *Dichanthelium boscii* (Bosc's panicgrass), *Piptochaetium avenaceum*

(blackseed speargrass), *Danthonia spicata* (poverty oatgrass), *Dichanthelium dichotomum var. dichotomum* (cypress panicgrass), *Brachyelytrum erectum* (bearded shorthusk), *Carex pensylvanica* (Pennsylvania sedge), *Chasmanthium latifolium* (Indian woodoats), *Carex planispicata* (flat-spiked sedge), *Melica mutica* (twoflower melicgrass), and *Bromus pubescens* (hairy woodland brome) the most constant and/or abundant species. The sedge *Carex woodii* (pretty sedge) dominates the herb layer of one plot. Forbs that are characteristic of the type include *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod), *Amphicarpaea bracteata* (American hogpeanut), *Erigeron pulchellus var. pulchellus* (robin's plantain), *Helianthus divaricatus* (woodland sunflower), *Scutellaria nervosa* (veiny skullcap), and the spring ephemeral *Claytonia virginica* (Virginia springbeauty), but many additional forbs occur at low cover and constancy. Although not captured in plots, an assemblage of lithophytic herbs was observed on rock outcrops and large boulders, including *Phacelia dubia var. dubia* (smallflower phacelia), *Arabis lyrata* (lyrate rockcress), *Corydalis flavula* (yellow fumewort), and *Cardamine parviflora var. arenicola* (sand bittercress). Overall species richness varies from moderate to extraordinary (56 to 126 taxa per 400 square m).

George Washington Memorial Parkway Vegetation: The vegetation of this community is an open, relatively short (mean canopy height = 19 m [62 feet]) forest with mean canopy cover <50% and mean cover contributed by all tree layers <75%. Maximum tree diameters are also small for the area, ranging from 40 to 55 cm (16-22 inches) dbh. *Carya glabra* (pignut hickory) is the leading dominant in both the canopy and subcanopy, occurring in mixed stands with codominant *Quercus rubra* (northern red oak), *Quercus montana* (chestnut oak), and *Fraxinus americana* (white ash). *Quercus alba* (white oak) and *Quercus stellata* (post oak) are less frequent codominants. *Quercus falcata* (southern red oak), *Carya cordiformis* (bitternut hickory), *Nyssa sylvatica* (blackgum), and *Pinus virginiana* (Virginia pine) are very minor overstory associates. The subcanopy tree layers are composed largely of recruitment of the canopy species and *Juniperus virginiana var. virginiana* (eastern red-cedar), with *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) very minor components. The shrub layer is diverse and variable (45% mean stratum cover), with *Carpinus caroliniana* (American hornbeam), *Ostrya virginiana* (hophornbeam), *Viburnum rafinesquianum*, *Chionanthus virginicus* (white fringetree), *Cornus florida* (flowering dogwood), *Dirca palustris* (eastern leatherwood), *Viburnum prunifolium* (blackhaw), *Ptelea trifoliata* (common hoptree), and *Asimina triloba* (pawpaw) all characteristic. The latter is most abundant in the shallow, Pleistocene age swales on the widest part of the terrace near Great Falls.

The short-shrub and herb layers are open to dense (55% mean combined stratum cover) but usually interrupted by bedrock cover. Low patches of *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and *Rosa carolina var. carolina* (Carolina rose) frequently contribute up to 10% of the combined cover in these layers. Graminoids are prevalent, with *Dichanthelium boscii* (Bosc's panicgrass), *Piptochaetium avenaceum* (blackseed speargrass), *Danthonia spicata* (poverty oatgrass), *Dichanthelium dichotomum var. dichotomum* (cypress panicgrass), *Brachyelytrum erectum* (bearded shorthusk), *Carex pensylvanica* (Pennsylvania sedge), *Chasmanthium latifolium* (Indian woodoats), *Carex planispicata* (flat-spiked sedge), *Melica mutica* (twoflower melicgrass), and *Bromus pubescens* (hairy woodland brome) the most constant and/or abundant species. The sedge *Carex woodii* (pretty sedge) dominates the herb layer of one plot. Forbs that are characteristic of the type include *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod), *Amphicarpaea bracteata* (American hogpeanut), *Erigeron pulchellus var. pulchellus* (robin's plantain), *Helianthus divaricatus* (woodland sunflower), *Scutellaria nervosa* (veiny skullcap), and the spring ephemeral *Claytonia virginica* (Virginia springbeauty), but many additional forbs occur at low cover and constancy. Although not captured in plots, an assemblage of lithophytic herbs was observed on rock outcrops and large boulders, including *Phacelia dubia var. dubia* (smallflower phacelia), *Arabis lyrata* (lyrate rockcress), *Corydalis flavula* (yellow fumewort), and *Cardamine parviflora var. arenicola* (sand bittercress). Overall species richness varies from moderate to extraordinary (56 to 126 taxa per 400 square m).

Global Vegetation: This community is an open forest of stunted (usually 15 m tall or less) trees. *Carya glabra* (pignut hickory) and several oaks (*Quercus rubra* (northern red oak), *Quercus montana* (chestnut oak), *Quercus alba* (white oak)) and *Fraxinus americana* (white ash) are codominant in the overstory. *Quercus stellata* (post oak), *Pinus virginiana* (Virginia pine), *Nyssa sylvatica* (blackgum), and *Acer rubrum* (red maple) may be present at low cover. *Juniperus virginiana* (eastern red-cedar) and *Ostrya virginiana* (hophornbeam) are constant species at low cover in the understory. *Chionanthus virginicus* (white fringetree), *Viburnum rafinesqueanum* (downy arrow-wood), *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Cornus florida* (flowering dogwood), and *Ptelea trifoliata* (common hoptree) are common shrubs. The herbaceous layer is dense to moderately dense, species-rich, and usually dominated by grasses (*Piptochaetium avenaceum* (blackseed speargrass), *Melica mutica* (twoflower melicgrass), *Dichanthelium boscii* (Bosc's panicgrass), *Dichanthelium laxiflorum* (openflower rosette grass), *Dichanthelium commutatum* (variable panicgrass), *Dichanthelium dichotomum* (cypress panicgrass), *Danthonia spicata* (poverty oatgrass), *Bromus pubescens* (hairy woodland brome), and *Muhlenbergia tenuiflora* (slimflower muhly)), and sedges (*Carex albicans var. albicans* (whitetinge sedge), *Carex pensylvanica*

(Pennsylvania sedge), *Carex swanii* (Swan's sedge), *Carex umbellata* (parasol sedge), *Carex nigromarginata* (black edge sedge), *Carex willdenowii* (Willdenow's sedge), *Carex woodii* (pretty sedge), *Carex planispicata* (flat-spiked sedge), *Carex retroflexa* (reflexed sedge), and *Trichophorum planifolium* (bashful bulrush)). Typical forbs include *Arabis laevigata* (smooth rockcress), *Tipularia discolor* (crippled cranefly), *Liparis liliifolia* (brown widelip orchid), *Oxalis violacea* (violet woodsorrel), *Amphicarpaea bracteata* (American hogpeanut), *Solidago caesia* (wreath goldenrod), and the spring ephemerals *Cardamine angustata* (slender toothwort), *Erythronium americanum* (dogtooth violet), *Claytonia virginica* (Virginia springbeauty), and *Corydalis flavula* (yellow fumewort). *Phacelia dubia* (smallflower phacelia), *Arabis lyrata* (lyrate rockcress), *Cardamine parviflora* (sand bittercress), *Scutellaria saxatilis* (smooth rock skullcap), and *Asplenium platyneuron* (ebony spleenwort) are frequent on and around rock outcrops. The introduced invasive plants *Microstegium vimineum* (Nepalese browntop), *Vinca minor* (common periwinkle), *Alliaria petiolata* (garlic mustard), and *Lonicera japonica* (Japanese honeysuckle) are problematic in most stands of the type. Mean species richness of 18 plot samples was 70 taxa per 400 m2 (range = 46 to 111 taxa).
Global Dynamics: Shallow, droughty soil over flat-lying bedrock appears to be the primary environmental factor driving the composition and physiognomy of this association. This habitat is subject to rare (every 30 to 85 years) catastrophic flood events which may remove soil, preventing deep soil accumulations.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak)
Herb (field)	Graminoid	*Piptochaetium avenaceum* (blackseed speargrass)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Carya glabra* (pignut hickory), *Chionanthus virginicus* (white fringetree), *Dichanthelium boscii* (Bosc's panicgrass), *Fraxinus americana* (white ash), *Piptochaetium avenaceum* (blackseed speargrass), *Quercus montana* (chestnut oak), *Viburnum rafinesqueanum* (downy arrow-wood)
George Washington Memorial Parkway: *Carya glabra* (pignut hickory), *Chionanthus virginicus* (white fringetree), *Dichanthelium boscii* (Bosc's panicgrass), *Fraxinus americana* (white ash), *Piptochaetium avenaceum* (blackseed speargrass), *Quercus montana* (chestnut oak), *Viburnum rafinesqueanum* (downy arrow-wood)
Global: *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), *Piptochaetium avenaceum* (blackseed speargrass), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Viburnum rafinesqueanum* (downy arrow-wood)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Cerastium arvense* var. *velutinum* (field chickweed, G5T4?, VA state-imperiled), *Onosmodium virginianum* (wild Job's tears, G4, VA state-imperiled), *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?, VA state-critically imperiled); **Invasive/Exotic Plants**: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Vinca minor* (common periwinkle, Low)
George Washington Memorial Parkway: Vulnerable Plants: *Cerastium arvense* var. *velutinum* (field chickweed, G5T4?, VA state-imperiled), *Onosmodium virginianum* (wild Job's tears, G4, VA state-imperiled), *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?, VA state-critically imperiled); **Invasive/Exotic Plants**: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Vinca minor* (common periwinkle, Low)
Global: Vulnerable Plants: *Scutellaria saxatilis* (smooth rock skullcap, G3G4), *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Vinca minor* (common periwinkle, Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1G2 (24-Jan-2005). This type appears to be endemic to a portion of the Potomac Gorge in Maryland and Virginia that is geomorphically unusual and has a near-unique combination of environmental

characteristics and natural disturbance regimes. The global extent of this community type is estimated to be less than 100 ha, and invasive introduced plants pose a significant threat to some of these stands. However, all known occurrences of the type are protected on National Park Service lands.

RELATED CONCEPTS

Global Similar Types:

- *Pinus virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata / Leucobryum glaucum* Woodland (CEGL008449)
- *Quercus alba - Carya glabra - Fraxinus americana / Muhlenbergia sobolifera - Elymus hystrix* Forest (CEGL006216) is a community of similar physiognomy and environmental affiliation, occurring on basic Piedmont soils with pronounced hardpans or shallow bedrock. Compositionally, it differs considerably from the present type in its shrub and herb-layer composition.
- *Quercus phellos - Liquidambar styraciflua / Claytonia virginica* Floodplain Forest (CEGL006494)
- *Quercus rubra - Acer saccharum / Ostrya virginiana / Cardamine concatenata* Forest (CEGL008517)
- *Quercus rubra - Quercus shumardii / Cercis canadensis* Floodplain Forest (CEGL006495)

Global Related Concepts:

- *Carya glabra - Quercus (alba, rubra, prinus) / Ostrya virginiana / Carex pensylvanica* Forest (Fleming and Patterson 2003) =
- *Carya glabra - Quercus (rubra, prinus) - Fraxinus americana / Viburnum rafinesquianum / Piptochaetium avenaceum* Forest (Fleming et al. 2007b) =
- *Carya glabra - Quercus (rubra, prinus, alba) / Ostrya virginiana / Panicum boscii* Forest (Lea 2000) =
- *Quercus (prinus, rubra, alba) - Carya glabra / Ostrya virginiana* Forest (Thomson et al. 1999) =

CLASSIFICATION

Status: Standard

Classification Confidence: 1 - Strong

Chesapeake & Ohio Canal National Historical Park Classification Comments: Potomac River Bedrock Terrace Oak - Hickory Forest can be distinguished from other upland forests of the George Washington Memorial Parkway by its restriction to the sublevel, rocky top of the high bedrock terrace below Great Falls; its somewhat stunted overstory of *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), and *Quercus* (oak) spp.; and its graminoid-dominated herb layer. It usually occurs adjacent to Appalachian-Northern Piedmont Riverside Outcrop Woodland (CEGL008449), which occupies the very rocky rims of the bedrock terrace and has an overstory dominated by *Pinus virginiana* (Virginia pine). The boundaries between these two types are fairly sharp on the Virginia side, with compositional intergradation more common on the Maryland side of the Gorge (Bear Island), where patch sizes are much larger. This community also has some compositional similarities to Piedmont Dry-Mesic Acidic Oak - Hickory Forest (CEGL008475), a more closed, larger-statured forest of submesic to subxeric, upland slopes and ridges.

Potomac River Bedrock Terrace Oak - Hickory Forest is sometimes referred to as Bedrock Terrace Oak - Hickory Forest.

Chesapeake & Ohio Canal National Historical Park Other Comments: Requisite bedrock terrace habitats for this community are much more extensive on the Maryland side of the gorge, particularly on Bear Island. The Maryland-side stands cover approximately five times the area (roughly 40 ha [100 acres]) of those in Virginia.

George Washington Memorial Parkway Classification Comments: Potomac River Bedrock Terrace Oak - Hickory Forest can be distinguished from other upland forests of the George Washington Memorial Parkway by its restriction to the sublevel, rocky top of the high bedrock terrace below Great Falls; its somewhat stunted overstory of *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), and *Quercus* (oak) spp.; and its graminoid-dominated herb layer. It usually occurs adjacent to Appalachian-Northern Piedmont Riverside Outcrop Woodland (CEGL008449), which occupies the very rocky rims of the bedrock terrace and has an overstory dominated by *Pinus virginiana* (Virginia pine). The boundaries between these two types are fairly sharp on the Virginia side, with compositional intergradation more common on the Maryland side of the Gorge (Bear Island), where patch sizes are much larger. This community also has some compositional similarities to Piedmont Dry-Mesic Acidic Oak - Hickory Forest (CEGL008475), a more closed, larger-statured forest of submesic to subxeric, upland slopes and ridges.

Potomac River Bedrock Terrace Oak - Hickory Forest is sometimes referred to as Bedrock Terrace Oak - Hickory Forest.

George Washington Memorial Parkway Other Comments: Requisite bedrock terrace habitats for this community are much more extensive on the Maryland side of the gorge, particularly on Bear Island. The Maryland-side stands cover approximately five times the area (roughly 40 ha [100 acres]) of those in Virginia.
Global Classification Comments: This type is supported by quantitative analysis of 13 Maryland and 5 Virginia plots in a 1250-plot regional dataset assembled for the NCR parks vegetation mapping project.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: Potomac River Bedrock Terrace Oak - Hickory Forest is endemic to the river-abutting strath terraces from Great Falls downstream through Mather Gorge, in George Washington Memorial Parkway (Great Falls Park) and C&O Canal National Historical Park (CHOH). This community occurs in an area where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.
George Washington Memorial Parkway Range: Potomac River Bedrock Terrace Oak - Hickory Forest is endemic to the river-abutting strath terraces from Great Falls downstream through Mather Gorge, in George Washington Memorial Parkway (Great Falls Park) and C&O Canal National Historical Park (CHOH). The total coverage of all patches in Great Falls Park is less than 8 ha (20 acres). This community occurs in an area where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.
Global Range: This community occurs along the stretch of the Potomac River below Great Falls. It is found on both the Maryland and Virginia sides of the gorge.
Nations: US
States/Provinces: MD:S1, VA:S1
TNC Ecoregions: 61:C
USFS Ecoregions (2007): 221Db:CCC
Federal Lands: NPS (C&O Canal, George Washington Parkway)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: GFNP_006, GFNP_016, GFNP_030, POTO_025.05, POTO_031.05, POTO_032.01, POTO_032.02, POTO_033.01, POTO_033.02, POTO_033.03, POTO_033.04, POTO_033.05, POTO_033.06, POTO_033.10, POTO_033.11, POTO_037.10.
George Washington Memorial Parkway Plots: GFNP_006, GFNP_016, GFNP_030, POTO_025.05, POTO_031.05, POTO_032.01, POTO_032.02, POTO_033.01, POTO_033.02, POTO_033.03, POTO_033.04, POTO_033.05, POTO_033.06, POTO_033.10, POTO_033.11, POTO_037.10.
Chesapeake & Ohio Canal National Historical Park Description Author(s): G.P. Fleming
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Global Description Author(s): G.P. Fleming and K.D. Patterson
References: Eastern Ecology Working Group n.d., Fleming 2007, Fleming and Patterson 2003, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Harrison 2004, Harrison 2011, Lea 2000, Lea 2000*, Southworth and Denenny 2006, Thomson et al. 1999

[CEGL006216] *Quercus alba - Carya glabra - Fraxinus americana / Muhlenbergia sobolifera - Elymus hystrix* Forest

Translated Name: **White Oak - Pignut Hickory - White Ash / Rock Muhly - Eastern Bottlebrush Grass Forest**
Common Name: **Northern Piedmont Hardpan Basic 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	Central Appalachian-Northeast Oak Forest & Woodland (G650)
Alliance	*Quercus alba - Carya glabra - Fraxinus americana* Forest Alliance (A4436)

ELEMENT CONCEPT

Global Summary: Found in the Culpeper Basin and western Piedmont foothills of Virginia and Maryland, this subxeric to submesic oak-hickory forest occurs in association with soils weathered from fine-grained mafic rocks (diabase and metabasalt). These soils often have a plastic, hardpan subsoil or are shallow over bedrock, and some have pronounced shrink-swell properties. Forest canopies can be open to closed, sometimes stunted, with variable combinations of oaks (especially *Quercus alba* (white oak) and *Quercus rubra)*, hickories (*Carya glabra* (pignut

hickory), *Carya ovalis* (red hickory), *Carya tomentosa* (mockernut hickory)), and *Fraxinus americana* (white ash). Subcanopy tree layers are usually dominated by young hickories and *Fraxinus americana* (white ash). Characteristic species in the shrub and small-tree layers are *Cercis canadensis var. canadensis* (eastern redbud), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Cornus florida* (flowering dogwood), *Ulmus rubra* (slippery elm), *Celtis occidentalis* (common hackberry), and *Rosa carolina* (Carolina rose). Less constant, but sometimes locally important, understory species include *Ostrya virginiana* (hophornbeam), *Carpinus caroliniana* (American hornbeam) (on more mesic sites), and *Chionanthus virginicus* (white fringetree). The herb layer of this community is frequently characterized by patch-dominance of the dry-site forest grasses *Muhlenbergia sobolifera* (rock muhly), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), and *Danthonia spicata* (poverty oatgrass). Co-occurring among the dominant grasses are a large number of low-cover forbs and graminoids. In 50 Virginia plot samples, this unit has a mean species richness of 82 taxa per 400 m2, one of the highest among all classified upland types in Virginia. This community is distinguished from other Mid-Atlantic region oak-hickory forests by its patch-dominance of forest grasses and its strong association with sub-level topography and soils with an impermeable hardpan or shallow bedrock.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This oak-hickory forest was documented at two locations in the park. One site is a moderate upper slope with clay loam soil. The unvegetated surface is made up of leaf litter (34% cover), large rocks (55%), wood (10%), and bare soil (1). This is a nice old-age forest and the only known diabase forest on Park Service lands in Maryland. The only evidence of disturbance is the presence of exotic species. The other site is a steep, somewhat rocky slope which faces south-southeast.

Manassas National Battlefield Park Environment: This association is widespread in the park, primarily on soils weathered from diabase, but also locally on soils weathered from siltstone. Stands occupy submesic to subxeric sites on low ridges and rolling to flat uplands. Surface substrate of most sites consists of thin leaf litter, with small patches of bare mineral soil exposed in places, and often spheroidal diabase boulders or stones. Collected soils are very strongly to moderately acidic clay loams with moderately high calcium and magnesium, and very high manganese levels. Most soils occupied by this community probably have a hardpan subsoil and some may have pronounced shrink-swell properties and contain embedded Pin Oak - Swamp White Oak Seasonal Pond (CEGL004643).

Global Environment: In the main, Piedmont portion of its range, this oak-hickory forest community occurs primarily on soils weathered from Triassic diabase but occasionally on soils weathered from siltstone. Outlying occurrences on western Piedmont foothills and the Blue Ridge are associated with metabasalt of the Catoctin Formation. Large stands occupy low, gentle ridges and rolling to flat uplands (mean slope = 4°) of the Mesozoic Basin. In submontane, foothill settings, stands are usually confined to relatively gentle slope benches with shallow underlying bedrock. Fifty plot-sampled sites in Virginia ranged from subxeric to submesic. Surface substrate of most sites consisted of thin leaf litter, with small patches of bare mineral soil exposed in places. Many plots had at least 1% surface cover of spheroidal diabase or metabasalt boulders or stones, and a few were extremely rocky. Soils collected from plots are very strongly to moderately acidic clay loams with moderately high calcium and magnesium, and very high manganese levels. Most soils occupied by this community have a plastic, hardpan subsoil or are shallow over bedrock, and some have pronounced shrink-swell properties.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: The dense (80+% cover) tree canopy, 20-35 m tall, is dominated by *Quercus alba* (white oak) along with lesser amounts of *Carya alba*, *Quercus montana* (chestnut oak), *Fraxinus americana* (white ash), and *Quercus rubra* (northern red oak). The very dense (80+%) subcanopy (10-20 m) includes canopy species as well as *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Celtis occidentalis* (common hackberry), and *Ulmus rubra* (slippery elm). The sparse (20%) tall-shrub layer (6-10 m) and sparse (20%) short-shrub layer (1-6 m) contain *Asimina triloba* (pawpaw), *Celtis tenuifolia* (dwarf hackberry), *Cercis canadensis var. canadensis* (eastern redbud), *Crataegus intricata* (Copenhagen hawthorn), *Juniperus virginiana* (eastern red-cedar), and *Viburnum prunifolium* (blackhaw) along with sapling canopy trees. The herbaceous layer (20-60%) is dominated by *Claytonia virginica* (Virginia springbeauty) (60%), along with a lot of *Alliaria petiolata* (garlic mustard) (exotic) and *Cardamine concatenata* (cutleaf toothwort). Other herbaceous plants include *Acalypha virginica* (Virginia threeseed mercury), *Amphicarpaea bracteata* (American hogpeanut), *Aristolochia serpentaria* (Virginia snakeroot), *Brachyelytrum erectum* (bearded shorthusk), *Carex albicans var. albicans* (whitetinge sedge), *Carex blanda* (eastern woodland sedge), *Carex digitalis* (slender woodland sedge), *Carex laxiculmis* (spreading sedge), *Carex willdenowii* (Willdenow's sedge), *Carex nigromarginata* (black edge sedge), *Cynoglossum virginianum var. virginianum* (wild comfrey), *Dichanthelium boscii* (Bosc's panicgrass),

Dichanthelium dichotomum (cypress panicgrass), *Arisaema triphyllum* (Jack in the pulpit), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Elymus virginicus var. virginicus* (Virginia wildrye), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Festuca subverticillata* (nodding fescue), *Hedeoma pulegioides* (American false pennyroyal), *Osmorhiza longistylis* (longstyle sweetroot), *Phryma leptostachya* (American lopseed), *Polygonatum biflorum* (smooth Solomon's seal), *Polygonum virginianum* (jumpseed), *Silene stellata* (widowsfrill), *Smilax pulverulenta* and *Viola sororia* (common blue violet). A total of 10 exotic plant species were reported from sampled stands.

Manassas National Battlefield Park Vegetation: Vegetation of this type is a mixed hardwood forest dominated by oaks and hickories. *Quercus alba* (white oak) and *Carya glabra* (pignut hickory) are the leading overstory dominants, especially among the larger diameter classes. *Quercus rubra* (northern red oak) and *Carya ovalis* (red hickory) are frequent overstory codominants, while *Quercus stellata* (post oak), *Fraxinus americana* (white ash), *Carya tomentosa* (mockernut hickory), *Juglans nigra* (black walnut), and *Quercus velutina* (black oak) are occasional overstory associates. Subcanopy tree layers are usually dominated by young hickories and *Fraxinus americana* (white ash). Characteristic species in the shrub and small-tree layers are *Cercis canadensis var. canadensis* (eastern redbud), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Cornus florida* (flowering dogwood), *Ostrya virginiana* (hophornbeam), *Ulmus rubra* (slippery elm), *Celtis occidentalis* (common hackberry), *Carpinus caroliniana* (American hornbeam), and *Chionanthus virginicus* (white fringetree). The herb layer of this community is characterized by patch-dominance of three dry-site forest grasses: *Muhlenbergia sobolifera* (rock muhly), *Dichanthelium boscii* (Bosc's panicgrass), and *Elymus hystrix var. hystrix* (eastern bottlebrush grass). Co-occurring among the dominant grasses are a large number of low-cover forbs and graminoids; among the most diagnostic of these are *Acalypha virginica* (Virginia threeseed mercury), *Ageratina altissima* (white snakeroot), *Agrimonia rostellata* (beaked agrimony), *Aristolochia serpentaria* (Virginia snakeroot), *Asclepias quadrifolia* (fourleaf milkweed), *Botrychium virginianum* (rattlesnake fern), *Clematis ochroleuca* (curlyheads), *Cynoglossum virginianum* (wild comfrey), *Galium circaezans* (licorice bedstraw), *Geum virginianum* (cream avens), *Hedeoma pulegioides* (American false pennyroyal), *Helianthus divaricatus* (woodland sunflower), *Phryma leptostachya* (American lopseed), *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod), *Thalictrum thalictroides* (rue-anemone), *Uvularia perfoliata* (perfoliate bellwort), and *Viola triloba var. triloba* (three-lobe violet). Many additional species occur at low cover and/or constancy. This unit has a mean species richness of 66 taxa per 400-square-meter plot, the highest among classified types at the park. A more widespread association, Piedmont Dry Mesic Acidic Oak Hickory Forest (CEGL008475) may have similar canopy dominants but will lack nutrient-demanding submesophytic herbs and grasses.

Global Vegetation: Vegetation of this type is an open- to closed-canopy, mixed hardwood forest dominated by oaks, hickories, and white ash. Stands over hardpans or shallow soils over bedrock have a somewhat stunted canopy. *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Carya tomentosa* (mockernut hickory), and *Fraxinus americana* (white ash) are the leading overstory dominants in variable combinations. In the more western, submontane habitats, *Quercus montana* (chestnut oak) is often codominant. *Quercus velutina* (black oak), *Quercus stellata* (post oak), *Quercus montana* (chestnut oak), *Ulmus rubra* (slippery elm), and *Juglans nigra* (black walnut) are occasional overstory associates. Subcanopy tree layers are usually dominated by young hickories and *Fraxinus americana* (white ash). Characteristic species in the shrub and small-tree layers are *Cercis canadensis var. canadensis* (eastern redbud) (dominant with up to 850 stems/ha in some areas), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Cornus florida* (flowering dogwood), *Ulmus rubra* (slippery elm), *Celtis occidentalis* (common hackberry), and *Rosa carolina* (Carolina rose). Less constant, but sometimes locally important, understory species include *Ostrya virginiana* (hophornbeam), *Carpinus caroliniana* (American hornbeam) (on more mesic sites), and *Chionanthus virginicus* (white fringetree). The herb layer of this community is frequently characterized by patch-dominance of the dry-site forest grasses *Muhlenbergia sobolifera* (rock muhly), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), and *Danthonia spicata* (poverty oatgrass). Co-occurring among the dominant grasses are a large number of low-cover forbs and graminoids, among the most characteristic of which are *Agrimonia rostellata* (beaked agrimony), *Amphicarpaea bracteata* (American hogpeanut), *Aristolochia serpentaria* (Virginia snakeroot), *Bromus pubescens* (hairy woodland brome), *Carex digitalis* (slender woodland sedge), *Carex hirsutella* (fuzzy wuzzy sedge), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Festuca subverticillata* (nodding fescue), *Galium circaezans* (licorice bedstraw), *Geum virginianum* (cream avens), *Houstonia purpurea var. purpurea* (Venus' pride), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Phryma leptostachya* (American lopseed), *Polygonatum biflorum* (smooth Solomon's seal), *Sanicula canadensis* (Canadian blacksnakeroot), *Scutellaria elliptica* (hairy skullcap), *Solidago caesia* (wreath goldenrod), *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod), *Thalictrum thalictroides* (rue-anemone), *Uvularia perfoliata* (perfoliate bellwort), and *Viola triloba var.*

triloba (three-lobe violet) (all of these with >50% constancy in 50 plots). Less constant species that are nevertheless locally abundant or characteristic include *Antennaria plantaginifolia* (woman's tobacco) (2 vars.), *Brachyelytrum erectum* (bearded shorthusk), *Carex albicans var. australis* (stellate sedge), *Carex pensylvanica* (Pennsylvania sedge), *Carex planispicata* (flat-spiked sedge), *Clematis ochroleuca* (curlyheads), *Dichanthelium linearifolium* (slimleaf panicgrass), *Galium concinnum* (shining bedstraw), *Helianthus divaricatus* (woodland sunflower), *Melica mutica* (twoflower melicgrass), *Piptochaetium avenaceum* (blackseed speargrass), and *Pycnanthemum incanum* (hoary mountainmint). Patches of exposed mineral soil around tree bases are frequently occupied by a suite of diminutive annuals including *Acalypha virginica* (Virginia threeseed mercury), *Hedeoma pulegioides* (American false pennyroyal), and *Paronychia canadensis* (smooth forked nailwort). Many additional species occur at low cover and/or constancy. In 50 Virginia plot samples, this unit has a mean species richness of 82 taxa per 400 m2, one of the highest among all classified upland types in Virginia. Additionally, a plot of this vegetation containing 125 taxa represents one of the most species-rich upland sample among >3300 plots in the VDNH database (VDNH unpubl. data).

Global Dynamics: Historically, this association had a more extensive distribution in northern Virginia, but many stands have been destroyed by development sprawling from the Washington, DC, metropolitan area. Most of the remaining stands have been subject to various anthropogenic disturbances, including cutting, conversion to pine silviculture, and grazing. Excessive deer browse, resulting in reduced tree recruitment and dwarfing of repeatedly grazed herbaceous species, is a serious problem in almost all stands. The rather dry soils occupied by this community keep many exotic plants in check, but the drought-tolerant *Lonicera japonica* (Japanese honeysuckle), *Poa compressa* (Canada bluegrass), and *Symphoricarpos orbiculatus* (coralberry) (a shrub naturalized from the western U.S.) are problematic invaders. Stands on the most mesic sites are vulnerable to invasion by *Microstegium vimineum* (Nepalese browntop) and *Alliaria petiolata* (garlic mustard). The fungal pathogen *Discula destructiva* (dogwood anthracnose) is now rampant in virtually all stands of this type and has caused extensive mortality of the former understory codominant *Cornus florida* (flowering dogwood).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Carya ovalis* (red hickory), *Fraxinus americana* (white ash)
Tree canopy	Broad-leaved deciduous tree	*Carya glabra* (pignut hickory), *Carya tomentosa* (mockernut hickory), *Quercus alba* (white oak), *Quercus rubra* (northern red oak)
Tree subcanopy	Broad-leaved deciduous tree	*Cercis canadensis* var. *canadensis* (eastern redbud)
Herb (field)	Graminoid	*Danthonia spicata* (poverty oatgrass), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix* var. *hystrix* (eastern bottlebrush grass), *Muhlenbergia sobolifera* (rock muhly)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Carya glabra* (pignut hickory), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix* var. *hystrix* (eastern bottlebrush grass), *Fraxinus americana* (white ash), *Quercus alba* (white oak)

Manassas National Battlefield Park: *Carya glabra* (pignut hickory), *Cercis canadensis* var. *canadensis* (eastern redbud), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix* var. *hystrix* (eastern bottlebrush grass), *Fraxinus americana* (white ash), *Muhlenbergia sobolifera* (rock muhly), *Quercus alba* (white oak)

Global: *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Cercis canadensis* var. *canadensis* (eastern redbud), *Danthonia spicata* (poverty oatgrass), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix* var. *hystrix* (eastern bottlebrush grass), *Fraxinus americana* (white ash), *Muhlenbergia sobolifera* (rock muhly), *Ostrya virginiana* (hophornbeam), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Ulmus rubra* (slippery elm)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Arctium minus* (lesser burdock, Medium/Insignificant), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Nepeta cataria* (catnip),

Perilla frutescens (beefsteakplant, Low), *Prunus avium* (sweet cherry, High/Low), *Rosa multiflora* (multiflora rose, Medium/Low)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (05-Aug-2004). The known distribution of this type is confined to a six-county area in northern Virginia and adjacent Maryland. Moreover, the environmental conditions under which it occurs are naturally uncommon to rare in the Mid-Atlantic region. Although it may locally form sizeable patches in the northern Virginia Culpeper Basin, many stands have been destroyed by suburban development and virtually all stands have been impacted by timber removal and other anthropogenic disturbances.

RELATED CONCEPTS

Global Similar Types:
- *Carya glabra - Quercus (rubra, montana) - Fraxinus americana / Viburnum rafinesqueanum* Forest (CEGL006209)
- *Fraxinus americana - Carya glabra / Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland (CEGL003683)
- *Quercus montana - Quercus rubra - Carya ovalis / Carex pensylvanica - (Calamagrostis porteri)* Forest (CEGL008516)
- *Quercus rubra - Quercus montana - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (CEGL008514)

Global Related Concepts:
- *Quercus alba - Carya glabra - Fraxinus americana / Cercis canadensis / Muhlenbergia sobolifera - Dichanthelium boscii* Forest (Fleming and Weber 2003) =
- *Quercus alba - Fraxinus americana - Carya (glabra, ovalis) / Cercis canadensis / Muhlenbergia sobolifera - Elymus hystrix* Forest (Fleming 2002a) =

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Chesapeake & Ohio Canal National Historical Park Classification Comments: Northern Hardpan Basic Oak - Hickory Forest is sometimes referred to as Hardpan Basic Oak - Hickory Forest.
Manassas National Battlefield Park Classification Comments: Northern Hardpan Basic Oak - Hickory Forest (sometimes referred to as Hardpan Basic Oak - Hickory Forest) is distinguished by its diverse floristic composition, its abundance of *Carya* (hickory) spp. and *Fraxinus americana* (white ash), and the patch-dominance of three distinctive forest grasses. It is quite similar to Piedmont Dry-Mesic Acidic Oak - Hickory Forest (CEGL008475), but has lusher and more diverse shrub and herb layers that lack significant cover of *Vaccinium pallidum* (Blue Ridge blueberry) and other heath shrubs. This type is largely confined to soils weathered from diabase, whereas CEGL008475 is exclusively associated with soils weathered from siltstone.
Manassas National Battlefield Park Other Comments: All stands of the park's Northern Hardpan Basic Oak - Hickory Forest have been cut in the past, and many appear to have been grazed.
Global Classification Comments: This vegetation type has been well-documented by 50 plot samples in Virginia and has emerged strongly in several large regional analyses of plot data (e.g., the 1250-plot analysis for the NCR parks vegetation mapping project). It has also been qualitatively documented in a large diabase sill near Boyds, Montgomery County, Maryland. The type also occurs very locally on metabasalt at low elevations of Catoctin Mountain, Maryland. It is generally distinguished from other mid-Atlantic region oak-hickory forests by its patch-dominance of forest grasses and its strong association with gentle or sub-level topography and soils with an impermeable hardpan or shallow bedrock. This unit is largely confined to Piedmont soils weathered from fine-grained mafic rocks (diabase and metabasalt). Several plots at low elevations of Shenandoah National Park are intermediate between this type and ~*Quercus rubra - Quercus montana - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (CEGL008514)$$ and could be assigned equally well to either type. For the purposes of vegetation mapping in Shenandoah, these plots were assigned to CEGL008514.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled at the Diabase Woodland, near Edwards Ferry (Canal mile 31) and at documented with an observation point at Pennyfield/Blockhouse Point (Canal mile 21).

Manassas National Battlefield Park Range: This association is widespread in the park on low ridges and rolling to flat uplands. Excellent, mature examples occur on the ridge just east of Brawner Farm, south of U.S. Route 29 opposite Battery Heights, and on the ridge south of Sudley.
Global Range: This association is widespread in the northern Virginia Mesozoic (Culpeper) Basin and locally in the extension of that basin in Montgomery County, Maryland. Small patches also occur on western Piedmont foothills and low elevations of the Blue Ridge in Virginia and Maryland. The global range of this community needs further investigation and may include parts of the Frederick Basin in Maryland, local areas around Gettysburg, Pennsylvania, and possibly other Mesozoic basins north to New Jersey or lower New England.
Nations: US
States/Provinces: MD:S2, PA?:SNA, VA:S3
TNC Ecoregions: 52:C, 59:C, 61:?
USFS Ecoregions (2007): 221Dd:CCC, 221De:CCC, M221Da:CCC
Federal Lands: NPS (C&O Canal, Manassas)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (1 plot): CHOH.209.
Manassas National Battlefield Park Plots: MANA.7. MANA.8, MANA.10, MANA.12, MANA.14, MANA.15, MANA.22, MANA.24, MANA.32.
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman and M.J. Russo
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d., Fleming 2001b, Fleming 2002a, Fleming 2002a*, Fleming 2002b, Fleming and Patterson 2003, Fleming and Patterson 2004, Fleming and Taverna 2006, Fleming and Weber 2003, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011

[CEGL008515] *Quercus alba - Quercus montana - 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	Central Appalachian-Northeast Oak Forest & Woodland (G650)
Alliance	*Quercus alba - Carya glabra - Fraxinus americana* Forest Alliance (A4436)

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 montana* (chestnut oak) and *Quercus alba* (white oak)), with high cover of *Carya* (hickory) spp., especially *Carya glabra* (pignut hickory). *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), *Carya tomentosa* (mockernut hickory), *Pinus virginiana* (Virginia pine), and *Pinus strobus* (eastern white pine) are also important, sometimes codominant trees. Stands in which *Quercus alba* (white oak) 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* (red hickory), *Pinus echinata* (shortleaf pine), *Quercus coccinea* (scarlet oak), and *Quercus stellata* (post oak). Young representatives of most canopy species are common in the understory, along with *Cornus*

florida (flowering dogwood) and *Amelanchier arborea* (common serviceberry). 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* (Blue Ridge blueberry) 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

Chesapeake & Ohio Canal National Historical Park Environment: This oak forest was sampled at 18 locations in the park. Sites range from gentle to steep, lower to upper sideslopes, gaps, interfluves, and rolling uplands (piedmonts) on nearly any aspect. Soils are rapidly to well-drained sandy loam and silt loam. The unvegetated surface is dominated by leaf litter (35-98% cover) with some exposed bedrock (0-15%), large rocks (0-15%), small rocks (0-35%), wood (0-20%), bare soil (1-25%), and mosses and lichens (1-20%). Evidence of disturbance includes chestnut blight, dogwood anthracnose, deer grazing/browsing, past logging, old roads, trails and camping/fire circle, and the presence of exotic species.
Harpers Ferry National Historical Park Environment: Central Appalachian Acidic Oak - Hickory Forest is generally found at the bases of slopes, on submesic to subxeric sites on a variety of substrates.
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

Chesapeake & Ohio Canal National Historical Park Vegetation: The sparse to moderate (20-60+% cover) tree canopy can be 20-35 m tall or 10-20 m tall, in which case a subcanopy is not differentiated. It is dominated by oaks *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), and *Quercus rubra* (northern red oak), as is the sparse to moderate (20-60%) subcanopy (10-20 m), when present. Additional tree species include *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), *Nyssa sylvatica* (blackgum), and *Pinus virginiana* (Virginia pine). Along with sapling canopy trees, the very sparse to moderate (10-60%) tall-shrub layer (6-10 m) and sparse to dense (20-80+%) short-shrub layer (1-6 m) are dominated by *Amelanchier arborea* (common serviceberry) and *Cornus florida* (flowering dogwood). Common and/or abundant species in the herbaceous and short shrub layer (<5-60%) include *Ageratina altissima* (white snakeroot), *Alliaria petiolata* (garlic mustard) (exotic), *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa var. flexuosa* (wavy hairgrass), *Gaylussacia baccata* (black huckleberry), *Hieracium venosum* (rattlesnakeweed), *Microstegium vimineum* (Nepalese browntop) (exotic), *Muhlenbergia sobolifera* (rock muhly), *Parthenocissus quinquefolia* (Virginia creeper), *Potentilla canadensis* (dwarf cinquefoil), *Spiraea corymbosa* (shinyleaf meadowsweet), *Toxicodendron radicans* (eastern poison-ivy), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium stamineum* (deerberry). Nonvascular species cover up to 10% of the ground surface. A total of 22 exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Carex careyana* (Carey's sedge), *Chenopodium standleyanum* (Standley's goosefoot), and *Chenopodium standleyanum* (Standley's goosefoot), state-imperiled *Antennaria solitaria* (singlehead pussytoes), and three state-vulnerable species.
Harpers Ferry National Historical Park Vegetation: The most frequent canopy tree is *Quercus montana* (chestnut oak), with *Quercus alba* (white oak), *Carya glabra* (pignut hickory), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), and *Carya tomentosa* (mockernut hickory). The most frequent subcanopy trees (which may transgress into the canopy) are *Amelanchier arborea* (common serviceberry), *Acer rubrum* (red maple), and *Fraxinus americana* (white ash), with, at lower frequency, *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Pinus virginiana* (Virginia pine), *Prunus serotina var. serotina* (black cherry),

Sassafras albidum (sassafras), and *Ulmus americana* (American elm). The most frequent shrub is *Viburnum prunifolium* (blackhaw), with *Cercis canadensis var. canadensis* (eastern redbud), *Hamamelis virginiana* (American witch-hazel), and *Vaccinium pallidum* (Blue Ridge blueberry). Vines include *Parthenocissus quinquefolia* (Virginia creeper) and *Toxicodendron radicans* (eastern poison-ivy), with *Vitis rotundifolia* (muscadine). The most frequent herbs are *Danthonia spicata* (poverty oatgrass), *Paronychia canadensis* (smooth forked nailwort), *Potentilla canadensis* (dwarf cinquefoil), with *Ageratina altissima* (white snakeroot), *Asplenium platyneuron* (ebony spleenwort), *Carex pensylvanica* (Pennsylvania sedge), *Carex willdenowii* (Willdenow's sedge), *Dichanthelium boscii* (Bosc's panicgrass), *Dichanthelium villosissimum var. villosissimum* (whitehair rosette grass), *Galium circaezans* (licorice bedstraw), *Hedeoma pulegioides* (American false pennyroyal), *Muhlenbergia sobolifera* (rock muhly), *Oxalis stricta* (common yellow oxalis), and *Sphenopholis obtusata* (prairie wedgescale), and with *Antennaria solitaria* (singlehead pussytoes), *Arabis laevigata var. laevigata* (smooth rockcress), *Cardamine hirsuta* (hairy bittercress), *Carex careyana* (Carey's sedge), *Carex cephalophora* (oval-leaf sedge), *Carex digitalis* (slender woodland sedge), *Carex laxiflora var. laxiflora* (broad looseflower sedge), *Carex nigromarginata* (black edge sedge), *Carex swanii* (Swan's sedge), *Carex virescens* (ribbed sedge), *Chenopodium standleyanum* (Standley's goosefoot), *Chimaphila maculata* (striped prince's pine), *Conyza canadensis* (Canadian horseweed), *Cunila origanoides* (common dittany), *Dichanthelium commutatum* (variable panicgrass), *Dichanthelium dichotomum* (cypress panicgrass), *Dichanthelium linearifolium* (slimleaf panicgrass), *Dichanthelium sabulorum var. thinium* (hemlock rosette grass), *Erechtites hieraciifolius var. hieraciifolius* (American burnweed), *Erigeron strigosus* (prairie fleabane), *Eupatorium sessilifolium var. sessilifolium*, *Eurybia divaricata* (white wood aster), *Festuca subverticillata* (nodding fescue), *Gamochaeta purpurea* (spoonleaf purple everlasting), *Hackelia virginiana* (beggarslice), *Helianthus hirsutus* (hairy sunflower), *Hieracium venosum* (rattlesnakeweed), *Houstonia caerulea* (azure bluet), *Houstonia longifolia* (longleaf summer bluet), *Hypericum punctatum* (spotted St. Johnswort), *Lespedeza procumbens* (trailing lespedeza), *Lobelia inflata* (Indian-tobacco), *Parietaria pensylvanica* (Pennsylvania pellitory), *Phytolacca americana* (American pokeweed), *Pilea pumila* (Canadian clearweed), *Polygonatum biflorum* (smooth Solomon's seal), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Scutellaria elliptica* (hairy skullcap), *Silene virginica* (fire pink), *Solanum ptycanthum* (West Indian nightshade), *Triodanis perfoliata* (clasping Venus' looking-glass), and *Viola sagittata* (arrowleaf violet) at lowest frequency. Exotic species in this community may include woody plants *Acer platanoides* (Norway maple), *Ailanthus altissima* (tree of heaven), *Pyrus communis* (common pear), the vine *Lonicera japonica* (Japanese honeysuckle), also *Rubus phoenicolasius* (wine raspberry), and herbs *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop), and *Rumex acetosella* (common sheep sorrel).

Global Vegetation: The characteristic vegetation of this type is an open oak-hickory or oak-hickory-pine forest dominated by oaks (particularly *Quercus montana* (chestnut oak) and *Quercus alba* (white oak)), with high cover of *Carya* (hickory) spp., especially *Carya glabra* (pignut hickory). *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), *Carya tomentosa* (mockernut hickory), *Pinus virginiana* (Virginia pine), and *Pinus strobus* (eastern white pine) are also important, sometimes codominant trees. Stands in which *Quercus alba* (white oak) 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* (red hickory), *Pinus echinata* (shortleaf pine), *Quercus coccinea* (scarlet oak), and *Quercus stellata* (post oak). Young representatives of most canopy species are common in the understory, along with *Acer rubrum* (red maple), *Cornus florida* (flowering dogwood), and *Amelanchier arborea* (common serviceberry). At the richer end of the soil spectrum, nutrient-demanding species such as *Cercis canadensis* (eastern redbud), *Acer saccharum* (sugar maple), *Ostrya virginiana* (hophornbeam), *Fraxinus americana* (white ash), and *Ulmus rubra* (slippery elm) may be present in the understory but rarely have more than 5% cover in a 400-m2 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* (Blue Ridge blueberry) may dominate the short shrub layer in low colonies. Frequent, non-ericaceous low shrubs include *Viburnum acerifolium* (mapleleaf viburnum) and *Rosa carolina* (Carolina rose). 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* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Dichanthelium boscii* (Bosc's panicgrass), and *Deschampsia flexuosa* (wavy hairgrass). Characteristic forbs are *Antennaria plantaginifolia* (woman's tobacco), *Chimaphila maculata* (striped prince's pine), *Desmodium rotundifolium* (prostrate ticktrefoil), *Galium circaezans* (licorice bedstraw), *Houstonia longifolia* (longleaf summer bluet), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Polygonatum biflorum* (smooth Solomon's seal), *Potentilla canadensis* (dwarf cinquefoil), *Scutellaria elliptica* (hairy skullcap), *Symphyotrichum undulatum* (wavyleaf aster), *Vicia caroliniana*

(Carolina vetch), and several *Lespedeza* (lespedeza, bushclover) spp. Species richness of 35 plot-sampled stands used in the NCR Parks analysis ranges from 27 to 73 taxa per 400 m2 (mean = 46). Species richness of 49 Virginia plots ranges from 29 to 105 taxa per 400 m2 (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* (white oak) about 225 years old, a 49-cm (19-inch) dbh *Quercus alba* (white oak) about 155 years old, and a 46-cm (18-inch) dbh coppice sprout of *Quercus montana* (chestnut oak) 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* (American chestnut) 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* (red maple), *Pinus strobus* (eastern white pine), and other shade-tolerant mesophytic trees.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya tomentosa* (mockernut hickory), *Quercus alba* (white oak), *Quercus velutina* (black oak)
Tree subcanopy	Broad-leaved deciduous tree	*Amelanchier arborea* (common serviceberry)
Herb (field)	Graminoid	*Carex pensylvanica* (Pennsylvania sedge)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Carex pensylvanica* (Pennsylvania sedge), *Carya glabra* (pignut hickory), *Cornus florida* (flowering dogwood), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Vaccinium pallidum* (Blue Ridge blueberry)

Harpers Ferry National Historical Park: *Amelanchier arborea* (common serviceberry), *Carya glabra* (pignut hickory), *Cornus florida* (flowering dogwood), *Danthonia spicata* (poverty oatgrass), *Fraxinus americana* (white ash), *Paronychia canadensis* (smooth forked nailwort), *Parthenocissus quinquefolia* (Virginia creeper), *Pinus virginiana* (Virginia pine), *Potentilla canadensis* (dwarf cinquefoil), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Vaccinium pallidum* (Blue Ridge blueberry), *Viburnum prunifolium* (blackhaw)

Global: *Antennaria plantaginifolia* (woman's tobacco), *Carex pensylvanica* (Pennsylvania sedge), *Carya glabra* (pignut hickory), *Cornus florida* (flowering dogwood), *Danthonia spicata* (poverty oatgrass), *Dichanthelium boscii* (Bosc's panicgrass), *Houstonia longifolia* (longleaf summer bluet), *Lespedeza hirta* (hairy lespedeza), *Lespedeza procumbens* (trailing lespedeza), *Lespedeza repens* (creeping lespedeza), *Lespedeza violacea* (violet lespedeza), *Lespedeza virginica* (slender lespedeza), *Pinus virginiana* (Virginia pine), *Potentilla canadensis* (dwarf cinquefoil), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Vaccinium pallidum* (Blue Ridge blueberry)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Antennaria solitaria* (singlehead pussytoes, G5, MD-imperiled), *Carex careyana* (Carey's sedge, G4G5, MD-critically imperiled), *Castanea dentata* (American chestnut, G3, MD-vulnerable), *Chenopodium standleyanum* (Standley's goosefoot, G5, MD-critically imperiled), *Hybanthus concolor* (eastern greenviolet, G5, MD-vulnerable), *Silphium trifoliatum* (whorled rosinweed, G4?, MD-vulnerable); **Invasive/Exotic Plants**: *Acer platanoides* (Norway maple, High/Medium), *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Cardamine hirsuta* (hairy bittercress), *Crataegus monogyna* (oneseed hawthorn), *Glechoma hederacea* (ground ivy, Low), *Hieracium piloselloides* (tall hawkweed, Medium/Insignificant), *Leontodon autumnalis* (fall dandelion), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Poa compressa* (Canada bluegrass, High/Low), *Poa pratensis* (Kentucky bluegrass, Medium), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Prunus avium* (sweet cherry, High/Low), *Pyrus communis* (common pear, High/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Rumex acetosella* (common sheep sorrel, Medium/Low), *Stellaria media* (common chickweed, Low), *Verbascum thapsus* (common mullein, Medium), *Vicia cracca* (bird vetch)

Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Acer platanoides* (Norway maple, High/Medium), *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium),

Lonicera japonica (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rubus phoenicolasius* (wine raspberry, Medium)
Global: Vulnerable Plants: *Berberis canadensis* (American barberry, G3G4), *Clematis coactilis* (Virginia whitehair leather flower, G3), *Heuchera caroliniana* (Carolina alumroot, G3), *Onosmodium virginianum* (wild Job's tears, G4, VA state-rare), *Pycnanthemum clinopodioides* (basil mountainmint, G1G2)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (02-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 ovalis / Acer saccharum / Polystichum acrostichoides* Forest (CEGL007233)
- *Quercus alba - Quercus rubra - Carya tomentosa / Vaccinium stamineum / Desmodium nudiflorum* Piedmont Forest (CEGL008475) is an analogue of CEGL008515 occurring in the southeastern Piedmont from southern Maryland to Georgia.
- *Quercus montana - Quercus rubra - Carya ovalis / Carex pensylvanica - (Calamagrostis porteri)* Forest (CEGL008516) is 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 montana* (chestnut oak) and other lower-elevation species.
- *Quercus rubra - Quercus montana - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (CEGL008514) is a more diverse oak-hickory forest of the Piedmont and lower Blue Ridge occurring on mafic and granitic substrates.

Global Related Concepts:
- *Quercus alba - Quercus montana - Carya glabra / Carex pensylvanica* Forest (Fleming and Moorhead 2000) <
- *Quercus alba - Quercus montana - Carya glabra / Vaccinium pallidum / Carex pensylvanica* Forest (Young et al. 2007a) =
- *Quercus alba - Quercus prinus - Carya glabra / Cornus florida / Vaccinium pallidum / Carex pensylvanica* Forest (Fleming and Coulling 2001) =
- *Quercus prinus - Quercus rubra - Carya ovalis / Cornus florida / Desmodium nudiflorum* Association: *Helianthus divaricatus - Carex pensylvanica - Dichanthelium boscii - Arabis laevigata* Subassociation, *pro parte* (Rawinski et al. 1996) <
- White Oak - Black Oak - Northern Red Oak: 52 (Eyre 1980) >

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: . Central Appalachian Acidic Oak - Hickory Forest is sometimes referred to as Acidic Oak - Hickory Forest.
Harpers Ferry National Historical Park Classification Comments: Local vegetation description for Harpers Ferry National Park is based on data in plots CHOH.302, CHOH.303, and CHOH.304, which are located in Chesapeake and Ohio Canal National Park, just upriver of Maryland Heights, on the Potomac River. Central Appalachian Acidic Oak - Hickory Forest is sometimes referred to as Acidic Oak - Hickory Forest.
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* (common serviceberry), *Quercus alba* (white oak), *Acer rubrum* (red maple), *Cornus florida* (flowering dogwood), *Quercus montana* (chestnut oak), *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Chimaphila maculata* (striped prince's pine), *Quercus velutina* (black oak), and *Carya glabra* (pignut hickory).

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled near Lock 34, Falling Water Road, Fort Duncan, Fort Frederick, Paw Paw Tunnel, Roundtop Hill, Spring Gap and Tunnel Hill.

Harpers Ferry National Historical Park Range: There is one polygon measuring 2.5 hectares of this type mapped in the park, on the lower slopes of Maryland Heights, east and north of the lower portion of the Military Road (main trail).
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:SNR, PA:SNR, VA:S4, WV:S3
TNC Ecoregions: 50:C, 51:C, 52:C, 59:C
USFS Ecoregions (2007): 231Ib:CCC, M221Aa:CCP, 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

Chesapeake & Ohio Canal National Historical Park Plots: (18 plots): CHOH.024, CHOH.034, CHOH.045, CHOH.046, CHOH.058, CHOH.061, CHOH.062, CHOH.064, CHOH.068, CHOH.070, CHOH.301, CHOH.302, CHOH.303, CHOH.304, CHOH.605, CHOH.617, CHOH.620, CHOH.625.
Harpers Ferry National Historical Park Plots: CHOH.302, CHOH.303, and CHOH.304.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Harpers Ferry National Historical Park Description Author(s): M. Pyne
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 Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Rawinski et al. 1996, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL008514] *Quercus rubra - Quercus montana - 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	Central Appalachian-Northeast Oak Forest & Woodland (G650)
Alliance	*Quercus alba - Carya glabra - Fraxinus americana* Forest Alliance (A4436)

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* (oak) spp. and *Carya* (hickory) spp. In particular, *Carya ovalis* (red hickory), *Quercus rubra* (northern red oak), and *Quercus montana* (chestnut oak) are consistent codominants and have the highest importance values based on standard forestry statistics generated from stem-diameter measurements. *Quercus alba* (white oak), *Quercus velutina* (black oak), *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), and *Liriodendron tulipifera* (tuliptree) are less constant canopy species but achieve codominance in some stands. *Carya* (hickory) spp., *Quercus* (oak) spp.,

Acer rubrum (red maple), *Nyssa sylvatica* (blackgum), *Fraxinus americana* (white ash), and *Sassafras albidum* (sassafras) are well-represented in lower tree strata. *Cercis canadensis* (eastern redbud) (at lower elevations) and, to a lesser extent, *Cornus florida* (flowering dogwood) dominate the shrub and lowest tree layers, while *Viburnum acerifolium* (mapleleaf viburnum) is a common low shrub. A large number of herbaceous species occur in the type.

ENVIRONMENTAL DESCRIPTION

Catoctin Mountain Park Environment: This vegetation generally occurs on gentle to south- and east-facing moderate slopes and flat summits on the Catoctin Formation. Aspects are variable. Rock outcrops, as well as large to small rocks are common on the surface. The sandy loam and silt loam soils are often stony. This association occurs at elevations ranging from 335m to over 550 m (1100-1800 feet). The entirety of the restricted area is mapped as this type, to a maximum of 550 m (1880 feet), but occurrence of this type at this elevation in the park requires confirmation. These forests occur on drier, more exposed slopes relative to High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125).

Chesapeake & Ohio Canal National Historical Park Environment: Occurs on slopes and benches of Maryland Heights, in the Northern Blue Ridge, the west facing bluff of Catoctin Mountain, and near the Potomac River in the Hagerstown Valley (Great Valley of Virginia).

Harpers Ferry National Historical Park Environment: Central Appalachian Basic Oak - Hickory Forest (Western Piedmont / Lower Blue Ridge Type) is common throughout the park on upland slopes and ridges in areas underlain by moderately fertile soil. Habitats are more-or-less rocky, gentle to steep, submesic slopes with a wide range of aspects. Midslope topographic positions are typical but stands occasionally occur on lower or upper slopes and crests. The type occurs on the phyllitic metasiltstones and phyllites of the Chilhowee Group (which includes Antietam, Harpers, and Loudoun formations), as well as (from west to east) Tomstown limestone, Weverton formation, (somewhat improbably?), and Garnet monzogranite (minor area). In addition one location is on metabasalt of the Catoctin Formation. Soils are acidic with moderately high Ca, Mg, Fe, and Al.

Monocacy National Battlefield Environment: This oak-hickory forest occurs on gentle to steep slopes between 100 and 140 m in elevation. Aspect is variable since this type occurs in the rolling uplands. Soils can be moderately well-drained to well-drained, dark brown silt loams and sandy loams. This forest type occurs over the quartzite of the Antietam Formation. The unvegetated surface is dominated by leaf litter (45-92% cover) with some large rocks (1-7%), small rocks (0-35%), wood (1-2%), bare soil (5-10%), and bryophytes and lichens (1-2%). Deer browse is extreme in this association, as in the entire park. Groundhog holes may also be common.

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

Catoctin Mountain Park Vegetation: This is a diverse forest type characterized by a closed to partially open canopy made up of trees 30-35 m tall. A subcanopy is usually present, but shrub layers are poorly developed to absent. The herbaceous layer, although diverse, is often sparse and patchy. Leaf litter often approaches 85-100% cover of the substrate. Frequent canopy trees include *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus alba* (white oak), *Carya glabra* (pignut hickory), and *Betula lenta* (sweet birch), with other tree associates including *Carya tomentosa* (mockernut hickory), *Liriodendron tulipifera* (tuliptree), *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), *Carya cordiformis* (bitternut hickory), and *Acer saccharum* (sugar maple). Occasional tree associates may include *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Nyssa sylvatica* (blackgum), and *Acer saccharum* (sugar maple). The subcanopy averages 40-50% cover, and is most frequently characterized by *Fraxinus americana* (white ash), *Acer saccharum* (sugar maple), *Amelanchier arborea* (common serviceberry), *Carya cordiformis* (bitternut hickory), *Betula lenta* (sweet birch), *Carya ovata* (shagbark hickory), *Acer rubrum* (red maple), and *Sassafras albidum* (sassafras). The tall-shrub layer, when present, is most often characterized by *Lindera benzoin* (northern spicebush). Other members of the tall-shrub layer may include *Acer rubrum* (red maple), *Hamamelis virginiana* (American witch-hazel), *Ostrya virginiana* (hophornbeam), *Prunus*

serotina (black cherry), and *Cornus florida* (flowering dogwood). Vines usually include *Parthenocissus quinquefolia* (Virginia creeper) and *Vitis aestivalis* (summer grape). Canopy gaps sometimes support densely vine-covered tall shrubs or tree saplings, most often *Vitis aestivalis* (summer grape). The herbaceous layer is diverse and variable. The most common species include *Arisaema triphyllum* (Jack in the pulpit), *Thalictrum thalictroides* (rue-anemone), *Circaea lutetiana* (broadleaf enchanter's nightshade), *Brachyelytrum erectum* (bearded shorthusk), *Dichanthelium boscii* (Bosc's panicgrass), *Galium circaezans* (licorice bedstraw), *Uvularia perfoliata* (perfoliate bellwort), *Hackelia virginiana* (beggarslice), and *Carex digitalis* (slender woodland sedge). Other associates may include *Danthonia spicata* (poverty oatgrass), *Carex swanii* (Swan's sedge), *Uvularia sessilifolia* (sessileleaf bellwort), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Pilea pumila* (Canadian clearweed), *Cynoglossum virginianum* (wild comfrey), *Cunila origanoides* (common dittany), *Oxalis stricta* (common yellow oxalis), *Paronychia virginica* (yellow nailwort), *Cardamine concatenata* (cutleaf toothwort), *Ageratina altissima* (white snakeroot), *Eurybia divaricata* (white wood aster), *Rubus phoenicolasius* (wine raspberry), *Muhlenbergia sobolifera* (rock muhly), *Erechtites hieraciifolius* (American burnweed), *Asplenium platyneuron* (ebony spleenwort), *Phytolacca americana* (American pokeweed), *Viola rotundifolia* (roundleaf yellow violet), and *Viola x palmata* (early blue violet). Exotic species are common in this forest type, particularly *Microstegium vimineum* (Nepalese browntop), which can form striking carpets that are visible for some distance from roadsides. Stands of this forest type that are more isolated from easy access have a lower cover of exotic species, but in general, a number of exotics may be present at low cover. *Alliaria petiolata* (garlic mustard) is commonly found in these stands; others may include *Perilla frutescens* (beefsteakplant), *Solanum dulcamara* (climbing nightshade), *Rosa multiflora* (multiflora rose), and *Berberis thunbergii* (Japanese barberry).

Chesapeake & Ohio Canal National Historical Park Vegetation: Dominant trees at these sites include *Carya alba*, *Carya cordiformis* (bitternut hickory), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus velutina* (black oak), and *Quercus rubra.* Other trees include *Sassafras albidum* (sassafras), *Carya glabra* (pignut hickory), *Ailanthus altissima* (exotic), *Prunus serotina*, *Juglans nigra* (black walnut), *Nyssa sylvatica* (blackgum), *Ulmus rubra* (slippery elm), *Pinus virginiana* (Virginia pine), *Fraxinus americana* (white ash), *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Quercus coccinea* (scarlet oak), *Liriodendron tulipifera* (tuliptree), *Carya ovalis* and *Robinia pseudoacacia.* The shrub layers include tree seedlings and saplings in addition to shrubs such as, *Amelanchier arborea* (common serviceberry), *Cercis canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Lindera benzoin* (northern spicebush), *Rubus phoenicolasius* (exotic), and *Asimina triloba.* The dominant herbaceous plant in several locations is the exotic *Alliaria petiolata.* Other common herbaceous plants are *Ageratina altissima* (white snakeroot), *Paronychia canadensis* (smooth forked nailwort), *Muhlenbergia sobolifera* (rock muhly), *Carex pensylvanica* (Pennsylvania sedge), and *Hedeoma pulegioides.* Some less common herbaceous plants include *Asplenium platyneuron* (ebony spleenwort), *Danthonia spicata* (poverty oatgrass), *Dichanthelium boscii* (Bosc's panicgrass), *Polygonum convolvulus*, *Oxalis stricta* (common yellow oxalis), and *Osmorhiza longistylis.*

Harpers Ferry National Historical Park Vegetation: This association is a true oak-hickory forest with variable mixed canopy dominance by several *Quercus* (oak) spp. and *Carya* (hickory) spp. Hickories are generally abundant in the canopy and subcanopy and include *Carya ovalis* (red hickory), *Carya tomentosa* (mockernut hickory), *Carya cordiformis* (bitternut hickory), and *Carya glabra* (pignut hickory). There is typically a variable mixture of oaks in the canopy, and common species include *Quercus alba* (white oak) (which may be dominant or codominant), *Quercus rubra* (northern red oak), *Quercus montana* (chestnut oak), and *Quercus velutina* (black oak). Additional common canopy and subcanopy associates include *Fraxinus americana* (white ash) and *Acer saccharum var. saccharum* (sugar maple). In stands that have regenerated following heavy cutting, *Liriodendron tulipifera* (tuliptree) may be a common or codominant member of the canopy. The subcanopy is typically dominated by canopy oak and hickory species and *Fraxinus americana* (white ash). In addition, *Cercis canadensis var. canadensis* (eastern redbud) and *Cornus florida* (flowering dogwood) may be important in the lower subcanopy and shrub layer. *Asimina triloba* (pawpaw) may be found in more mesic examples. Additional shrub-layer species include *Viburnum prunifolium* (blackhaw), *Rubus occidentalis* (black raspberry) and *Rubus pensilvanicus* (Pennsylvania blackberry). Small patches of *Vaccinium pallidum* (Blue Ridge blueberry) and *Vaccinium stamineum* (deerberry) may be present, but as a rule ericads are sparse. Climbing lianas are frequent and include *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis aestivalis* (summer grape). The herb layer varies from somewhat sparse to fairly dense. A large number of herbaceous species occur in the type, but *Ageratina altissima* (white snakeroot), *Amphicarpaea bracteata* (American hogpeanut), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Eurybia divaricata* (white wood aster), *Galium aparine* (stickywilly), *Hackelia virginiana* (beggarslice), *Osmorhiza claytonii* (Clayton's sweetroot), *Phryma leptostachya* (American lopseed), and *Polymnia canadensis* (whiteflower leafcup) are most characteristic. The exotic species *Alliaria petiolata* (garlic mustard) is an aggressive and problematic invader of this vegetation type, even in undisturbed stands.

Monocacy National Battlefield Vegetation: The moderately dense (50-75% cover) tree canopy, 20-35 m tall, is dominated by *Quercus rubra* (northern red oak), *Quercus montana* (chestnut oak), *Quercus alba* (white oak), and *Fraxinus americana* (white ash). Other canopy associates include *Carya glabra* (pignut hickory), *Carya tomentosa* (mockernut hickory), *Carya ovata* (shagbark hickory), *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), and *Liriodendron tulipifera* (tuliptree). The moderately dense (25-50%) tree subcanopy (10-20 m) is dominated by *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), *Acer rubrum* (red maple), and *Prunus serotina var. serotina* (black cherry), but can contain other species from the canopy as well. The sparse to moderately dense (10-75%) tall-shrub layer (1-6 m) includes species of the upper layers as well as *Amelanchier arborea* (common serviceberry) and *Cornus florida* (flowering dogwood). A short-shrub layer (0.5-1 m) is absent. The herbaceous layer can be sparse (5-15%) or moderately dense (50-75%). This layer is typically dominated by exotic plants, including *Alliaria petiolata* (garlic mustard), *Lonicera japonica* (Japanese honeysuckle), *Microstegium vimineum* (Nepalese browntop), and *Polygonum cespitosum var. longisetum* (oriental ladysthumb). Some common native species include *Festuca subverticillata* (nodding fescue), *Cardamine concatenata* (cutleaf toothwort), *Claytonia virginica* (Virginia springbeauty), *Danthonia spicata* (poverty oatgrass), and *Paronychia canadensis* (smooth forked nailwort). *Parthenocissus quinquefolia* (Virginia creeper) and *Toxicodendron radicans* (eastern poison-ivy) are common vines in this forest type.
Global Vegetation: This association is a true oak-hickory forest with variable mixed canopy dominance by several *Quercus* (oak) spp. and *Carya* (hickory) spp. *Carya ovalis* (red hickory), *Quercus rubra* (northern red oak), and *Quercus montana* (chestnut oak) are consistent codominants and have the highest importance values (IV) based on standard forestry statistics generated from stem-diameter measurements. *Quercus alba* (white oak), *Quercus velutina* (black oak), *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), and *Liriodendron tulipifera* (tuliptree) are less constant canopy species but achieve codominance in some stands. *Carya* (hickory) spp., *Quercus* (oak) spp., *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Fraxinus americana* (white ash), and *Sassafras albidum* (sassafras) are well-represented in lower tree strata. *Cercis canadensis* (eastern redbud) and, to a lesser extent, *Cornus florida* (flowering dogwood) dominate the shrub and lowest tree layers, while *Viburnum acerifolium* (mapleleaf viburnum) is a common low shrub. *Cercis canadensis* (eastern redbud), however, is elevation-limited in this region and is commonly absent from stands on the main Blue Ridge. Small patches of *Vaccinium pallidum* (Blue Ridge blueberry) and *Vaccinium stamineum* (deerberry) may be present, but as a rule, ericads are sparse. Additional shrubs and small trees of irregular but local importance include *Ostrya virginiana* (hophornbeam), *Asimina triloba* (pawpaw), *Ulmus rubra* (slippery elm), *Amelanchier arborea* (common serviceberry), and *Hamamelis virginiana* (American witch-hazel). Climbing lianas of *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis* (grape) 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* (nakedflower ticktrefoil), *Solidago caesia* (wreath goldenrod), *Dioscorea quaternata* (fourleaf yam), *Galium circaezans* (licorice bedstraw), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Amphicarpaea bracteata* (American hogpeanut), *Botrychium virginianum* (rattlesnake fern), *Geum virginianum* (cream avens), *Phryma leptostachya* (American lopseed), *Actaea racemosa* (black baneberry), *Aristolochia serpentaria* (Virginia snakeroot), and *Cardamine concatenata* (cutleaf toothwort) are particularly characteristic. The latter species, *Thalictrum thalictroides* (rue-anemone), and *Claytonia virginica* (Virginia springbeauty) completely dominate the early spring herbaceous aspect, carpeting the ground with their small white flowers. *Solidago curtisii* (mountain decumbent goldenrod) usually replaces *Solidago caesia* (wreath goldenrod) at the higher end of the elevational range. Herbs that may be locally common or abundant include *Dryopteris marginalis* (marginal woodfern), *Desmodium glutinosum* (pointedleaf ticktrefoil), and *Aralia nudicaulis* (wild sarsaparilla). Species richness of plot-sampled stands ranges from 43 to 103 taxa per 400 m2 (mean = 70).
Global Dynamics: The proportion of *Liriodendron tulipifera* (tuliptree) increases with canopy disturbance. Consequently, in many stands logged during the 20th century, *Liriodendron* (tuliptree) 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* (tuliptree). *Symphoricarpos orbiculatus* (coralberry), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), and exotics such as *Ailanthus altissima* (tree of heaven), *Rubus phoenicolasius* (wine raspberry), and *Celastrus orbiculatus* (oriental bittersweet) often become established in canopy gaps following timber harvests or gypsy moth damage. In recent years, the abundance of *Cornus florida* (flowering dogwood) has been significantly reduced by mortality resulting from dogwood anthracnose.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Carya ovalis* (red hickory)
Tree canopy	Broad-leaved deciduous tree	*Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak)
Tree subcanopy	Broad-leaved deciduous tree	*Ostrya virginiana* (hophornbeam)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Amelanchier arborea* (common serviceberry), *Arisaema triphyllum* (Jack in the pulpit), *Betula lenta* (sweet birch), *Brachyelytrum erectum* (bearded shorthusk), *Carex digitalis* (slender woodland sedge), *Carya cordiformis* (bitternut hickory), *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Carya tomentosa* (mockernut hickory), *Circaea lutetiana* (broadleaf enchanter's nightshade), *Cornus florida* (flowering dogwood), *Dichanthelium boscii* (Bosc's panicgrass), *Fraxinus americana* (white ash), *Galium circaezans* (licorice bedstraw), *Hackelia virginiana* (beggarslice), *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Ostrya virginiana*, *Parthenocissus quinquefolia* (Virginia creeper), *Prunus serotina* (black cherry), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Sassafras albidum* (sassafras), *Thalictrum thalictroides* (rue-anemone), *Uvularia perfoliata* (perfoliate bellwort), *Vitis aestivalis* (summer grape)
Chesapeake & Ohio Canal National Historical Park: *Cercis canadensis* var. *canadensis* (eastern redbud), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak)
Harpers Ferry National Historical Park: *Carya ovalis* (red hickory), *Cercis canadensis* var. *canadensis* (eastern redbud), *Quercus montana* (chestnut oak)
Monocacy National Battlefield: *Carya glabra* (pignut hickory), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak)
Global: *Actaea racemosa* (black baneberry), *Amphicarpaea bracteata* (American hogpeanut), *Aristolochia serpentaria* (Virginia snakeroot), *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Carya tomentosa* (mockernut hickory), *Cercis canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Fraxinus americana* (white ash), *Galium circaezans* (licorice bedstraw), *Liriodendron tulipifera* (tuliptree), *Maianthemum racemosum* (feathery false lily of the valley), *Phryma leptostachya* (American lopseed), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Solidago caesia* (wreath goldenrod), *Uvularia perfoliata* (perfoliate bellwort), *Viburnum acerifolium* (mapleleaf viburnum)

OTHER NOTEWORTHY SPECIES

Catoctin Mountain Park: Invasive/Exotic Plants: *Berberis thunbergii* (Japanese barberry, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Solanum dulcamara* (climbing nightshade, Low)
Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Rubus phoenicolasius* (wine raspberry, Medium)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Prunus avium* (sweet cherry, High/Low), *Torilis japonica* (erect hedgeparsley)
Monocacy National Battlefield: Vulnerable Plants: *Carex appalachica* (Appalachian sedge, G4, MD state-critically imperiled), *Trichophorum planifolium* (bashful bulrush, G4G5, MD state-vulnerable);
Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Berberis thunbergii* (Japanese barberry, High/Medium), *Cardamine hirsuta* (hairy bittercress), *Chenopodium album* (lambsquarters), *Humulus japonicus* (Japanese hop, Medium/Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Prunus avium* (sweet cherry, High/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Stellaria media* (common chickweed, Low), *Veronica hederifolia* (ivyleaf speedwell)
Global: Vulnerable Plants: *Actaea racemosa* (black baneberry, G3G4), *Panax quinquefolius* (American ginseng, G3G4, under collection pressure), *Scutellaria saxatilis* (smooth rock skullcap, G3G4)

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* (flowering dogwood) has been significantly reduced by mortality resulting from dogwood anthracnose. Stands are threatened by removal of commercially valuable timber species (e.g., *Quercus rubra* (northern red oak), *Quercus montana* (chestnut oak), *Quercus alba* (white oak), *Carya* (hickory) spp.). Some stands of this association have been modified by repeated cutting and are now heavily dominated by *Liriodendron tulipifera* (tuliptree). *Symphoricarpos orbiculatus* (coralberry), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), and exotics such as *Ailanthus altissima* (tree of heaven), *Rubus phoenicolasius* (wine raspberry), and *Celastrus orbiculatus* (oriental bittersweet) 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 montana - 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 montana - Quercus rubra - Carya ovalis / Carex pensylvanica - (Calamagrostis porteri)* Forest (CEGL008516) occupies drier sites at higher elevations in the Central Appalachians; usually lacks *Liriodendron tulipifera* (tuliptree), *Cercis canadensis* (eastern redbud), and other low-elevation species.
- *Quercus montana - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057)
- *Quercus montana - 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.

Global Related Concepts:

- *Quercus montana - Quercus rubra - Carya ovalis / Desmodium nudiflorum - Dichanthelium boscii* Forest (Fleming 2002b) =
- *Quercus rubra - Quercus montana - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (Fleming and Taverna 2006) =
- *Quercus rubra - Quercus montana - Carya ovalis / Solidago caesia - Desmodium nudiflorum* Forest (Young et al. 2007a) =
- *Quercus rubra - Quercus prinus - Carya ovalis / Cercis canadensis / Solidago caesia* Forest (Fleming and Coulling 2001) =
- Central Appalachian Basic Oak - Hickory Forest (Submontane / Foothills Type) (Young et al. 2006) =
- White Oak - Black Oak - Northern Red Oak: 52 (Eyre 1980) >

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Catoctin Mountain Park Classification Comments: Despite the evident absence of *Solidago caesia* (wreath goldenrod) or *Desmodium nudiflorum* (nakedflower ticktrefoil) in this vegetation at Catoctin, the overall floristic composition in comparison to the global type supports this classification. Within this park, Central Appalachian Basic Oak - Hickory Forest (Western Piedmont / Lower Blue Ridge Type) is also referred to as Basic Oak - Hickory Forest within this park.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Central Appalachian Basic Oak - Hickory Forest (Western Piedmont / Lower Blue Ridge Type) is not to be confused with Hardpan Basic Oak - Hickory Forest (CEGL006216), which shares part of its name.
Harpers Ferry National Historical Park Classification Comments: Many stands of Central Appalachian Basic Oak - Hickory Forest (Western Piedmont / Lower Blue Ridge Type) in the park have been disturbed in the past and are weedy and/or somewhat atypical in composition compared to older or less disturbed stands. Within this park, Central Appalachian Basic Oak - Hickory Forest (Western Piedmont / Lower Blue Ridge Type) is also referred to as Basic Oak - Hickory Forest.

This community is somewhat similar to both Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057) and Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest (CEGL008523). Compositionally, it can be distinguished from both by a much greater abundance of hickories in all woody layers, a more diverse and usually denser herbaceous flora, and a more general prevalence of nutrient-demanding species such as *Fraxinus americana* (white ash) and *Cercis canadensis* (eastern redbud). It is more extensive and occupies a greater range of site conditions than either of the chestnut oak - red oak types. Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057) is confined to narrow patches on protected, north- to east-facing rocky slopes, while Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest (CEGL008523) is confined to exposed, convex, usually south- or west-facing ridge slopes on acidic, nutrient-poor soils.

Monocacy National Battlefield Classification Comments: Within this park, Central Appalachian Basic Oak - Hickory Forest (Western Piedmont / Lower Blue Ridge Type) is also referred to as Basic Oak - Hickory Forest.

Global Classification Comments: In the context of the VDNH George Washington / Jefferson National Forest dataset (VDNH unpubl. data), *Desmodium nudiflorum* (nakedflower ticktrefoil) 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* (nakedflower ticktrefoil) attained much higher indicator status in other vegetation types. Because of these results, *Solidago caesia* (wreath goldenrod) was chosen as a nominal herb for this community, instead of *Desmodium nudiflorum* (nakedflower ticktrefoil).

ELEMENT DISTRIBUTION

Catoctin Mountain Park Range: This forest type is most widespread in the south-central portion of the park. It also occurs in smaller patches embedded within Successional Mixed Deciduous Forest Map Class (COMP_SMDF) and Ruderal Tuliptree Forest (Rich Type) (CEGL007220) in the western third of the park.

Chesapeake & Ohio Canal National Historical Park Range: Most of the occurrences of this community are on the slopes of Maryland Heights (Canal mile 60-61), across the Potomac River from Harpers Ferry. It also occurs at Fort Duncan (Canal mile 62), Dargan Bend (Canal mile 64-65), and on the west facing slope at Point of Rocks (between Canal miles 48 and 49).

Harpers Ferry National Historical Park Range: Basic Oak - Hickory Forest is common throughout the park on upland slopes and ridges. Large, mature stands of the type occur at Maryland Heights, Short Hill Mountain, and Loudon Heights.

Monocacy National Battlefield Range: This association occurs in forested areas throughout the eastern side of the park.

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:SNR, VA:S3S4, WV:S2

TNC Ecoregions: 51:C, 52:C, 59:C

USFS Ecoregions (2007): 221Dd:CCC, 221De:CCC, 231Ib: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

Catoctin Mountain Park Plots: CATO.004, CATO.005, CATO.039, CATO.043, CATO.046.

Chesapeake & Ohio Canal National Historical Park Plots: (3 plots): HAFE_013, HAFE_019, HAFE_023.

Harpers Ferry National Historical Park Plots: HAFE.26, HAFE.36, HAFE.38, HAFE.114, HAFE.115.

Monocacy National Battlefield Plots: (5 plots): MONO.5, MONO.6, MONO.547, MONO.549, MONO.550.

Monocacy National Battlefield Plots: (5 plots): MONO.5, MONO.6, MONO.547, MONO.549, MONO.550.

Catoctin Mountain Park Description Author(s): L. Sneddon

Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman

Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming

Monocacy National Battlefield Description Author(s): M. Russo and S. Perles

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 Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2003, Lea 2004, WVNHP unpubl. data, Young et al. 2006, Young et al. 2007a, Young et al. 2009

A4467 *Quercus montana - Quercus rubra* / *Vaccinium angustifolium* Rocky Woodland

[CEGL008526] *Quercus montana / 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	Central Appalachian-Northeast Oak Forest & Woodland (G650)
Alliance	*Quercus montana* - *Quercus rubra* / *Vaccinium angustifolium* Rocky Woodland (A4467)

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 montana* (chestnut oak). Overstory trees are often stunted and gnarled. *Quercus rubra* (northern red oak) and *Carya glabra* (pignut hickory) are constant, usually minor canopy associates that attain codominance with *Quercus montana* (chestnut oak) locally. *Pinus virginiana* (Virginia pine) 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* (bear oak), *Vaccinium stamineum* (deerberry), and *Vaccinium pallidum* (Blue Ridge blueberry) are the chief species of a patchy shrub layer, which may also include *Rosa carolina* (Carolina rose), *Amelanchier arborea* (common serviceberry), and *Viburnum rafinesqueanum* (downy arrow-wood). *Quercus ilicifolia* (bear oak) 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

Chesapeake & Ohio Canal National Historical Park Environment: This chestnut oak woodland was sampled at six locations in the park. The sites are steep to very steep mid and upper sideslopes with southern and western aspects. Soils rapidly drained loam, silt loam and sandy loam. The unvegetated surface is made up of leaf litter (7-93% cover), large rocks (0-5%), small rocks (2-40%), wood (1-5%), bare soil (3-50%), and mosses and lichens (1-30%). Evidence of disturbance is minimal rockslide.

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

Chesapeake & Ohio Canal National Historical Park Vegetation: The very sparse to sparse (10-40% cover) tree canopy, 10-20 m tall, is dominated by *Quercus montana* (chestnut oak) and may include *Pinus rigida* (pitch pine), *Pinus virginiana* (Virginia pine), and *Quercus rubra* (northern red oak). The sparse to moderate (20-60%) tall-shrub layer (6-10 m) is dominated by *Quercus montana* (chestnut oak) and *Quercus rubra* (northern red oak), while the moderate (40-60%) short-shrub layer (1-6 m) may be dominated by those taxa as well as *Amelanchier arborea* (common serviceberry), *Carya glabra* (pignut hickory), *Quercus ilicifolia* (bear oak), and *Quercus velutina* (black oak). Common and/or abundant species in the herbaceous layer (10-80+%) include *Carex pensylvanica* (Pennsylvania sedge), *Deschampsia flexuosa var. flexuosa* (wavy hairgrass), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium stamineum* (deerberry). Nonvascular species are always present and can cover up to 30% of the ground surface.

Global Vegetation: This community is an open to very open woodland dominated by *Quercus montana* (chestnut oak). Overstory trees are often stunted and gnarled. *Quercus rubra* (northern red oak) and *Carya glabra* (pignut hickory) are constant, usually minor canopy associates that attain codominance with *Quercus montana* (chestnut oak) locally. *Pinus virginiana* (Virginia pine) 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* (bear oak), *Vaccinium stamineum* (deerberry), and *Vaccinium pallidum* (Blue Ridge blueberry) are the chief species of a patchy shrub layer, which may also include *Rosa carolina* (Carolina rose), *Amelanchier arborea* (common serviceberry), and *Viburnum rafinesqueanum* (downy arrow-wood). *Quercus ilicifolia* (bear oak) 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* (poverty oatgrass), *Carex pensylvanica* (Pennsylvania sedge), *Solidago bicolor* (white goldenrod), *Houstonia longifolia* (longleaf summer bluet), *Hieracium greenii* (Maryland hawkweed), *Symphyotrichum undulatum* (wavyleaf aster), *Potentilla canadensis* (dwarf cinquefoil), *Penstemon canescens* (eastern gray beardtongue), and *Polygonatum biflorum* (smooth Solomon's seal). Species that are less constant but locally important include *Paronychia montana* (mountain nailwort), *Parthenium integrifolium* (wild quinine), *Silene caroliniana ssp. pensylvanica* (Pennsylvania catchfly), *Aureolaria laevigata* (entireleaf yellow false foxglove), *Coreopsis major* (greater tickseed), *Campanula divaricata* (small bonny bellflower), *Solidago erecta* (showy goldenrod), *Cunila origanoides* (common dittany), *Antennaria virginica* (shale barren pussytoes), *Phlox latifolia* (wideflower phlox), *Helianthus laevigatus* (smooth sunflower), and *Liatris pilosa* (shaggy blazing star). Scattered individuals of shale barren endemics such as *Packera antennariifolia* (shale barren ragwort) and *Clematis albicoma* (whitehair leather flower) 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 m2 (mean = 33).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana* (Virginia pine)
Tree canopy	Broad-leaved deciduous tree	*Quercus montana* (chestnut oak)
Herb (field)	Graminoid	*Carex pensylvanica* (Pennsylvania sedge)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Quercus ilicifolia* (bear oak), *Quercus montana* (chestnut oak)

Global: *Carya glabra* (pignut hickory), *Coreopsis verticillata* (whorled tickseed), *Danthonia spicata* (poverty oatgrass), *Hieracium greenii* (Maryland hawkweed), *Houstonia longifolia* (longleaf summer bluet), *Parthenium integrifolium* (wild quinine), *Pinus virginiana* (Virginia pine), *Quercus ilicifolia* (bear oak), *Solidago bicolor* (white goldenrod), *Viola pedata* (birdfoot violet)

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Buckleya distichophylla* (piratebush, 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 montana / Gaylussacia baccata / Carex pensylvanica* Woodland (CEGL004821)
- *Pinus virginiana - Quercus montana / Quercus ilicifolia / (Hieracium greenii, Viola pedata)* Woodland (CEGL008525) is a *Pinus virginiana* (Virginia pine)-dominated shale woodland with very sparse understory and herb layers, and dense colonies of *Cladonia* (cup lichen) 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* (Virginia pine)-dominated shale woodland of the Southern Appalachians.
- *Quercus montana - 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.

Global Related Concepts:

- *Pinus pungens - Pinus rigida / Quercus ilicifolia / Gaylussacia baccata* Association: *Andropogon scoparius - Coreopsis verticillata - Dichanthelium depauperatum* Subassociation, *pro parte* (Rawinski et al. 1996) **?**
- *Quercus prinus / Quercus ilicifolia / Danthonia spicata - Solidago bicolor* Woodland (Fleming and Coulling 2001) **=**

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Chesapeake & Ohio Canal National Historical Park Classification Comments: Central Appalachian Xeric Shale Woodland (Chestnut Oak / Mixed Herbs Type) is mapped as Shale Barren Woodland Map Class (COMP_SBWO), which includes four associations, Central Appalachian Circumneutral Barrens (CEGL006037), North-Central Appalachian Acidic Shale Woodland (CEGL006288), Central Appalachian Xeric Shale Woodland (Virginia Pine / Sparse Herbs Type) (CEGL008525), and Central Appalachian Xeric Shale Woodland (Chestnut Oak / Mixed Herbs Type) (CEGL008526).

This association is also referred to as Central Appalachian Chestnut Oak / Mixed Herbs Shale Woodland.

Global Classification Comments: This community type is floristically similar to *~Pinus virginiana - Quercus montana / Quercus ilicifolia / (Hieracium greenii*, *Viola pedata)* Woodland (CEGL008525)$$ but differs in the dominance of hardwoods (versus *Pinus virginiana* (Virginia pine)) and in its much greater herbaceous diversity and overall species richness (n = 33 versus 15 per 400 m2). 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

Chesapeake & Ohio Canal National Historical Park Range: This association was sampled with plots near Tunnel Hill and Kasecamp Neck Road. The Shale Barren Woodland Map Class (COMP_SBWO) is mapped on dry slopes along the Chesapeake & Ohio Canal at many locations in the Ridge and Valley (Canal mile 137-173).

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:SNR, PA?:SNA, VA:S3, WV?:SNA

TNC Ecoregions: 51:C, 59:C

USFS Ecoregions (2007): M221Aa:CCP, M221Ab:CCC, M221Da:CCC, M221Db:CCC

Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (6 plots): CHOH.071, CHOH.072, CHOH.075, CHOH.616, CHOH.618, CHOH.623.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Global Description Author(s): G. Fleming and P. Coulling
References: Eastern Ecology Working Group n.d., Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Rawinski et al. 1996

A4435 *Quercus montana* / *Kalmia latifolia* - *Vaccinium pallidum* Forest Alliance

[CEGL008539] *Pinus strobus - Quercus alba - Quercus montana / 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	Central Appalachian-Northeast Oak Forest & Woodland (G650)
Alliance (A4435)	*Quercus montana* / *Kalmia latifolia* - *Vaccinium pallidum* Forest Alliance

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* (eastern white pine) (25-75% canopy cover) and various oaks, particularly *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), and *Quercus montana* (chestnut oak). Minor canopy associates include *Acer rubrum* (red maple), *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Fagus grandifolia* (American beech) (mostly Piedmont), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Pinus virginiana* (Virginia pine), *Quercus falcata* (southern red oak) (mostly Piedmont), *Quercus velutina* (black oak), and *Tsuga canadensis* (eastern hemlock). Understory trees include *Acer rubrum* (red maple), *Oxydendrum arboreum* (sourwood), and *Nyssa sylvatica* (blackgum), which may be abundant, along with *Cornus florida* (flowering dogwood). The shrub layer is predominantly ericaceous and varies from sparse and patchy to occasionally dense, with *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), and *Kalmia latifolia* (mountain laurel) being characteristic. Other frequent but lower-cover shrub-layer species include *Amelanchier arborea* (common serviceberry), *Viburnum acerifolium* (mapleleaf viburnum), *Smilax rotundifolia* (roundleaf greenbrier), *Smilax glauca* (cat greenbrier), *Sassafras albidum* (sassafras), and *Diospyros virginiana* (common persimmon). 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* (poverty oatgrass), *Deschampsia flexuosa* (wavy hairgrass), or *Carex pensylvanica* (Pennsylvania sedge).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This pine-oak forest was sampled at five locations in the park. Sites are steep to extremely steep mid and upper sideslopes with northern and western aspects. Soils are rapidly to well-drained sandy loam and silt loam. The unvegetated surface is dominated by leaf litter (86-97% cover) with some exposed bedrock (0-5%), large rocks (0-7%), small rocks (0-1%), wood (1-2%), bare soil

(1-2%), and mosses and lichens (1-25%). Evidence of disturbance includes past fire, hemlock woolly adelgid, deer and cow grazing/browsing, trails, and the presence of exotic species.

Manassas National Battlefield Park Environment: Central Appalachian-Piedmont White Pine - Subxeric Oak Forest occupies both upland sideslopes and flats and relatively steep slopes of a ravine system and bluff-top along Bull Run. The area along Bull Run is underlain by Ball's Bluff siltstone, and all soils are extremely acidic and infertile. Most slopes occupied by this vegetation have northerly aspects and were subjectively considered submesic in site moisture potential. Surface substrate of most sampling sites consists of thin leaf litter.

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

Chesapeake & Ohio Canal National Historical Park Vegetation: The sparse to moderate (20-60% cover) tree canopy ranges from 20-35 m to 10-20 m tall, in which case a subcanopy is not differentiated. It is composed of *Pinus strobus* (eastern white pine), *Pinus virginiana* (Virginia pine), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), and *Quercus velutina* (black oak), as is the sparse (20-40%) subcanopy (10-20 m), when present. The sparse to moderate (20-60%) tall-shrub layer (6-10 m) and moderate (40-60%) short-shrub layer (1-6 m) are made up of canopy species as well as *Amelanchier arborea* (common serviceberry), *Betula lenta* (sweet birch), and *Tsuga canadensis* (eastern hemlock). The herbaceous/field layer (20-60%) is dominated by *Deschampsia flexuosa var. flexuosa* (wavy hairgrass) and *Vaccinium pallidum* (Blue Ridge blueberry) and may include *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Gaylussacia baccata* (black huckleberry), and *Vaccinium stamineum* (deerberry). Nonvascular species are present in all stands and cover up to 20% of the ground surface. A total of five exotic species were reported from sampled stands. This community also supports Maryland state-imperiled *Campanula rotundifolia* (bluebell bellflower) and state-vulnerable *Cystopteris bulbifera* (bulblet bladderfern).

Manassas National Battlefield Park Vegetation: The vegetation of this community is a mixed forest with overstory codominance by *Pinus strobus* (eastern white pine) and *Quercus* (oak) spp. *Quercus montana* (chestnut oak), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Quercus coccinea* (scarlet oak) are all common associates. Of these, *Quercus montana* (chestnut oak) can probably be considered most diagnostic since it is not common in other vegetation types of the park. Also included in this type are forests with an overstory of oaks and *Pinus strobus* (eastern white pine) strongly dominant in the understory. *Pinus virginiana* (Virginia pine) is an occasional overstory associate indicative of past disturbance. *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) are the leading species of the understory, which also includes *Cornus florida* (flowering dogwood), *Sassafras albidum* (sassafras), *Carya tomentosa* (mockernut hickory), and young reproduction of *Pinus strobus* (eastern white pine) and *Tsuga canadensis* (eastern hemlock). Ericaceous (heath family) species, including *Kalmia latifolia* (mountain laurel), *Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium stamineum* (deerberry), are prevalent in the shrub and herb layers. True herbaceous plants are very sparse but can include *Pteridium aquilinum var. latiusculum* (western brackenfern) and *Mitchella repens* (partridgeberry).

Global Vegetation: Vegetation is a mixed forest, with canopies varying from closed to somewhat open, codominated by *Pinus strobus* (eastern white pine) (25-75% canopy cover) and various oaks, particularly *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), and *Quercus montana* (chestnut oak). Minor canopy associates include *Acer rubrum* (red maple), *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Fagus grandifolia* (American beech) (mostly Piedmont), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Pinus virginiana* (Virginia pine), *Quercus falcata* (southern red oak) (mostly Piedmont), *Quercus velutina* (black oak), and *Tsuga canadensis* (eastern hemlock). In addition, *Acer rubrum* (red maple), *Oxydendrum arboreum* (sourwood), and *Nyssa sylvatica* (blackgum) are abundant understory trees, along with *Cornus florida* (flowering dogwood). The shrub layer is predominantly ericaceous and varies from sparse and patchy to occasionally dense. *Vaccinium stamineum* (deerberry), *Vaccinium*

pallidum (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), and *Kalmia latifolia* (mountain laurel) are characteristic ericads. Other frequent but lower-cover shrub-layer species include *Amelanchier arborea* (common serviceberry), *Viburnum acerifolium* (mapleleaf viburnum), *Smilax rotundifolia* (roundleaf greenbrier), *Smilax glauca* (cat greenbrier), *Sassafras albidum* (sassafras), and *Diospyros virginiana* (common persimmon). 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* (striped prince's pine), *Polygonatum biflorum* (smooth Solomon's seal), *Mitchella repens* (partridgeberry), *Cypripedium acaule* (moccasin flower), *Dioscorea quaternata* (fourleaf yam), *Conopholis americana* (American cancer-root), *Houstonia longifolia* (longleaf summer bluet), *Antennaria plantaginifolia* (woman's tobacco), *Zizia trifoliata* (meadow alexanders), *Gaultheria procumbens* (eastern teaberry), *Cunila origanoides* (common dittany), *Potentilla simplex* (common cinquefoil), and *Viola x palmata* (early blue violet). Occasional stands, especially on shale substrates, contain dense graminoid patches of *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa* (wavy hairgrass), or *Carex pensylvanica* (Pennsylvania sedge). Species richness of plot-sampled stands ranged from 16 to 65 taxa per 400 m2 (mean = 36) in the VA and MD plots and from 20 to 53 (mean = 33.5) species per 200 m2 in the WV plots.

Global Dynamics: The successional status of this community is somewhat unclear. At some sites, it appears that *Pinus strobus* (eastern white pine) 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 montana* (chestnut oak) and *Quercus coccinea* (scarlet oak)) that underwent rapid change toward an oak-maple-white pine composition over a 20-year period. In 1971, *Pinus strobus* (eastern white pine) 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* (sugar maple), *Tsuga canadensis* (eastern hemlock), and *Fagus grandifolia* (American beech) in the understory, which may indicate successional trends; in other stands, however, there is evidence of abundant oak regeneration.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Amelanchier arborea* (common serviceberry), *Viburnum acerifolium* (mapleleaf viburnum)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia* (mountain laurel)
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum* (Blue Ridge blueberry)
Herb (field)	Flowering forb	*Galax urceolata* (beetleweed)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Pinus strobus* (eastern white pine), *Quercus alba* (white oak), *Quercus montana* (chestnut oak)

Manassas National Battlefield Park: *Kalmia latifolia* (mountain laurel), *Pinus strobus* (eastern white pine), *Quercus montana* (chestnut oak)

Global: *Carya tomentosa* (mockernut hickory), *Chimaphila maculata* (striped prince's pine), *Diospyros virginiana* (common persimmon), *Pinus strobus* (eastern white pine), *Pinus virginiana* (Virginia pine), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak), *Quercus stellata* (post oak), *Vaccinium stamineum* (deerberry)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Campanula rotundifolia* (bluebell bellflower, G5, MD-imperiled), *Cystopteris bulbifera* (bulblet bladderfern, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Commelina communis* (Asiatic dayflower), *Digitaria ischaemum* (smooth crabgrass), *Kummerowia striata* (Japanese clover, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)

Global: Vulnerable Plants: *Heuchera caroliniana* (Carolina alumroot, G3), *Monarda fistulosa* var. *brevis* (wild bergamot, G5T1T2), *Tsuga caroliniana* (Carolina hemlock, G2G3)

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, montana) / (Gaylussacia ursina, Vaccinium stamineum)* Forest (CEGL007519) of the Southern Appalachians.
- *Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest (CEGL006293)
- *Pinus strobus - Quercus alba - (Carya tomentosa) / Gaylussacia ursina* Forest (CEGL007517) of the Southern Appalachians.

Global Related Concepts:

- *Pinus strobus - Quercus alba - Quercus (coccinea, prinus) / Gaylussacia baccata - Vaccinium stamineum* Forest (Fleming and Patterson 2003) =
- *Pinus strobus - Quercus alba - Quercus coccinea / Vaccinium stamineum* Forest (Fleming and Coulling 2001) =
- *Pinus strobus - Quercus montana / Kalmia latifolia* Forest (Fleming and Weber 2003) =
- *Quercus montana - Pinus strobus / Ostrya virginiana* Forest (Fleming and Moorhead 2000) <
- White Pine - Chestnut Oak: 51 (Eyre 1980) >
- White Pine - Mixed Oak (Rentch et al. 2005) =

CLASSIFICATION

Status: Standard

Classification Confidence: 1 - Strong

Chesapeake & Ohio Canal National Historical Park Classification Comments: Central Appalachian-Piedmont White Pine - Subxeric Oak Forest (CEGL008539) is also referred to as White Pine - Xeric Oak Forest.

Manassas National Battlefield Park Other Comments: This dry, eastern white pine - oak community is most common on low mountains of the Ridge and Valley province in western Virginia and adjacent West Virginia but is also widely scattered on the Blue Ridge and in the Piedmont. The stands in the park are variable, and portions of them are transitional to an eastern hemlock community type. Stands where *Pinus strobus* (eastern white pine) and oaks are important throughout are treated and mapped as Central Appalachian-Piedmont White Pine - Subxeric Oak Forest (CEGL008539), which is also referred to as White Pine - Xeric Oak Forest.

Global Classification Comments: In Virginia, many stands of oak/heath are succeeding to *~Pinus strobus - Quercus alba - Quercus montana / Vaccinium stamineum* Forest (CEGL008539)$$ because of fire exclusion. The circumscription of this type is based on analysis of 16 plot samples from the Virginia Piedmont and Blue Ridge, and Maryland Ridge and Valley, with an additional 16 plots from the environs of the Bluestone River, West Virginia. Additional data, particularly from Central Appalachian regions where white pine is prevalent, would assist in making the classification more robust and identifying potential regional patterns of variation. Central Appalachian white pine - hardwood forests are distinguished from similar vegetation of the Southern Appalachians, e.g., *~Pinus strobus - Quercus alba - (Carya tomentosa) / Gaylussacia ursina* Forest (CEGL007517)$$ and *~Pinus strobus - Quercus (coccinea, montana) / (Gaylussacia ursina, Vaccinium stamineum)* Forest (CEGL007519)$$ by the absence of Southern Appalachian species such as *Gaylussacia ursina* (bear huckleberry), *Eubotrys recurvus*, *Rhododendron minus* (piedmont rhododendron), *Arundinaria gigantea* (giant cane), and *Hydrangea radiata* (silverleaf hydrangea). 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

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled near Old Towne (Lock 68), Tunnel Hill, Tunnel Hollow, and Outdoor Club Road.

Manassas National Battlefield Park Range: This community is found in five sites in the park, with one site occurring directly outside the park boundary on the east side of Bull Run, south of U.S. Route 29.

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:SNR, VA:S4, WV:S4
TNC Ecoregions: 50:C, 51:?, 52:C, 58:C, 59:C
USFS Ecoregions (2007): 221Dd:CCC, 221De:CC?, 231Aa:CC?, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ha:CC?, 232Je:C??, M221Aa:CCP, 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

Chesapeake & Ohio Canal National Historical Park Plots: (5 plots): CHOH.041, CHOH.073, CHOH.077, CHOH.078, CHOH.622.
Manassas National Battlefield Park Plots: MANA.19.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
Global Description Author(s): G.P. Fleming, P.P. Coulling, S.C. Gawler
References: Abrams et al. 1995, Brooks 1910, Eastern Ecology Working Group n.d., 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 Taverna 2006, Fleming and Weber 2003, Fleming et al. 2017, Harrison 2004, Harrison 2011, Patterson 2008e, Perles pers. comm., Rentch et al. 2005, Rhoades 1995, Taverna and Patterson 2008, Vanderhorst et al. 2007, Vanderhorst et al. 2008, WVNHP unpubl. data

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[CEGL006299] *Quercus montana - (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	Central Appalachian-Northeast Oak Forest & Woodland (G650)
Alliance	*Quercus montana* / *Kalmia latifolia* - *Vaccinium pallidum* Forest Alliance (A4435)

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 montana* (chestnut oak). The most characteristic canopy associates are *Quercus coccinea* (scarlet oak), which varies from sparse to codominant, and *Quercus rubra* (northern red oak). Minor associates frequently include *Quercus velutina* (black oak), *Quercus alba* (white oak), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), and/or *Robinia pseudoacacia* (black locust). Root sprouts of *Castanea dentata* (American chestnut) are present in some areas. *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) are often abundant in the understory tree layers. Tall shrubs include *Kalmia latifolia* (mountain laurel) (usually dominant), *Viburnum acerifolium* (mapleleaf viburnum), and *Rhododendron periclymenoides* (pink azalea). The short-shrub layer is well-developed and includes *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and *Gaylussacia baccata* (black huckleberry), any one of which can exhibit patch-dominance. The herb layer generally has sparse cover but sometimes includes scattered individuals of *Aureolaria laevigata* (entireleaf yellow false foxglove), *Chimaphila maculata* (striped prince's pine), *Comandra umbellata* (bastard toadflax), *Cypripedium acaule* (moccasin flower), *Danthonia spicata* (poverty oatgrass), *Epigaea repens* (trailing arbutus), *Gaultheria procumbens* (eastern teaberry), *Hieracium venosum* (rattlesnakeweed), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Medeola virginiana* (Indian cucumber), *Monotropa uniflora* (Indianpipe), *Pteridium aquilinum* (western brackenfern), and/or *Uvularia puberula* (mountain bellwort). Strong dominance of *Quercus montana* (chestnut oak) in the canopy, strong dominance of *Kalmia latifolia* (mountain laurel) in the tall-shrub layer, and *Vaccinium pallidum* (Blue Ridge blueberry) present and often abundant as a short shrub are diagnostics for this type.

ENVIRONMENTAL DESCRIPTION

Catoctin Mountain Park Environment: This chestnut oak forest association occurs as matrix or large patches on steep mid/upper slopes and ridgetops of the Harpers, Loudoun, and Weverton formations in the southeastern portion of the park. Soils are sandy loam and well-drained, on steep mid/upper slopes and ridgetops, on a variety of aspects at 210-490 m (700-1600 feet) in elevation. Exposed bedrock is abundant. Litter usually covers or partially covers the ground surface. This association commonly occurs in association with two other dry oak forests at Catoctin, Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest (CEGL008523) and Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057).

Chesapeake & Ohio Canal National Historical Park Environment: This chestnut oak forest was sampled at two locations in the park. The sites are moderately rolling upper slopes, one with a northwest aspect. Soils are well-drained silt loam and sandy loam (extremely rocky and thin). The unvegetated surface is dominated by leaf litter (86-90% cover) with some large rocks (4-10%), wood (2-6%), bare soil (1-2%), and mosses and lichens (3-5%). Evidence of disturbance includes heavy browsing, roads, and the presence of exotic species.

George Washington Memorial Parkway Environment: This chestnut oak forest is widely distributed in the Potomac Gorge section of the George Washington Memorial Parkway but covers substantial areas only in Great Falls Park. Elsewhere, it forms small, discrete patches where requisite habitat conditions prevail. The type is strongly associated with dry, solar-exposed, often sheet-eroded, middle and upper slopes and ridge crests. At most sites, parent material is one of the acidic metasedimentary units of the Mather Gorge or Sykesville formations. Plot-sampling sites were subjectively considered somewhat xeric to xeric. On rocky sites, soils are sparse and interstitial. Elsewhere, they are weathered in saprolitic residuum and typically have a dense, 2-10 cm (1-4 inches) deep surface horizon of duff, humus, and shrub roots. Samples extracted from plots are extremely acidic and infertile, with mean calcium, magnesium, and total base saturation values all among the lowest of communities along the parkway.

Harpers Ferry National Historical Park Environment: This chestnut oak forest typically occurs in the park as long relatively narrow patches where requisite habitat conditions prevail. The type is strongly associated with dry, solar-exposed, middle and upper slopes and ridge crests with xeric site conditions. Soils tend to have a thick surface horizon of root-matted, poorly decomposed organic matter. Mineral soils below are extremely acidic with very low base cation status, except for high Fe and Al.

National Capital Parks-East Environment: This chestnut oak forest was sample at three locations in the park. Sites are moderate to rolling upper slopes and crests. Soils are well-drained sandy loam and clay loam. The unvegetated ground surface is dominated by leaf litter along with some wood and bryophytes. No evidence of disturbance was reported.

Rock Creek Park Environment: This chestnut oak forest is found on the highest, driest, and most acidic ridgetops and hilltops in the park, and on their adjacent upper slopes in a few sites. It often grows on coarse, infertile soil, over ancient river terraces that cap a few of these ridges and upper slopes. Alternately, it can be found on infertile loamy soil weathered from acidic bedrock (commonly the Laurel Formation) often marbled with white quartz veins. No fires have occurred in this community at Rock Creek Park for decades and this is believed to be altering the composition by allowing fire-intolerant species such as *Acer rubrum* (red maple) and *Fagus grandifolia* (American beech) to get established. Though these species are not likely to become as dominant in this community as in more mesic communities in the park, continued lack of fire may eventually result in an increase of *Acer rubrum* (red maple) and *Fagus grandifolia* (American beech) in the canopy. The sparse herbaceous cover and thin duff make the dry, rocky soils of this community susceptible to erosion from foot and horse traffic, surface runoff, and splashing from intense rainstorms. In their hilltop location, the trees in this community are exposed to windstorms and icestorms. Gypsy moth damage to *Quercus montana* (chestnut oak), dogwood anthracnose, and over-browsing of shrubs by deer are additional threats that could alter the species composition of this community.

Wolf Trap National Park for the Performing Arts Environment: This chestnut oak forest occurs in Wolf Trap National Park on dry, acidic uplands on steep, west-facing sideslopes. The soil is infertile and the forest is species-poor. It typically grades into Low-Elevation Mixed Oak / Heath Forest (CEGL008521), which occurs on gentler upland slopes and ridges, or into Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075) on moister concave slopes.

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

Catoctin Mountain Park Vegetation: These forests often have a partially open canopy, and although the shrub layer may have a dense upper canopy, the multiple stems of *Kalmia latifolia* (mountain laurel) are often bare of leaves, conveying the impression of an open and park-like understory. The herbaceous layer is poorly developed to absent, and cushion mosses are usually abundant on flatter rock surfaces. The tree canopy is usually dominated by *Quercus montana* (chestnut oak), and *Quercus coccinea* (scarlet oak) and *Quercus velutina* (black oak) are usually common canopy components. Other canopy species may include *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and occasionally, *Pinus rigida* (pitch pine) or *Magnolia acuminata* (cucumber-tree). The tree subcanopy is usually characterized by *Acer rubrum* (red maple), *Betula lenta* (sweet birch), and *Nyssa sylvatica* (blackgum). *Kalmia latifolia* (mountain laurel) usually dominates an open tall-shrub layer; other associates may include *Sassafras albidum* (sassafras), *Amelanchier arborea* (common serviceberry), and *Hamamelis virginiana* (American witch-hazel). There is usually a well-developed short-shrub layer dominated by *Vaccinium pallidum* (Blue Ridge blueberry). *Gaylussacia baccata* (black huckleberry) is often present in this layer. Herbs are uncommon and sparse, and when present may include *Chimaphila maculata* (striped prince's pine), *Danthonia spicata* (poverty oatgrass), *Medeola virginiana* (Indian cucumber), as well as scattered seedlings from canopy or subcanopy trees.

Chesapeake & Ohio Canal National Historical Park Vegetation: These stands have strong dominance of *Quercus montana* (chestnut oak) in the canopy, strong dominance of *Kalmia latifolia* (mountain laurel) in the shrub layer, and other heaths such as *Gaylussacia baccata* (black huckleberry) in the short-shrub layer. The very dense to open tree canopy, usually is 15-25 m tall. It is dominated by *Quercus montana* (chestnut oak), usually with a sparse to open subcanopy (10-20 m) of *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Quercus alba* (white oak). Additional tree species include *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Pinus strobus* (eastern white pine), *Pinus virginiana* (Virginia pine), *Quercus coccinea* (scarlet oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), and *Sassafras albidum. Kalmia latifolia* tends to dominate the short-shrub layer, usually it is 1-3 m tall. The sparse (10-20%) tall-shrub layer (5-10 m) and sparse to dense and patchy short-shrub layer (1-5 m) has canopy tree saplings as well as *Amelanchier arborea* (common serviceberry), *Asimina triloba* (pawpaw), *Betula lenta* (sweet birch), *Castanea dentata* (American chestnut) (Maryland state-vulnerable), *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Hamamelis virginiana* (American witch-hazel), *Prunus serotina var. serotina* (black cherry), *Rhododendron maximum* (great laurel), *Rhododendron periclymenoides* (pink azalea), and *Viburnum acerifolium. Parthenocissus quinquefolia*, *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), and *Vitis aestivalis* are vines found mainly in the short-shrub layer. The herbaceous/field layer (<2-60%) is very shrubby, dominated by heaths; *Gaylussacia baccata* (black huckleberry), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium corymbosum* (highbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium stamineum* (deerberry). Herbaceous plants include *Carex pensylvanica* (Pennsylvania sedge), *Carex tonsa* (shaved sedge), *Danthonia spicata* (poverty oatgrass), *Dennstaedtia punctilobula* (eastern hayscented fern), *Deschampsia flexuosa var. flexuosa* (wavy hairgrass), *Dichanthelium commutatum* (variable panicgrass), *Dichanthelium dichotomum* (cypress panicgrass), *Epigaea repens* (trailing arbutus), *Eurybia divaricata* (white wood aster), *Hieracium venosum* (rattlesnakeweed), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Medeola virginiana* (Indian cucumber), *Mitchella repens* (partridgeberry), Nonvascular species, such as *Umbilicaria sp.*, cover up to 5% of the ground surface. Only one exotic species, *Ailanthus altissima* (tree of heaven) was reported from sampled stands.

George Washington Memorial Parkway Vegetation: Stands of this community tend to have a somewhat open canopy (about 70% mean stratum cover) with trees that are shorter than those of the more mesophytic forests. *Quercus montana* (chestnut oak) is the overwhelming overstory dominant and accounts for 57% of the large-tree density in plot-sampled stands. *Quercus coccinea* (scarlet oak) is the most frequent overstory associate, varying from absent to occasionally codominant, particularly in areas with a discernable history of logging and fire within the past 100 years. *Quercus rubra* (northern red oak) is an important associate in a few stands that occur on less exposed, north and east slopes. *Quercus velutina* (black oak), *Quercus alba* (white oak), and *Quercus falcata* (southern red oak) are minor, inconstant overstory trees; *Nyssa sylvatica* (blackgum) also occasionally reaches the overstory, although it is most characteristic of the subcanopy. *Liriodendron tulipifera* (tuliptree), *Robinia pseudoacacia* (black locust), *Betula lenta* (sweet birch), *Pinus virginiana* (Virginia pine), *Pinus echinata* (shortleaf pine), *Pinus pungens* (Table Mountain pine), and *Pinus strobus* (eastern white pine) are very infrequent canopy associates indicative of past disturbances (gaps, logging, and fires). *Nyssa sylvatica* (blackgum) and *Acer rubrum* (red maple) dominate the understory tree layers, occasionally attaining densities as high as 825 and 650 stems/ha, respectively, in an individual stand. *Fagus grandifolia* (American beech), *Sassafras albidum* (sassafras), and *Cornus florida* (flowering dogwood) are also constant, though much less important understory trees. Young recruitment of *Quercus montana* (chestnut oak) is usually present, though greatly outnumbered by *Nyssa sylvatica* (blackgum) and

Acer rubrum (red maple). The majority of measurable stems of *Castanea dentata* (American chestnut) found in the park are in plots of this community. The tall-shrub layer has moderate to dense cover (mean = 61%), most of it contributed by *Kalmia latifolia* (mountain laurel) and tree saplings. Minor but characteristic shrub-layer associates include *Vaccinium stamineum* (deerberry), *Gaylussacia baccata* (black huckleberry), *Rhododendron periclymenoides* (pink azalea), *Hamamelis virginiana* (American witch-hazel), and *Smilax* (greenbrier) spp. The low-shrub layer (mean stratum cover = 28%) consists mostly of low colonies of *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), and seedlings of *Quercus montana* (chestnut oak). The rocky, infertile soils, dense root mats from colonial ericads, and dense shade of *Kalmia latifolia* (mountain laurel) thickets combine to create difficult conditions for the establishment of herbs. Although the perennial subshrub *Chimaphila maculata* (striped prince's pine) occurs with low cover in most plots, no true herbaceous species attains a constancy >35% or a mean cover of 1% across all plots of the type. Nevertheless, scattered individuals of *Danthonia spicata* (poverty oatgrass), *Epigaea repens* (trailing arbutus), *Aralia nudicaulis* (wild sarsaparilla), *Aureolaria laevigata* (entireleaf yellow false foxglove), *Isotria verticillata* (large whorled pogonia), *Pteridium aquilinum var. latiusculum* (western brackenfern), and other xerophytic herbs are characteristic. Spring ephemerals are absent. Stands near developed areas often have cover of exotics such as *Lonicera japonica* (Japanese honeysuckle), *Hedera helix* (English ivy), and *Wisteria sinensis* (Chinese wisteria). Total species richness is the lowest among forested communities in the area, ranging from 12 to 40 taxa per 400 square m (mean = 25).

Harpers Ferry National Historical Park Vegetation: Stands of this community tend to have a canopy with trees that are shorter than those of the more mesophytic forests. *Quercus montana* (chestnut oak) is the overwhelming overstory dominant. *Quercus rubra* (northern red oak) is a frequent overstory associate. *Fagus grandifolia* (American beech) is occasionally present in the canopy and subcanopy, most likely in areas with no history of fire within the past 80-100 years. *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) also occasionally reach the overstory, although they are most characteristic of the understory. Young recruitment of *Quercus montana* (chestnut oak) and *Quercus rubra* (northern red oak) is usually present, though outnumbered by *Nyssa sylvatica* (blackgum) and *Acer rubrum* (red maple). The shrub layer has moderate to dense cover, most of it contributed by *Kalmia latifolia* (mountain laurel) and tree saplings. Minor but characteristic shrub-layer associates include *Vaccinium stamineum* (deerberry), *Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Rhododendron periclymenoides* (pink azalea), and occasionally *Betula lenta* (sweet birch). The herb layer consists mostly of low colonies of *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), and seedlings of *Quercus montana* (chestnut oak). The rocky, infertile soils, dense root mats from colonial ericads, and dense shade of *Kalmia latifolia* (mountain laurel) thickets combine to create difficult conditions for the establishment of herbs. The perennial sub-shrub *Chimaphila maculata* (striped prince's pine) often occurs with low cover. Scattered individuals of *Danthonia spicata* (poverty oatgrass), *Carex umbellata* (parasol sedge), and other xerophytic herbs are characteristic. Spring ephemerals are absent.

National Capital Parks-East Vegetation: The dense (up to 90% cover) canopy (20-35 m tall) and moderate (up to 60%) subcanopy (10-20 m) are dominated by *Quercus montana* (chestnut oak); additional tree species include *Castanea dentata* (American chestnut), *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), *Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak), *Quercus velutina* (black oak), and *Sassafras albidum* (sassafras). The dense (up to 80%) shrub layers (0.5-10 m) are dominated by *Kalmia latifolia* (mountain laurel) along with saplings of canopy species; additional shrubs include *Acer rubrum* (red maple), *Diospyros virginiana* (common persimmon), *Rhododendron periclymenoides* (pink azalea), and short shrubs *Gaylussacia baccata* (black huckleberry) and *Vaccinium pallidum* (Blue Ridge blueberry). The moderate to dense (20-80%) herbaceous layer is made up almost entirely of tree and shrub seedlings. Vines of *Smilax glauca* (cat greenbrier) and *Smilax rotundifolia* (roundleaf greenbrier) may be found trailing along the ground or climbing into the shrub canopy.

Rock Creek Park Vegetation: This forest is characterized by a canopy of *Quercus montana* (chestnut oak) with a strong presence of *Kalmia latifolia* (mountain laurel) in the understory. At Rock Creek Park, *Nyssa sylvatica* (blackgum) is the most common subcanopy tree. This community usually has a presence of *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), and *Rhododendron periclymenoides* (pink azalea), though often in low cover. Occasional canopy components include *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Quercus coccinea* (scarlet oak). At Rock Creek Park, occasional understory species include *Acer rubrum* (red maple), *Cornus florida* (flowering dogwood), *Sassafras albidum* (sassafras), *Hamamelis virginiana* (American witch-hazel), *Amelanchier arborea* (common serviceberry), and *Viburnum acerifolium* (mapleleaf viburnum). *Fagus grandifolia* (American beech) and *Acer rubrum* (red maple) saplings are also regularly encountered in the understory, though they were almost certainly less common in this community historically. The field layer is typically sparse and often dominated by *Quercus montana* (chestnut oak) seedlings. In some stands, *Kalmia latifolia* (mountain laurel) is lacking. It is unclear what accounts for its absence in these areas, but all are

located in areas that were intensely disturbed during the 1860s. We identify these stands as lower quality examples of this community because the canopy is predominantly comprised of *Quercus montana* (chestnut oak), the understory has few native shrubs and very little ground cover, and they are located on upper slopes or hilltops. This forest community was intensively harvested for charcoal fuel production during early European settlement and the Civil War era. Multi-trunk trees (a result of stump-sprouting) offer evidence of historic logging.

Wolf Trap National Park for the Performing Arts Vegetation: The canopy of Central Appalachian-Northern Piedmont Chestnut Oak Forest is strongly dominated by *Quercus montana* (chestnut oak). The most characteristic canopy associates are *Quercus rubra* (northern red oak) and *Quercus alba* (white oak). Frequent canopy and subcanopy associates include *Quercus velutina* (black oak), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), and *Acer rubrum* (red maple). The tall-shrub layer is strongly dominated by *Kalmia latifolia* (mountain laurel). The tall- and short-shrub layers also often contain a number of the canopy species. Other short shrubs often include *Rhododendron periclymenoides* (pink azalea), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and *Gaylussacia baccata* (black huckleberry). The herb layer is generally sparse but sometimes includes scattered herbs such as *Chimaphila maculata* (striped prince's pine) and *Medeola virginiana* (Indian cucumber). Woody vines, such as *Smilax glauca* (cat greenbrier) and *Vitis* (grape) spp., are also common in the herb and short shrub layers.

Global Vegetation: The canopy is strongly dominated by *Quercus montana* (chestnut oak) or, less frequently, by combinations of *Quercus montana* (chestnut oak) and other oaks. The most frequent canopy associates are *Quercus coccinea* (scarlet oak), which varies from sparse to codominant, and *Quercus rubra* (northern red oak). Minor associates frequently include *Quercus velutina* (black oak), *Quercus alba* (white oak), *Nyssa sylvatica* (blackgum), *Betula lenta* (sweet birch), and *Sassafras albidum* (sassafras). *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) are usually abundant in the understory tree layers. Tall shrubs *Kalmia latifolia* (mountain laurel) (usually dominant), *Viburnum acerifolium* (mapleleaf viburnum), and *Rhododendron periclymenoides* (pink azalea) are often associated, sometimes at low cover. The short-shrub layer is well-developed and includes *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and *Gaylussacia baccata* (black huckleberry), any one of which can exhibit patch-dominance. Occasional stands lack *Kalmia latifolia* (mountain laurel) and have an entirely deciduous, ericaceous shrub layer. The herb layer generally has sparse cover but sometimes includes *Aureolaria laevigata* (entireleaf yellow false foxglove), *Chimaphila maculata* (striped prince's pine), *Comandra umbellata* (bastard toadflax), *Cypripedium acaule* (moccasin flower), *Danthonia spicata* (poverty oatgrass), *Epigaea repens* (trailing arbutus), *Gaultheria procumbens* (eastern teaberry), *Hieracium venosum* (rattlesnakeweed), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Medeola virginiana* (Indian cucumber), *Monotropa uniflora* (Indianpipe), *Pteridium aquilinum* (western brackenfern), and *Uvularia puberula* (mountain bellwort). Strong dominance of *Quercus montana* (chestnut oak) in the canopy, strong dominance of *Kalmia latifolia* (mountain laurel) in the tall-shrub layer, and *Vaccinium pallidum* (Blue Ridge blueberry) 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* (red maple)-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* (American chestnut) was formerly an important canopy species in these forests prior to chestnut blight.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak)
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia* (mountain laurel)
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Gaylussacia baccata* (black huckleberry), *Kalmia latifolia* (mountain laurel), *Nyssa sylvatica* (blackgum), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), *Vaccinium pallidum* (Blue Ridge blueberry)

Chesapeake & Ohio Canal National Historical Park: *Gaylussacia baccata* (black huckleberry), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Vaccinium pallidum* (Blue Ridge blueberry)
George Washington Memorial Parkway: *Acer rubrum* (red maple), *Kalmia latifolia* (mountain laurel), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), *Sassafras albidum* (sassafras), *Vaccinium pallidum* (Blue Ridge blueberry)
Harpers Ferry National Historical Park: *Kalmia latifolia* (mountain laurel), *Nyssa sylvatica* (blackgum), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Vaccinium pallidum* (Blue Ridge blueberry)
National Capital Parks-East: *Kalmia latifolia* (mountain laurel), *Quercus montana* (chestnut oak), *Vaccinium pallidum* (Blue Ridge blueberry)
Rock Creek Park: *Kalmia latifolia* (mountain laurel), *Nyssa sylvatica* (blackgum), *Quercus montana* (chestnut oak)
Wolf Trap National Park for the Performing Arts: *Kalmia latifolia* (mountain laurel), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Sassafras albidum* (sassafras)
Global: *Kalmia latifolia* (mountain laurel), *Quercus montana* (chestnut oak), *Vaccinium pallidum* (Blue Ridge blueberry)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Castanea dentata* (American chestnut, G3, MD-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium)
George Washington Memorial Parkway: Invasive/Exotic Plants: *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Wisteria sinensis* (Chinese wisteria, Medium)
National Capital Parks-East: Invasive/Exotic Plants: *Hemerocallis fulva* (orange daylily, Medium/Low)
Rock Creek Park: Invasive/Exotic Plants: *Elaeagnus umbellata* (autumn olive, High), *Euonymus fortunei* (winter creeper, High/Medium), *Prunus avium* (sweet cherry, High/Low), *Viburnum dilatatum* (linden arrow-wood)
Global: Vulnerable Plants: *Carex polymorpha* (variable sedge, G3), *Heuchera caroliniana* (Carolina alumroot, G3), *Monotropsis odorata* (pygmypipes, G3), *Tsuga caroliniana* (Carolina hemlock, G2G3); **Other Plants**: *Gaylussacia baccata* (black huckleberry, 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 (montana, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271) of the Southern Appalachians.
- *Quercus alba - Quercus (coccinea, velutina, montana) / Gaylussacia baccata* Forest (CEGL008521) primarily of the Piedmont.
- *Quercus montana - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum*) Forest (CEGL006282) northern; at high elevations at the southern edge of its range.
- *Quercus montana - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057) occurs on submesic sites.
- *Quercus montana - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest (CEGL008523) occurs on subxeric sites.

Global Related Concepts:
- *Quercus montana - (Quercus coccinea, Quercus velutina) / Kalmia latifolia - Vaccinium pallidum* Forest (Fleming 2002b) =
- *Quercus montana - (Quercus coccinea, Quercus velutina) / Kalmia latifolia / Vaccinium pallidum* Forest (Fleming 2002a) =
- *Quercus montana / Kalmia latifolia / Gaultheria procumbens* Association (Rawinski et al. 1994) <
- *Quercus montana / Kalmia latifolia / Gaylussacia baccata* Forest (Fleming and Moorhead 2000) <
- *Quercus montana / Kalmia latifolia / Vaccinium pallidum* Association, *pro parte* (Rawinski et al. 1996) <
- *Quercus montana / Kalmia latifolia / Vaccinium pallidum* Forest (Fleming and Patterson 2003) =
- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (Fleming 2007) =
- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (Vanderhorst and Streets 2006) =
- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (Fleming and Taverna 2006) =

- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (Fleming and Patterson 2009a) =
- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (Fleming et al. 2007b) =
- *Quercus prinus - Quercus (rubra, velutina, coccinea) / Nyssa sylvatica / Kalmia latifolia* Forest [Ridge and Valley Chestnut Oak / Mountain Laurel Forest] (Vanderhorst 2017d) =
- *Quercus prinus / Kalmia latifolia - Rhododendron periclymenoides* Forest (Fleming and Coulling 2001) <
- *Quercus prinus / Kalmia latifolia / Vaccinium pallidum* Forest (Fleming and Patterson 2003) =
- *Quercus prinus / Smilax rotundifolia - Polypodium virginianum* Subassociation (Fleming and Moorhead 1996) <

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Catoctin Mountain Park Classification Comments: This association, sometimes referred to as Chestnut Oak / Mountain Laurel Forest, is usually distinguished from Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest (CEGL008523) by strong dominance of chestnut oak in the canopy and of mountain laurel in the understory. Relative to CEGL008523, this association generally occurs higher on the slope and ridgetops, as well as along the most acute convexities.
George Washington Memorial Parkway Classification Comments: The density of ericaceous shrubs, as well as the absence or scarcity of trees important in other types (e.g., *Carya* (hickory) spp. and *Liriodendron tulipifera* (tuliptree)) help distinguish stands from co-occurring communities in the field. For the most part, boundaries between stands of Chestnut Oak Forest and other community types are fairly sharp. More gradual, less distinct transitions with Piedmont Dry-Mesic Acidic Oak - Hickory Forest (CEGL008475) occur on the high ridge between Difficult Run and the Potomac River (Great Falls Park). It can be distinguished from Low-Elevation Mixed Oak / Heath Forest (CEGL008521) by its presence on steep slopes and bluffs, the high cover of *Kalmia latifolia* (mountain laurel) in the shrub layer, and the lack of a dense low ericaceous shrub layer. This community is sometimes referred to as Chestnut Oak / Mountain Laurel Forest,
George Washington Memorial Parkway Other Comments: A dramatic reduction in fires that has marked the twentieth century both in Virginia and regionwide is now leading to slow but certain changes in the structure and composition of these communities. Reduced oak recruitment and the invasion of understories by fire-intolerant mesophytic trees such as *Acer rubrum* (red maple) and *Fagus grandifolia* (American beech) are the principal symptoms of fire exclusion.
Harpers Ferry National Historical Park Classification Comments: This community, sometimes referred to as Chestnut Oak / Mountain Laurel Forest, can be readily identified by its dry, infertile sites and quite species-poor vegetation overwhelmingly dominated by *Quercus montana* (chestnut oak) and *Kalmia latifolia* (mountain laurel), with *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) abundant in the subcanopy layers. The absence or scarcity of species important in other types, including *Carya* (hickory) spp. and *Liriodendron tulipifera* (tuliptree), help distinguish stands from co-occurring communities in the field. For the most part, boundaries between stands of Central Appalachian-Northern Piedmont Chestnut Oak Forest and other community types are fairly sharp.
Rock Creek Park Classification Comments: This community is sometimes referred to as Chestnut Oak / Mountain Laurel Forest. Diagnostic features of this community include mostly *Quercus montana* (chestnut oak) in the tree canopy, *Nyssa sylvatica* (blackgum) in the subcanopy, and quite a bit of *Kalmia latifolia* (mountain laurel) in the shrub layer. *Fagus grandifolia* (American beech), if present, is not characteristic in the canopy. Very little grows on the forest floor other than *Quercus montana* (chestnut oak) seedlings. At Rock Creek Park, this community often occurs on hilltops capped with ancient gravel terraces as evidenced by the potato-sized stones (especially at the base of large trees where erosion has exposed them).
Wolf Trap National Park for the Performing Arts Classification Comments: Central Appalachian-Northern Piedmont Chestnut Oak Forest could be confused with Low-Elevation Mixed Oak / Heath Forest (CEGL008521). It can be distinguished by its occurrence on steeper slopes, having a dominance of *Quercus montana* (chestnut oak) in the canopy, and having strong dominance of *Kalmia latifolia* (mountain laurel) in the tall-shrub layer. It is sometimes referred to as Chestnut Oak / Mountain Laurel Forest.
Global Classification Comments: Two variants of the type have been detected in quantitative analyses: (1) a variant with *Quercus rubra* (northern red oak) as the principal associate of *Quercus montana* (chestnut oak), with *Betula lenta* (sweet birch) and *Hamamelis virginiana* (American witch-hazel) often important in the subcanopy and shrub layers, typically occurring on sheltered slopes, often with northerly aspects; and (2) a variant with *Quercus coccinea* (scarlet oak) as the principal associate of *Quercus montana* (chestnut oak), occurring with *Gaylussacia*

baccata (black huckleberry) and *Rhododendron periclymenoides* (pink azalea), 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 (montana*, *coccinea) / Kalmia latifolia / (Galax urceolata*, *Gaultheria procumbens)* Forest (CEGL006271)$$. It is compositionally similar but generally lacks Southern Appalachian species such as *Galax urceolata* (beetleweed), *Oxydendrum arboreum* (sourwood), and *Eubotrys recurvus*. 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

Catoctin Mountain Park Range: This association is restricted to the southeastern portion of the park where it occurs in large patches.
Chesapeake & Ohio Canal National Historical Park Range: Vegetation plots of this community were sampled at Chilton Woods and Roundtop Hill. The community has been mapped and documented with observation and rapid assessment points at many locations from Carderock (near Canal mile 11) in the Outer Piedmont to Irons Mountain (Canal mile 175) in the Ridge and Valley, including Potomac Forks (Canal mile 165), Harpers Ferry (Canal mile 61), Marble Quarry (Canal mile 38-39), Pennyfield (Canal mile 19-22), and Great Falls (Canal mile 12-16).
George Washington Memorial Parkway Range: Central Appalachian-Northern Piedmont Chestnut Oak Forest covers substantial areas only in Great Falls Park, where it is a major community on the high ridge between Difficult Run and the Potomac River. In Turkey Run Park and along the parkway below Chain Bridge, this community occurs in small, isolated patches on the most xeric, exposed, convex slopes.
Harpers Ferry National Historical Park Range: This community is found on upper slopes and ridges of Loudon Heights, Maryland Heights and Short Hill Mountain. One additional stand occurs on lower slopes at the eastern end of Short Hill Mountain.
National Capital Parks-East Range: This forest association was sampled at Fort Dupont Park in southeast Washington, DC, and along the Fort Stanton Connector. There are points and mapped polygons in the central area and on Oxon Hill Parkway, Maryland. Within NACE it appears to be restricted to this area.
Rock Creek Park Range: This forest is uncommon at Rock Creek Park and is only found on the main core area of the park. This is primarily because the outlying parts of the park do not include the dry hilltops that support this community. One of the best examples of it in the park can be found on the hilltop beside Picnic Area 16 on Glover Road (also visible from the White Horse Trail that cuts across this same forested knoll). It is easy to spot because of the abundance of *Quercus montana* (chestnut oak) and the near-absence of *Fagus grandifolia* (American beech).
Wolf Trap National Park for the Performing Arts Range: Central Appalachian-Northern Piedmont Chestnut Oak Forest is not widespread in WOTR and only occurs on steep sideslopes bordering Wolf Trap Creek along the eastern side of the 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:SNR, DE:S2, MD:SNR, PA:SNR, VA:S5, WV:S4
TNC Ecoregions: 51:C, 52:C, 58:C, 59:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, 221De:CCC, 231Aa:CCP, 231Ad:CCC, 231Af:CC?, 231Ib:CCC, 231Id:CCP, 232Ad:CCC, M221Aa:CCP, M221Ab:CCC, M221Ba: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

Catoctin Mountain Park Inventory Notes: Because the photosignature was not always reliable, it is likely that some areas mapped as CEGL006299 are in fact CEGL008523, and vice versa.
Catoctin Mountain Park Plots: CATO.001, CATO.049.
Chesapeake & Ohio Canal National Historical Park Plots: (2 plots): CHOH.038, CHOH.237.
George Washington Memorial Parkway Plots: GFNP_012, GFNP_014, GFNP_014, GFNP_018, GFNP_039, GFNP_045, GWMP_007, GWMP_008, GWMP.14, TURK_026, TURK_046.
Harpers Ferry National Historical Park Plots: HAFE.112.

National Capital Parks-East Plots: (3 plots: NACE.003, NACE.006, NACE.009).
Rock Creek Park Plots: ROCR.5.
Wolf Trap National Park for the Performing Arts Plots: WOTR.3.
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman and M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming and K. Taverna
Harpers Ferry National Historical Park Description Author(s): G. Fleming and K. Taverna
National Capital Parks-East Description Author(s): M.J. Russo
Rock Creek Park Description Author(s): J. Teague
Wolf Trap National Park for the Performing Arts Description Author(s): K. Taverna
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 Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2003, Lea 2004, Rawinski et al. 1994, Rawinski et al. 1996, Vanderhorst 2017d, Vanderhorst and Streets 2006, WVNHP unpubl. data, Young et al. 2006, Young et al. 2009

[CEGL006057] *Quercus montana - 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	Central Appalachian-Northeast Oak Forest & Woodland (G650)
Alliance (A4435)	*Quercus montana* / *Kalmia latifolia* - *Vaccinium pallidum* Forest Alliance

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 montana* (chestnut oak) and *Quercus rubra* (northern red oak). Associated canopy species include *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Carya tomentosa* (mockernut hickory), *Acer saccharum* (sugar maple), *Tilia americana* (American basswood), *Fagus grandifolia* (American beech), and *Betula lenta* (sweet birch). The tall-shrub layer is most often characterized by *Hamamelis virginiana* (American witch-hazel) and *Acer pensylvanicum* (striped maple). 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* (marginal woodfern), *Dioscorea quaternata* (fourleaf yam), *Eurybia divaricata* (white wood aster), *Ageratina altissima* (white snakeroot), *Polygonatum biflorum* (smooth Solomon's seal), *Solidago caesia* (wreath goldenrod), *Festuca subverticillata* (nodding fescue), *Thelypteris noveboracensis* (New York fern), *Sanicula trifoliata* (largefruit blacksnakeroot), *Prenanthes altissima* (tall rattlesnakeroot), *Polystichum acrostichoides* (Christmas fern), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Galium latifolium* (purple bedstraw), *Houstonia purpurea* (Venus' pride), and *Maianthemum racemosum* (feathery false lily of the valley). 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

Catoctin Mountain Park Environment: This forest type occurs regularly throughout the park, and is not restricted to any geological formation here. It typically occurs on moderately to steep north- or west-facing slopes at elevations ranging from 240-460 m (780-1500 feet). Exposed rock is common, and boulders are abundant. Soils are well-drained stony sandy or silt loams. On the northern, more sheltered portion of the Catoctin Formation, where the matrix forest is High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125), this type typically occurs as somewhat linear patches on the steepest, often bouldery, convex, more exposed slopes. On the southern, more exposed portion of the Catoctin Formation, High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125) occurs adjacent to or embedded within Central Appalachian Basic Oak - Hickory Forest (Western Piedmont / Lower Blue Ridge Type) (CEGL008514), occupying more sheltered sites relative to the oak-hickory. On the Harpers,

Loudoun, and Weverton formations, where oak/heath forests Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299) and Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest (CEGL008523) are dominant, this type appears to be restricted to more sheltered slopes, often concave and/or associated with drainages and lower slopes. It can also occur in more exposed situations in association with narrow patches of CEGL008523, which seem to indicate linear inclusions of somewhat basic soils embedded within the highly acidic soils more typical of these formations.

Chesapeake & Ohio Canal National Historical Park Environment: This oak forest was sampled at four locations in the park. Sites range from gentle to extremely steep, mid to upper sideslopes and rolling uplands (piedmonts) on west and northwest aspects. Soils are rapidly to moderately well-drained sandy loam. The unvegetated surface is made up of leaf litter (44-86% cover) with exposed bedrock (0-20%), large rocks (0-10%), small rocks (2-40%), wood (1-3%), bare soil (2-10%), and mosses and lichens (0-12%). Evidence of disturbance includes chestnut blight, dogwood anthracnose, deer grazing/browsing, trails, and the presence of exotic species.

George Washington Memorial Parkway Environment: Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest is at the eastern edge of its range in the Potomac Gorge section of the George Washington Memorial Parkway. Here, it is restricted to the north- and northeast-facing, river-fronting bluffs in Turkey Run Park and the Arlington section of the parkway below Chain Bridge. A few stands occur on relatively dry, oligotrophic boulderfields (compare with Central Appalachian-Piedmont Rich Boulderfield Forest (CEGL006471)) or highly fractured, weathered-in-place outcrops. Soils are evidently shallow to underlying bedrock, which includes diamictite, migmatitic schist, amphibolite, and biotite-hornblende tonalite. However, there is little indication of influence by mafic materials in collected soil samples, which are consistently extremely acidic and very low in base status, excepting iron and aluminum. These shallow soils may have been readily leached of bases or deposited as colluvium weathered from different parent material upslope.

Harpers Ferry National Historical Park Environment: Typical habitats of Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest are submesic, steep, somewhat to very sheltered middle and lower slopes with northerly or easterly aspects. It can occur on upper slopes if north-facing. Sites are often very rocky and can include weathered boulderfields. Soils are typically acidic, with moderately high cation levels.

Monocacy National Battlefield Environment: This dry-mesic oak forest occurs on steep, rocky, northwest-facing, mid to upper slopes typically between 90 and 130 m in elevation. Soils are rapidly to well-drained, xeric black sandy loams (with organics) derived from sandstone. The unvegetated surface is made up of leaf litter (35-45% cover) with large rocks (5-20%), small rocks (30-45%), wood (2-5%), bare soil (3-10%), and bryophytes and lichens (2-4%). Due to the steep topography, soil and rocks are prone to erosion.

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

Catoctin Mountain Park Vegetation: The canopy of this forest is partially to moderately open, and shrub cover varies from somewhat open to very open. The herbaceous layer is generally not well-developed and is of variable composition across the park. Trees on steeper slopes or more exposed sites may be somewhat stunted. The tree canopy is always dominated by *Quercus montana* (chestnut oak), and *Quercus rubra* (northern red oak) is usually codominant or common in the canopy. Other canopy associates may include *Acer rubrum* (red maple), which can be locally abundant, as well as *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Tilia americana* (American basswood), and *Carya glabra* (pignut hickory). Frequent subcanopy trees include *Betula lenta* (sweet birch), *Acer rubrum* (red maple), and *Fraxinus americana* (white ash). Other associates in the subcanopy may include *Nyssa sylvatica* (blackgum), *Ostrya virginiana* (hophornbeam), *Amelanchier arborea* (common serviceberry), and *Liriodendron tulipifera* (tuliptree). The tall-shrub layer, when well-developed, is dominated by *Hamamelis virginiana* (American witch-hazel). The herbaceous layer is often of low cover and is variable in composition. Typical herbaceous species are *Arisaema triphyllum* (Jack in the pulpit) and *Carex pensylvanica*

(Pennsylvania sedge). Other associates may include *Eurybia divaricata* (white wood aster), *Maianthemum racemosum* (feathery false lily of the valley), *Oxalis stricta* (common yellow oxalis), *Parthenocissus quinquefolia* (Virginia creeper), *Polypodium virginianum* (rock polypody), and *Thalictrum thalictroides* (rue-anemone). Less frequent associates are *Carex swanii* (Swan's sedge), *Conopholis americana* (American cancer-root), *Dioscorea quaternata* (fourleaf yam), *Galium circaezans* (licorice bedstraw), *Medeola virginiana* (Indian cucumber), *Prenanthes altissima* (tall rattlesnakeroot), and *Uvularia sessilifolia* (sessileleaf bellwort). *Vaccinium pallidum* (Blue Ridge blueberry) is often present but there is usually evidence of severe deer browse, and stems are often very short. Seedlings of canopy trees are often present, such as *Betula lenta* (sweet birch), *Acer rubrum* (red maple), and *Liriodendron tulipifera* (tuliptree). Seedlings of *Quercus* (oak) species are infrequent. Invasive exotic species are present infrequently and usually at low cover, and may include *Microstegium vimineum* (Nepalese browntop), *Berberis thunbergii* (Japanese barberry), and *Alliaria petiolata* (garlic mustard). Litter covers much of the ground surface. Deer browse is evident on low ericaceous shrubs.

Chesapeake & Ohio Canal National Historical Park Vegetation: The very sparse to moderate (10-60+% cover) tree canopy, 20-35 m tall, is codominated by *Quercus montana (=Quercus prinus)* and *Quercus rubra* (northern red oak), as is the moderate (40-60%) subcanopy (10-20 m). Additional tree species include *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Pinus virginiana* (Virginia pine), *Quercus alba* and *Tilia americana* (American basswood). The very sparse (10-20%) tall-shrub layer (6-10 m) and sparse to dense (20-80%) short-shrub layer (1-6 m) include canopy species along with *Acer saccharum var. saccharum* (sugar maple), *Amelanchier arborea* (common serviceberry), *Carya glabra* (pignut hickory), *Cercis canadensis var. canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Fraxinus americana* (white ash), *Hamamelis virginiana* (American witch-hazel), *Juglans nigra* (black walnut), *Ostrya virginiana* (hophornbeam), and *Rubus phoenicolasius* (wine raspberry), among others. The herbaceous layer (<5-40%) includes *Adiantum pedatum* (northern maidenhair), *Ageratina altissima* (white snakeroot), *Agrostis hyemalis* (winter bentgrass), *Antennaria plantaginifolia* (woman's tobacco), *Arabis laevigata* (smooth rockcress), *Asplenium platyneuron* (ebony spleenwort), *Carex communis* (fibrousroot sedge), *Carex digitalis* (slender woodland sedge), *Carex nigromarginata* (black edge sedge), *Carex pensylvanica* (Pennsylvania sedge), *Carex platyphylla* (broadleaf sedge), *Carex virescens* (ribbed sedge), *Chimaphila maculata* (striped prince's pine), *Cunila origanoides* (common dittany), *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa var. flexuosa* (wavy hairgrass), *Dichanthelium boscii* (Bosc's panicgrass), *Dichanthelium dichotomum* (cypress panicgrass), *Dioscorea quaternata* (fourleaf yam), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Euphorbia corollata* (flowering spurge), *Eurybia divaricata* (white wood aster), *Festuca subverticillata* (nodding fescue), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Hedeoma pulegioides* (American false pennyroyal), *Hieracium venosum* (rattlesnakeweed), *Houstonia caerulea* (azure bluet), *Houstonia longifolia* (longleaf summer bluet), *Lespedeza procumbens* (trailing lespedeza), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Muhlenbergia schreberi* (nimblewill), *Paronychia canadensis* (smooth forked nailwort), *Parthenocissus quinquefolia* (Virginia creeper), *Polygonatum biflorum* (smooth Solomon's seal), *Polypodium virginianum* (rock polypody), *Polystichum acrostichoides* (Christmas fern), *Prenanthes altissima* (tall rattlesnakeroot), *Saxifraga virginiensis* (early saxifrage), *Scutellaria elliptica* (hairy skullcap), *Solidago caesia* (wreath goldenrod), *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod), *Uvularia perfoliata* (perfoliate bellwort), and *Woodsia obtusa ssp. obtusa*. Low shrubs include *Ceanothus americanus* (New Jersey tea), *Viburnum acerifolium* and *Vaccinium pallidum* (Blue Ridge blueberry). Vines include *Lonicera japonica* (Japanese honeysuckle), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), and *Sicyos angulatus* (oneseed bur cucumber). Nonvascular species, when present, can cover up to 20% of the ground surface. A total of seven exotic species were reported from sampled stands. This community also supports one Maryland state-vulnerable species.

George Washington Memorial Parkway Vegetation: Stands in the Potomac Gorge are somewhat open to closed-canopy forests with strongly uneven-aged tree growth. The constancy of large, often slightly gnarled *Quercus montana* (chestnut oak) is characteristic of the overstory, with the species constituting almost half of the total large-tree density. *Liriodendron tulipifera* (tuliptree), *Quercus rubra* (northern red oak), and *Fagus grandifolia* (American beech) are constant but minor overstory associates. Canopy-class individuals of *Carya glabra* (pignut hickory), *Carya cordiformis* (bitternut hickory), *Quercus alba* (white oak), and *Nyssa sylvatica* (blackgum) also occasionally occur. The subcanopy tree layers are composed almost entirely of mesophytic species, with *Acer saccharum var. saccharum* (sugar maple), *Acer rubrum* (red maple), and *Ostrya virginiana* (hophornbeam) most important, and *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), and *Nyssa sylvatica* (blackgum) also characteristic. The shrub layer is open (35% mean stratum cover) but quite diverse, with *Hamamelis virginiana* (American witch-hazel), *Cornus florida* (flowering dogwood), *Hydrangea arborescens* (wild

hydrangea), *Viburnum acerifolium* (mapleleaf viburnum), *Asimina triloba* (pawpaw), and *Kalmia latifolia* (mountain laurel) all characteristic. The herb layers of sampled stands are quite dense (59% mean stratum cover), but this is partly an artifact of the less rugged, deeper-soiled sites where it was possible to establish plots. Where stands occur on very steep slopes with large outcrops or boulder deposits, herb cover is typically low. In either case, this type has a distinctive herbaceous flora, with *Eurybia divaricata* (white wood aster), *Polystichum acrostichoides* (Christmas fern), and/or *Dryopteris marginalis* (marginal woodfern) usually exerting patch-dominance, the first two where soils are well-developed. Additional herbs that can be considered especially characteristic of the type include *Carex communis* (fibrousroot sedge), *Carex platyphylla* (broadleaf sedge), *Carex virescens* (ribbed sedge), *Solidago caesia* (wreath goldenrod), *Poa cuspidata* (early bluegrass), *Stellaria pubera* (star chickweed), *Heuchera americana* (American alumroot), *Saxifraga virginiensis* (early saxifrage), and *Polypodium virginianum* (rock polypody). Many other species occur at low cover and/or constancy. Total species richness among the eight plot samples ranges from 47 to 61 taxa per 400 square meters. Lower numbers for species richness can be expected on very rocky, inaccessible sites.

Harpers Ferry National Historical Park Vegetation: *Quercus montana* (chestnut oak) and *Quercus rubra* (northern red oak) are codominant in the overstory, and many additional mesophytic tree species occur as minor associates. These include *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Betula lenta* (sweet birch), and *Carya tomentosa* (mockernut hickory). Understory cover and composition vary and common species include *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), and *Carya ovalis* (red hickory). *Hamamelis virginiana* (American witch-hazel) is common and characteristic of the shrub layer. *Asimina triloba* (pawpaw) is typically constant but with lower cover. *Viburnum acerifolium* (mapleleaf viburnum) is less constant but locally abundant. Ericads are rather infrequent and rarely constitute >5% cover. Other common shrubs include *Cornus florida* (flowering dogwood), *Hydrangea arborescens* (wild hydrangea), and various tree saplings. The woody vines *Parthenocissus quinquefolia* (Virginia creeper) and/or *Toxicodendron radicans* (eastern poison-ivy) are typically found in the low-shrub layer with moderate to high cover, especially on boulderfields.

Herb cover can be moderately dense on slopes with well-developed residual or colluvial soils; where stands occur on very steep slopes with outcrops or boulder deposits, herb cover is typically low. In either case, this type has a distinctive herbaceous flora, with patchy to moderately dense cover of mesophytic ferns and forbs. *Eurybia divaricata* (white wood aster) and/or *Dryopteris marginalis* (marginal woodfern) usually exert patch-dominance, the first where soils are well-developed. Additional herbs that can be considered especially characteristic of the type in the study area include *Polymnia canadensis* (whiteflower leafcup), *Dioscorea quaternata* (fourleaf yam), *Ageratina altissima* (white snakeroot), *Solidago caesia* (wreath goldenrod), *Arabis laevigata var. laevigata* (smooth rockcress), *Polystichum acrostichoides* (Christmas fern), and *Polypodium virginianum* (rock polypody). Many other species occur at low cover and/or constancy.

Monocacy National Battlefield Vegetation: The moderately dense to dense (50-90+% cover) tree canopy, 20-35 m tall, is dominated by *Quercus montana* (chestnut oak) and *Quercus rubra* with lesser amounts of *Quercus alba* (white oak), *Fraxinus americana* (white ash), *Acer rubrum* (red maple), and *Fagus grandifolia* (American beech). The sparse to moderately sparse (2-25%) subcanopy (6-10 m) is made up of canopy species as well as *Ostrya virginiana* (hophornbeam). The moderately dense (25-50%) tall-shrub layer (1-6 m) is dominated by *Hamamelis virginiana* (American witch-hazel) along with *Fraxinus americana* (white ash) and other canopy species, *Amelanchier arborea* (common serviceberry), and *Staphylea trifolia* (American bladdernut). *Ailanthus altissima* (tree of heaven), an exotic invasive species, can be present in multiple strata, most commonly the tall-shrub and subcanopy layers. The absent to very sparse (0-2%) short-shrub layer (0.5-1 m), when present, includes *Asimina triloba* (pawpaw) and *Rubus* (blackberry) spp. The sparse to moderately dense (25-75%) herbaceous layer (<0.5 m) is dominated by *Alliaria petiolata* (garlic mustard) (exotic), *Eurybia divaricata* (white wood aster), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), and *Glechoma hederacea* (ground ivy). *Parthenocissus quinquefolia* (Virginia creeper) is a common vine in this forest type.

Global Vegetation: The vegetation is usually a closed-canopy forest codominated by *Quercus montana* (chestnut oak) and *Quercus rubra* (northern red oak) in variable proportions. Over the full geographic range, overstory associates are reported to include *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Tilia americana* (American basswood), *Betula lenta* (sweet birch), *Acer rubrum* (red maple), *Magnolia acuminata* (cucumber-tree), *Nyssa sylvatica* (blackgum), *Robinia pseudoacacia* (black locust), *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), and *Carya tomentosa* (mockernut hickory). Less frequent, and more local, overstory and understory trees include *Acer saccharum* (sugar maple), *Amelanchier arborea* (common serviceberry), *Asimina triloba* (pawpaw), *Fagus grandifolia* (American beech), *Ostrya virginiana* (hophornbeam), and *Tsuga canadensis* (eastern hemlock). A tall-shrub layer is occasionally absent but usually characterized by *Hamamelis virginiana*

(American witch-hazel) and, less frequently, by *Cornus florida* (flowering dogwood) and *Acer pensylvanicum* (striped maple), the latter more common at higher elevations. The lower shrub layer contains scrambling or climbing vines of *Parthenocissus quinquefolia* (Virginia creeper), *Vitis aestivalis* (summer grape), and *Toxicodendron radicans* (eastern poison-ivy), along with *Viburnum acerifolium* (mapleleaf viburnum), *Hydrangea arborescens* (wild hydrangea), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium stamineum* (deerberry). In general, ericaceous species are patchy to sparse in this community. The herbaceous layer is usually sparse but may include *Dryopteris marginalis* (marginal woodfern), *Dioscorea quaternata* (fourleaf yam), *Eurybia divaricata* (white wood aster), *Ageratina altissima* (white snakeroot), *Polygonatum biflorum* (smooth Solomon's seal), *Solidago caesia* (wreath goldenrod), *Festuca subverticillata* (nodding fescue), *Thelypteris noveboracensis* (New York fern), *Sanicula trifoliata* (largefruit blacksnakeroot), *Prenanthes altissima* (tall rattlesnakeroot), *Polystichum acrostichoides* (Christmas fern), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Galium latifolium* (purple bedstraw), *Houstonia purpurea* (Venus' pride), and *Maianthemum racemosum* (feathery false lily of the valley). Although not one of the more constant herbs, *Aralia nudicaulis* (wild sarsaparilla) 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* (flowering dogwood) from dogwood anthracnose (*Discula destructiva*), and a few small fire scars were disturbances noted in plots. Although *Castanea dentata* (American chestnut) logs and wood were not abundant in plots, frequent sprouts indicate that *Castanea dentata* (American chestnut) 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 montana* (chestnut oak) >220 years old; a 63-cm (25 inches) dbh *Quercus montana* (chestnut oak) about179 years old; a 67-cm (26 inches) dbh *Quercus montana* (chestnut oak) 265 years old; and a 71-cm (28 inches) dbh *Quercus rubra* (northern red oak) >247 years old (Fleming and Moorhead 2000).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Acer rubrum* (red maple), *Amelanchier arborea* (common serviceberry), *Arisaema triphyllum* (Jack in the pulpit), *Betula lenta* (sweet birch), *Carex pensylvanica* (Pennsylvania sedge), *Fraxinus americana* (white ash), *Hamamelis virginiana* (American witch-hazel), *Parthenocissus quinquefolia* (Virginia creeper), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak)

Chesapeake & Ohio Canal National Historical Park: *Hamamelis virginiana* (American witch-hazel), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak)

George Washington Memorial Parkway: *Carex communis* (fibrousroot sedge), *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Hamamelis virginiana* (American witch-hazel), *Ostrya virginiana*, *Quercus montana* (chestnut oak)

Harpers Ferry National Historical Park: *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Hamamelis virginiana* (American witch-hazel), *Quercus montana* (chestnut oak), *Viburnum acerifolium* (mapleleaf viburnum)

Monocacy National Battlefield: *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak)

Global: *Acer pensylvanicum* (striped maple), *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), *Cornus florida* (flowering dogwood), *Hamamelis virginiana* (American witch-hazel), *Parthenocissus quinquefolia* (Virginia creeper), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Sassafras albidum* (sassafras), *Viburnum acerifolium* (mapleleaf viburnum), *Vitis aestivalis* (summer grape)

OTHER NOTEWORTHY SPECIES

Catoctin Mountain Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Cystopteris bulbifera* (bulblet bladderfern, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria*

petiolata (garlic mustard, High/Medium), *Cardamine hirsuta* (hairy bittercress), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Prunus avium* (sweet cherry, High/Low), *Rubus phoenicolasius* (wine raspberry, Medium)
George Washington Memorial Parkway: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Prunus subhirtella* (winter-flowering cherry), *Rubus phoenicolasius* (wine raspberry, Medium)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rubus phoenicolasius* (wine raspberry, Medium)
Monocacy National Battlefield: Vulnerable Plants: *Carex argyrantha* (hay sedge, G5, MD state-vulnerable), *Galium concinnum* (shining bedstraw, G5, MD state-vulnerable), *Hybanthus concolor* (eastern greenviolet, G5, MD state-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Chelidonium majus* var. *majus* (celandine), *Cirsium arvense* (Canada thistle, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Humulus japonicus* (Japanese hop, Medium/Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Stellaria media* (common chickweed, Low)
Global: Vulnerable Plants: *Panax quinquefolius* (American ginseng, G3G4, under collection pressure), *Scutellaria saxatilis* (smooth rock skullcap, G3G4), *Tsuga caroliniana* (Carolina hemlock, G2G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (01-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 montana / Parthenocissus quinquefolia* Woodland (CEGL006565)
- *Quercus montana - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299)
- *Quercus montana - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267)
- *Quercus montana - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum*) Forest (CEGL006282)
- *Quercus montana - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest (CEGL008523) occurs on more subxeric sites and has a more prominent ericaceous shrub layer.
- *Quercus rubra - Quercus montana - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (CEGL008514)
- *Quercus rubra - Quercus montana - Magnolia (acuminata, fraseri) / Acer pensylvanicum* Forest (CEGL004817)

Global Related Concepts:
- *Quercus montana - Quercus rubra / Acer pensylvanicum - Hamamelis virginiana* Forest (Fleming and Moorhead 2000) **<**
- *Quercus montana - Quercus rubra / Cornus florida / Viburnum acerifolium* Forest (Young et al. 2007a) **=**
- *Quercus montana - Quercus rubra / Vitis aestivalis var. bicolor - Parthenocissus quinquefolia / Aralia nudicaulis - Dryopteris marginalis* Forest (Fleming 2002b) **=**
- *Quercus montana - Robinia pseudoacacia / Ribes rotundifolium* Association (Rawinski et al. 1994) **<**
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (Fleming and Coulling 2001) **=**
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (Fleming 2007) **=**
- *Quercus rubra - Magnolia acuminata* Association (Fleming and Moorhead 1996) **<**
- *Quercus rubra - Quercus montana / Parthenocissus quinquefolia - Vitis aestivalis var. bicolor / Dryopteris marginalis - Aralia nudicaulis* Forest (Fleming and Patterson 2003) **=**
- *Quercus rubra - Quercus montana / Parthenocissus quinquefolia / Aralia nudicaulis - Dryopteris marginalis* Forest (Fleming 2002a) **=**
- *Quercus rubra - Quercus prinus - Liriodendron tulipifera / Parthenocissus quinquefolia - Dryopteris marginalis* Association (Rawinski et al. 1996) **<**
- Chestnut Oak - Black Birch community (Ehrenfeld 1977) **=**
- Chestnut Oak: 44 (Eyre 1980) **>**
- Chestnut oak-red oak/ericad forest: (matrix) N slopes (CAP pers. comm. 1998) **<**
- Mixed oak / hardwoods mesic forest (Windisch 1993) **?**

- Red Oak - Chestnut Oak Community Type (Stephenson and Adams 1991) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Catoctin Mountain Park Classification Comments: Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest is also referred to as Dry-Mesic Chestnut Oak - Northern Red Oak Forest. In heavily browsed stands with sparse shrub and herb layers, it may be difficult to differentiate this type from Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest (CEGL008523).
George Washington Memorial Parkway Classification Comments: Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (also referred to as Dry-Mesic Chestnut Oak - Northern Red Oak Forest) is distinctive and unlikely to be confused with other upland forests of the Potomac Gorge. Its boundaries with other vegetation types tend to be sharp because of its restriction to very steep, rocky or shallow-soiled habitats on north-facing river bluffs. Its composition, with overstory dominance by *Quercus prinus* and understory dominance by *Acer* (maple) spp. and *Ostrya virginiana* (hophornbeam), is also unlike other forests of the area. Its herbaceous flora is fairly lush where soils have accumulated, containing an unusual mixture of mesophytic generalists (e.g., *Eurybia divaricata* (white wood aster)) and semi-lithophytic species (e.g., *Dryopteris marginalis* (marginal woodfern), *Heuchera americana* (American alumroot)). The sedges *Carex communis* (fibrousroot sedge) and *Carex platyphylla* (broadleaf sedge) have high fidelity and constancy in this vegetation type and are especially diagnostic.
Harpers Ferry National Historical Park Classification Comments: Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest is also referred to as Dry-Mesic Chestnut Oak - Northern Red Oak Forest. It can be distinguished from Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest (CEGL008523) by its location on steep, sheltered, often rocky, middle to lower slopes with north or northeast aspects. The overstory vegetation is often similar among both types, but the shrub and herb layers are quite distinct. The shrub layer of the Dry-Mesic Chestnut Oak - Northern Red Oak Forest is typically dominated by *Hamamelis virginiana* (American witch-hazel) and/or *Viburnum acerifolium* (mapleleaf viburnum), whereas the shrub layer of CEGL008523 is typically composed of tree saplings or low, deciduous ericads. Also, the herbaceous flora of the Dry-Mesic Chestnut Oak - Northern Red Oak Forest is fairly lush where soils have accumulated, containing an unusual mixture of mesophytic generalists (e.g., *Eurybia divaricata* (white wood aster)). The herb layer of CEGL008523 is typically a patchy cover of tree seedlings and scattered low-cover xerophytic forbs and graminoids.

ELEMENT DISTRIBUTION

Catoctin Mountain Park Range: This association occurs throughout the park on all geological formations.
Chesapeake & Ohio Canal National Historical Park Range: Vegetation plots of this community were sampled near Dargan, Falling Water Road, and Mountain Lock. It has been mapped and documented with points at locations from Oldtown-Battie Mixon (Canal mile 167) in the Ridge and Valley to Great Falls (near Canal mile 13), including Sorrel Ridge (Canal mile 153-156), Stockpile Hill (Canal mile 147-152), Indigo Neck (near Canal mile 139), Sideling Hill Creek Aqueduct (Canal mile 137), Cumberland Valley (Canal mile 95-97), Harpers Ferry (Canal mile 61-65), Spinks Ferry (Canal mile 42), Marble Quarry (Canal mile 38-39), and Edwards Ferry (between Canal mile 31 and 32).
George Washington Memorial Parkway Range: In terms of areal coverage, this is not a major forest of the Potomac Gorge, mostly occurring in discrete, somewhat linear patches. However, some stands may have escaped cutting because of their location on extremely steep bluffs and the poor commercial quality of somewhat gnarled or leaning trees. It is restricted to the north- and northeast-facing, river-fronting bluffs from the western end of Turkey Run Park downstream. Its occurrence in the Arlington section of the parkway below Chain Bridge is limited to small patches because of extensive historical disturbances that destroyed most of the natural vegetation in that area.
Harpers Ferry National Historical Park Range: Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest occurs in steep habitats in the park, primarily on steep bluffs bordering the Shenandoah and Potomac rivers or on upper north slopes of local ridges.
Monocacy National Battlefield Range: This association is a common forest type on the upper slopes of Brooks Hill and can be found in other forested areas in the northern portions of the park.
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:SNR, NJ:SNR, PA:SNR, VA:S4, WV:S3

TNC Ecoregions: 52:C, 59:C, 61:C
USFS Ecoregions (2007): 211G:P?, 221Am:CCP, 221Da:CCP, 221Db:CCC, 221Ea:C??, 221F:C?, 231A:??, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc: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

Catoctin Mountain Park Plots: CATO.35, CATO.45, CATO.53, CATO.57.
Chesapeake & Ohio Canal National Historical Park Plots: (4 plots): CHOH.003, CHOH.026, CHOH.305, CHOH.307.
George Washington Memorial Parkway Plots: GWMP_001, TURK_017, TURK_018, TURK_019, TURK_050.
Harpers Ferry National Historical Park Plots: HAFE.25, HAFE.35, HAFE.43, HAFE.107, HAFE.110, HAFE.202.
Monocacy National Battlefield Plots: (2 plots): MONO.3, MONO.4.
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman and M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Monocacy National Battlefield Description Author(s): M. Russo and S. Perles
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 Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2003, Lea 2004, Rawinski et al. 1994, Rawinski et al. 1996, Sneddon et al. 2008, Stephenson and Adams 1991, Vanderhorst 2000b, WVNHP unpubl. data, Windisch 1993, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL008523] *Quercus montana - 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	Central Appalachian-Northeast Oak Forest & Woodland (G650)
Alliance (A4435)	*Quercus montana* / *Kalmia latifolia* - *Vaccinium pallidum* Forest Alliance

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, nutrient poor 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 montana* (chestnut oak) and *Quercus rubra* (northern red oak) generally codominate the overstory, but either species may dominate discrete areas within stands. Minor canopy associates include *Quercus velutina* (black oak), *Quercus alba* (white oak), *Betula lenta* (sweet birch),

Carya (hickory) spp., *Robinia pseudoacacia* (black locust), and *Pinus strobus* (eastern white pine). *Acer rubrum* (red maple) 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* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), *Rhododendron periclymenoides* (pink azalea), and *Kalmia latifolia* (mountain laurel). *Acer pensylvanicum* (striped maple) and *Smilax rotundifolia* (roundleaf greenbrier) may be present in minor amounts. A suite of low-cover, xerophytic herbs is characteristic, including *Houstonia longifolia* (longleaf summer bluet), *Campanula divaricata* (small bonny bellflower), *Potentilla canadensis* (dwarf cinquefoil), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Carex pensylvanica* (Pennsylvania sedge), *Aureolaria laevigata* (entireleaf yellow false foxglove), and *Hieracium paniculatum* (Allegheny hawkweed).

Environmental Description

Catoctin Mountain Park Environment: This forest type typically occurs as matrix or in large patches on steep upper slopes with south or east-facing aspect, with occasional smaller patches. Soils are sandy loams or silt loams derived from the Harpers, Loudoun, and Weverton formations; one patch also occurs on schistose basalt of the Catoctin Formation. Exposed rocks and boulders are common, and leaf litter is abundant on the ground surface. Elevations are generally 240-460 m (800-1500 feet).

Chesapeake & Ohio Canal National Historical Park Environment: This community type occurs most abundantly in the Northern Blue Ridge at Harpers Ferry on a large ridge called Maryland Heights. There it occurs near the ridgetop and on chiefly convex, moderately steep middle to upper slopes which face southeast to west. Soils are subxeric or xeric and strongly infertile. The elevations there range from 170 m to 425 m (550 - 1400 feet). At Point of Rocks this community occurs at 180 m (600 feet) on the moderately steep west facing slope of Catoctin Mountain.

Harpers Ferry National Historical Park Environment: Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest generally occurs on upper slope topographic positions in areas with southerly or westerly aspects. Sites are frequently exposed and convex, creating dry site conditions. Boulder and rock cover varies but can be relatively high. Soils are typically acidic with low Ca, Mg, and Mn concentrations. Substrates of massive quartzite and gneissic granites prevail among plot samples.

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 montana* (chestnut oak) 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* (American chestnut) as an overstory dominant.

Vegetation Description

Catoctin Mountain Park Vegetation: The tree canopy is dominated by *Quercus montana* (chestnut oak), and *Quercus rubra* (northern red oak) is either codominant or abundant. Other tree species in the canopy are infrequent but may include *Betula lenta* (sweet birch). The subcanopy is characterized by *Acer rubrum* (red maple), *Betula lenta* (sweet birch), and *Nyssa sylvatica* (blackgum). Shrub and herbaceous layers are usually poorly developed. Occasional species of the tall-shrub layer include *Amelanchier arborea* (common serviceberry), *Castanea dentata* (American chestnut), and *Sassafras albidum* (sassafras) saplings. *Vaccinium pallidum* (Blue Ridge blueberry) and occasionally *Vaccinium stamineum* (deerberry) form a patchy but generally sparse low-shrub layer. The herbaceous layer is very sparse; graminoids may be locally patchy and include *Danthonia spicata* (poverty oatgrass) and *Carex pensylvanica* (Pennsylvania sedge). Other species may include *Chimaphila maculata* (striped prince's pine), *Conopholis americana* (American cancer-root), and seedlings of trees and shrubs such as *Sassafras albidum* (sassafras), *Vaccinium stamineum* (deerberry), *Nyssa sylvatica* (blackgum), and occasionally *Liriodendron tulipifera* (tuliptree). *Quercus* (oak) species seedlings are uncommon.

Chesapeake & Ohio Canal National Historical Park Vegetation: *Quercus montana* (chestnut oak) dominates and *Quercus rubra* (northern red oak) may codominate the overstory. *Acer rubrum* and sometimes *Quercus montana* are subcanopy dominants. Other trees include *Carya alba*, *Cary glabra*, *Carya ovata* (shagbark hickory), *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Sassafras albidum* (sassafras), In addition to tree seedlings and saplings, shrubs include *Amelanchier arborea* (common serviceberry), *Asimina triloba* (pawpaw), *Castanea dentata* (American chestnut), *Cornus florida* (flowering dogwood), *Gaylussacia baccata* (black huckleberry), *Hamamelis virginiana* (American witch-hazel),

Kalmia latifolia (mountain laurel), *Rhododendron periclymenoides* (pink azalea), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium stamineum.* Vines include *Parthenocissus quinquefolia* (Virginia creeper), and *Toxicodendron radicans* (eastern poison-ivy). Common herbaceous plants include *Alliaria petiolata* (invasive exotic), *Chimaphila maculata* (striped prince's pine), *Danthonia spicata* (poverty oatgrass), *Dichanthelium dicotomum*, and *Hieracium venosum.* Other herbaceous plants include *Antennaria virginica* (shale barren pussytoes), *Carex digitalis* (slender woodland sedge), *Carex nigromarginata* (black edge sedge), *Carex pensylvanica* (Pennsylvania sedge), *Carex virescens* (ribbed sedge), *Cunila origanoides* (common dittany), *Dichanthelium commutatum* (variable panicgrass), *Dioscorea quaternata* (fourleaf yam), *Galium circaezans* (licorice bedstraw), *Hepatica americana*, *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Muhlenbergia sobolifera* (rock muhly), *Paronychia canadensis* (smooth forked nailwort), *Polygonatum biflorum* (smooth Solomon's seal), *Solidago bicolor* (white goldenrod), and *Solidago juncea* (early goldenrod).

Harpers Ferry National Historical Park Vegetation: *Quercus montana* (chestnut oak) and *Quercus rubra* (northern red oak) codominate, with minor associates of *Quercus velutina* (black oak), *Betula lenta* (sweet birch), and *Carya* (hickory) spp. Understory layers include saplings of the above, as well as *Acer rubrum* (red maple), *Sassafras albidum* (sassafras), *Nyssa sylvatica* (blackgum), and *Fagus grandifolia* (American beech). The shrub layer is fairly open and typically dominated by tree saplings. Patchy cover of *Vaccinium pallidum* (Blue Ridge blueberry), *Viburnum acerifolium* (mapleleaf viburnum), *Rubus pensilvanicus* (Pennsylvania blackberry), *Gaylussacia baccata* (black huckleberry), and *Kalmia latifolia* (mountain laurel) is common in some stands. Woody vines are common in the shrub layer, including *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), and *Smilax rotundifolia* (roundleaf greenbrier). The herb layer is sparse with dry-mesophytic and xerophytic herbs present in low cover (<1%). Examples include *Chimaphila maculata* (striped prince's pine), *Danthonia spicata* (poverty oatgrass), *Lysimachia quadrifolia* (whorled yellow loosestrife), and *Desmodium nudiflorum* (nakedflower ticktrefoil). *Aralia nudicaulis* (wild sarsaparilla) is occasionally a patch-dominant on bouldery sites.

Global Vegetation: *Quercus montana* (chestnut oak) and *Quercus rubra* (northern red oak) generally codominate the overstory, but either species may dominate discrete areas within stands. *Acer rubrum* (red maple) cover may equal or exceed that of the diagnostic oak species in stands with recent harvesting. Minor canopy associates include *Quercus velutina* (black oak), *Betula lenta* (sweet birch), *Carya* (hickory) spp., *Robinia pseudoacacia* (black locust), *Quercus alba* (white oak), and *Pinus strobus* (eastern white pine). *Acer rubrum* (red maple) is the most constant and abundant species of the subcanopy, which also contains *Sassafras albidum* (sassafras), *Prunus serotina* (black cherry), *Nyssa sylvatica* (blackgum), and *Acer pensylvanicum* (striped maple) (mostly at higher elevations). Patchy dominance by *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), *Rhododendron periclymenoides* (pink azalea), and *Kalmia latifolia* (mountain laurel) characterizes the shrub layer. *Acer pensylvanicum* (striped maple) and *Smilax rotundifolia* (roundleaf greenbrier) 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* (longleaf summer bluet), *Campanula divaricata* (small bonny bellflower), *Potentilla canadensis* (dwarf cinquefoil), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Carex pensylvanica* (Pennsylvania sedge), *Aureolaria laevigata* (entireleaf yellow false foxglove), and *Hieracium paniculatum* (Allegheny hawkweed). *Medeola virginiana* (Indian cucumber) and *Monotropa uniflora* (Indianpipe) may also be present. *Aralia nudicaulis* (wild sarsaparilla) is occasionally a patch-dominant on dry, bouldery sites. On other sites with better soil development, *Dennstaedtia punctilobula* (eastern hayscented fern) nearly dominates the herb stratum. Mean species richness of 28 plots is 40 taxa per 400 m2, much higher than that of other oak/heath types in the Central Appalachians region.

Global Dynamics: *Castanea dentata* (American chestnut) abounds in the shrub layer of some stands, which undoubtedly reflects the former importance of this species in the canopy. Both *Acer rubrum* (red maple) and *Robinia pseudoacacia* (black locust) 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

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak)
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple)
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry)

Characteristic Species

Catoctin Mountain Park: *Acer rubrum* (red maple), *Amelanchier arborea* (common serviceberry), *Betula lenta* (sweet birch), *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Monotropa uniflora* (Indianpipe), *Nyssa sylvatica* (blackgum), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Sassafras albidum* (sassafras), *Vaccinium pallidum* (Blue Ridge blueberry)
Chesapeake & Ohio Canal National Historical Park: *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Vaccinium pallidum* (Blue Ridge blueberry)
Harpers Ferry National Historical Park: *Acer rubrum* (red maple), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak)
Global: *Aureolaria laevigata* (entireleaf yellow false foxglove), *Carex virescens* (ribbed sedge), *Castanea dentata* (American chestnut), *Hieracium paniculatum* (Allegheny hawkweed), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Rhododendron periclymenoides* (pink azalea), *Vaccinium pallidum* (Blue Ridge blueberry)

Other Noteworthy Species

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Castanea dentata* (American chestnut, G3, MD-vulnerable); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rubus phoenicolasius* (wine raspberry, Medium)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium)
Global: Vulnerable Plants: *Castanea dentata* (American chestnut, G3), *Tsuga caroliniana* (Carolina hemlock, G2G3); **Other Plants**: *Kalmia latifolia* (mountain laurel, G5)

Conservation Status Rank

Global Rank & Reasons: G3G4 (02-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, montana) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest (CEGL007230) is a broadly defined association from the Southern Blue Ridge.
- *Quercus montana - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299)
- *Quercus montana - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum*) Forest (CEGL006282) ranges from Maine to Virginia.
- *Quercus montana - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057) is common in the Central Appalachians, possibly ranging north to New Jersey.
- *Quercus rubra - Quercus montana - Carya ovalis / (Cercis canadensis) / Solidago caesia* Forest (CEGL008514)
- *Tsuga canadensis - Fagus grandifolia - Quercus (montana, alba)* Forest (CEGL006474)

Global Related Concepts:
- *Quercus prinus - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest (Fleming and Taverna 2006) =
- *Quercus prinus - Quercus rubra / Vaccinium pallidum* Forest [Subxeric Chestnut Oak - Red Oak / Blueberry Forest] (Vanderhorst 2017d) =
- *Quercus rubra - (Quercus prinus, Quercus velutina) / Rhododendron periclymenoides / Lysimachia quadrifolia - Hieracium paniculatum* Forest (Fleming and Coulling 2001) <
- *Quercus velutina - Quercus montana - Quercus rubra / Rhododendron periclymenoides / Vaccinium pallidum* Forest (Coulling and Rawinski 1999) <
- Chestnut Oak: 44 (Eyre 1980) >

Classification

Status: Standard
Classification Confidence: 2 - Moderate

Catoctin Mountain Park Classification Comments: It is sometimes difficult to differentiate this association (also referred to as Dry Chestnut Oak - Northern Red Oak / Heath Forest) from Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057), in part due to the extent of deer browse, particularly on ericaceous species.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest (CEGL008523) is also referred to as Dry Chestnut Oak - Northern Red Oak / Heath Forest.
Harpers Ferry National Historical Park Classification Comments: Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest (CEGL008523) (also referred to as Dry Chestnut Oak - Northern Red Oak / Heath Forest) occupies sites intermediate between the xeric, oligotrophic sites of Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299) and the somewhat sheltered, submesic, subacidic sites of Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057). Compared to CEGL006057, stands of this type (CEGL008523) generally occur on gentler slopes (sometimes very bouldery) with southerly or westerly aspects on middle to upper slopes. In addition, the shrub layer of this type is typically composed of tree saplings and scattered ericads, versus a high cover of *Hamamelis virginiana* (American witch-hazel) and/or *Viburnum acerifolium* (mapleleaf viburnum) in CEGL006057. The herb layer of this type (CEGL008523) is typically a patchy cover of tree seedlings and scattered low-cover xerophytic forbs and graminoids. This is quite distinct from the moderately dense cover of mesophytic ferns and forbs in the herb layer of CEGL006057.
Harpers Ferry National Historical Park Other Comments: In areas where this association (CEGL008523) and CEGL006057 are mapped in close proximity, there are stands that bear characteristics of both or either of them. *Quercus alba* (white oak) may be a component of areas that would otherwise be assigned to CEGL008523 (which does not usually have *Quercus alba* (white oak) as a dominant); and *Aralia nudicaulis* (wild sarsaparilla) may be found in portions of stands that would otherwise be assigned to CEGL006057.
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, montana) / Rhododendron calendulaceum - (Gaylussacia ursina)* Forest (CEGL007230)$$ is a broadly defined association from the Southern Blue Ridge. It differs from the present community type in the presence of several Southern Appalachian endemics (*Gaylussacia ursina* (bear huckleberry), *Halesia tetraptera* (mountain silverbell), *Magnolia fraseri* (mountain magnolia)) whose range does not extend to the Northern Blue Ridge and by the general absence (except for *Lysimachia quadrifolia* (whorled yellow loosestrife)) of the xerophytic herbs characteristic of this type. *~Quercus montana - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057)$$ 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* (striped maple), *Hamamelis virginiana* (American witch-hazel), and *Carya* (hickory) spp., which are characteristic of CEGL006057, are relatively unimportant in stands of the present type. *~Quercus montana - 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. Plots from the Allegheny Mountains of West Virginia previously attributed to this association (CEGL008523) (Vanderhorst 2001a, Vanderhorst and Streets 2006) have been reclassified as different associations, thus the association is now considered to be restricted to the Blue Ridge in the far eastern panhandle of the state.

ELEMENT DISTRIBUTION

Catoctin Mountain Park Range: This association occurs in the eastern portion of the park in large patches, and in one patch in the south-central portion of the park. It occurs adjacent to, or as an inclusion within, Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057) and Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299).
Chesapeake & Ohio Canal National Historical Park Range: This vegetation is documented with vegetation plots and mapped at Harpers Ferry (Canal mile 60-61). It is also documented with rapid assessment points at Harpers Ferry (Canal mile 60-61), Point of Rocks (Canal mile 48-49), and Marble Quarry (Canal mile 38). It is documented with observation points at Sorrell Ridge (Canal mile 155), Harpers Ferry (Canal mile 60-61), and Point of Rocks (Canal mile 48-49).
Harpers Ferry National Historical Park Range: In the park, this community is only found on sideslopes in the higher elevations of Maryland Heights and Loudoun Heights. To date, this type has only been documented on the northern Blue Ridge, from Amherst County in west-central Virginia to the vicinity of the park. It is likely to be more widespread, but certain topographic and/or soil conditions on the northern Blue Ridge may favor its development there.

Global Range: This community is documented only from the northern Blue Ridge and its eastern foothills, from Amherst County in west-central Virginia to Jefferson County in far-eastern West Virginia and in the the Catoctin Mountains of northern Maryland. 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:SNR, VA:S3S4, WV:S3
TNC Ecoregions: 52:C, 59:C
USFS Ecoregions (2007): M221Aa:CPP, 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

Chesapeake & Ohio Canal National Historical Park Plots: (4 plots): HAFE_012, HAFE_204, HAFE_205, HAFE_556.
Harpers Ferry National Historical Park Plots: HAFE.37, HAFE.48, HAFE.105, HAFE.204, HAFE.205.
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Global Description Author(s): G.P. Fleming, P.P. Coulling, S.C. Gawler
References: Abrams 1992, Coulling and Rawinski 1999, 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 Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Harrison et al. 1989, Newell 1997, Stephenson and Adams 1989, Vanderhorst 2017d, WVNHP unpubl. data, Whittaker 1956, Young et al. 2009

A4466 *Quercus rubra - Quercus montana - Betula lenta* Talus Woodland

[CEGL006565] *Betula lenta - Quercus montana / 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	Central Appalachian-Northeast Oak Forest & Woodland (G650)
Alliance	*Quercus rubra - Quercus montana - Betula lenta* Talus Woodland (A4466)

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* (sweet birch) but less frequently including *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), or *Betula alleghaniensis* (yellow birch), as well as *Nyssa sylvatica* (blackgum). Other tree associates may include *Tsuga canadensis* (eastern hemlock), *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), *Quercus montana* (chestnut oak), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), or *Quercus coccinea* (scarlet oak). Typical shrubs include *Acer spicatum* (mountain maple), *Acer pensylvanicum* (striped maple), *Amelanchier arborea* (common serviceberry), *Castanea dentata* (American chestnut), *Kalmia latifolia* (mountain laurel), *Hamamelis virginiana* (American witch-hazel), *Menziesia pilosa* (minniebush), *Ribes rotundifolium* (Appalachian gooseberry), *Vaccinium angustifolium* (lowbush blueberry), *Vitis* (grape) spp., *Toxicodendron radicans* (eastern poison-ivy), *Smilax rotundifolia* (roundleaf greenbrier), and *Parthenocissus quinquefolia* (Virginia creeper). Ferns characterize the herb layer and may include *Dryopteris marginalis* (marginal woodfern), *Polypodium virginianum* (rock polypody), *Woodsia obtusa* (bluntlobe cliff fern), or *Asplenium platyneuron* (ebony spleenwort). The forbs *Aralia nudicaulis*

(wild sarsaparilla), *Heuchera* (alumroot) spp., and *Scutellaria saxatilis* (smooth rock skullcap) are also well-adapted to the bouldery habitats. Lichens, especially the rock-tripes *Lasallia papulosa* (blistered naval lichen) and *Umbilicaria mammulata* and the foliose species *Flavoparmelia baltimorensis* (Baltimore flavoparmelia lichen), characterize the nonvascular layer.

ENVIRONMENTAL DESCRIPTION

Catoctin Mountain Park Environment: This association forms small patches on steep boulder talus with crustose lichens. It is often embedded within, or adjacent to, Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299) or Central Appalachian Hemlock - Chestnut Oak Forest (CEGL006923).
Chesapeake & Ohio Canal National Historical Park Environment: This community was documented at two locations along the C&O Canal, on a steep bouldery talus slope on Maryland Heights.
Harpers Ferry National Historical Park Environment: Sweet Birch - Chestnut Oak Talus Woodland occurs as a semi-closed to very open woodland on extensive talus slopes with deeply piled quartzite boulders or phyllite slabs. Sites in the park vary from steeply sloping boulderfields at higher elevations to gentler benches along the Potomac River. Soil is limited to interstitial, root-rich duff deposits, or to thin, organic / sandy material 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.
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, sandstone caprock, or phyllite. 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

Catoctin Mountain Park Vegetation: This association is characterized by an open or patchy tree canopy with little to no shrub or herb layers. Crustose lichens on the boulder substrate are common and abundant. The tree canopy is composed of *Betula lenta* (sweet birch) and *Quercus montana* (chestnut oak). Other canopy trees may include *Quercus rubra* (northern red oak), *Nyssa sylvatica* (blackgum), and *Acer rubrum* (red maple). *Pinus rigida* (pitch pine) may occur sparingly. *Kalmia latifolia* (mountain laurel) or *Vaccinium pallidum* (Blue Ridge blueberry) may form an interrupted or sparse tall- or dwarf-shrub layer. Herbaceous species are few and patchy or sparse. The most common species is *Dryopteris marginalis* (marginal woodfern). Others may include *Conopholis americana* (American cancer-root), *Danthonia spicata* (poverty oatgrass), or seedlings of *Sassafras albidum* (sassafras). *Parthenocissus quinquefolia* (Virginia creeper) is a common vine, found in most stands of this type at the park. Deer browse is evident in the absence of mature fronds on many of the *Dryopteris marginalis* (marginal woodfern) individuals, and in at least one location having *Kalmia latifolia* (mountain laurel), the lower limbs were missing, conferring a dwarf-tree appearance.
Chesapeake & Ohio Canal National Historical Park Vegetation: Vegetation in the two areas where this community was documented is characterized by rock-tripe lichens (*Umbilicaria* (navel lichen) sp.) and the woody vines, *Vitis aestivalis* (summer grape), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* and *Rubus allegheniensis.* A scattered tall shrub layer is dominated by the invasive plant, *Ailanthus altissima* (tree of heaven).
Harpers Ferry National Historical Park Vegetation: The woodland vegetation has variable cover, typically with a semi-open canopy broken by patches of open talus. Most canopy species overhang from the edges of the talus. *Betula lenta* (sweet birch) is the leading dominant in the overstory. Common canopy associates include *Tilia americana* (American basswood), *Quercus montana* (chestnut oak), and *Acer saccharum* (sugar maple). Understory species include *Fraxinus americana* (white ash) and *Acer rubrum* (red maple). The shrub layer is typically sparse and open, with *Hamamelis virginiana* (American witch-hazel) the most common shrub. *Sambucus racemosa var. racemosa* (red elderberry) is a noteworthy montane shrub that occurs at exceptionally low elevations in this community. The ground layer consists almost entirely of scattered scrambling vines of *Parthenocissus quinquefolia*

(Virginia creeper), *Vitis* (grape) spp., and *Toxicodendron radicans* (eastern poison-ivy). True herbs are very sparse and restricted to mossy pockets or flat boulders; typical species are *Dryopteris marginalis* (marginal woodfern), *Scutellaria saxatilis* (smooth rock skullcap), *Impatiens pallida* (pale touch-me-not), and *Cystopteris protrusa* (lowland bladderfern).

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* (sweet birch) and *Quercus montana* (chestnut oak) generally <20 m tall. *Betula lenta* (sweet birch) 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* (sweet birch) on more weathered and stable habitats. Other overstory associates that may be important on some sites are *Quercus rubra* (northern red oak), *Nyssa sylvatica* (blackgum), *Betula populifolia* (gray birch), *Betula papyrifera var. cordifolia* (mountain paper birch), *Carya glabra* (pignut hickory), *Tsuga canadensis* (eastern hemlock), and *Betula alleghaniensis* (yellow birch). The presence of well-preserved, fallen boles indicates that *Castanea dentata* (American chestnut) was important on some boulderfields prior to the arrival of chestnut blight (Fleming and Moorhead 2000). *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) are scattered canopy associates and frequent understory species. The typically open shrub layer contains *Acer pensylvanicum* (striped maple), *Acer spicatum* (mountain maple), *Amelanchier arborea* (common serviceberry), *Castanea dentata* (American chestnut) sprouts, *Hamamelis virginiana* (American witch-hazel), *Ilex montana* (mountain holly), *Kalmia latifolia* (mountain laurel), *Menziesia pilosa* (minniebush) (at the southern end of the range), and *Ribes rotundifolium* (Appalachian gooseberry). The ground layer consists almost entirely of low-statured shrubs, particularly *Menziesia pilosa* (minniebush) and *Vaccinium angustifolium* (lowbush blueberry), and/or scattered to abundant vines of *Parthenocissus quinquefolia* (Virginia creeper), *Vitis* (grape) spp., *Toxicodendron radicans* (eastern poison-ivy), and *Smilax rotundifolia* (roundleaf greenbrier). True herbs are very sparse and restricted to mossy pockets or flat boulders; typical species are *Dryopteris marginalis* (marginal woodfern), *Polypodium appalachianum* (Appalachian polypody), *Deschampsia flexuosa* (wavy hairgrass), and *Danthonia spicata* (poverty oatgrass). In the southern portion of the range, *Heuchera* (alumroot) spp. and *Scutellaria saxatilis* (smooth rock skullcap) are characteristic herbs. Bryophyte cover ranges up to 65% in some microhabitats. The rock-tripes *Lasallia papulosa* (blistered naval lichen) and *Umbilicaria mammulata* (navel lichen), and the foliose species *Flavoparmelia baltimorensis* (Baltimore flavoparmelia lichen), 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 m2) 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 montana* - *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

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula lenta* (sweet birch), *Quercus montana* (chestnut oak)
Herb (field)	Liana	*Parthenocissus quinquefolia* (Virginia creeper)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Betula lenta* (sweet birch), *Dryopteris marginalis* (marginal woodfern), *Kalmia latifolia* (mountain laurel), *Nyssa sylvatica* (blackgum), *Parthenocissus quinquefolia* (Virginia creeper), *Quercus montana* (chestnut oak)

Chesapeake & Ohio Canal National Historical Park: *Parthenocissus quinquefolia* (Virginia creeper), *Umbilicaria* spp., *Vitis* spp.

Harpers Ferry National Historical Park: *Betula lenta* (sweet birch), *Dryopteris marginalis* (marginal woodfern), *Parthenocissus quinquefolia* (Virginia creeper), *Tilia americana* (American basswood)
Global: *Acer spicatum* (mountain maple), *Aralia nudicaulis* (wild sarsaparilla), *Betula lenta* (sweet birch), *Betula papyrifera* var. *cordifolia* (mountain paper birch), *Dryopteris marginalis* (marginal woodfern), *Menziesia pilosa* (minniebush), *Parthenocissus quinquefolia* (Virginia creeper), *Polypodium appalachianum* (Appalachian polypody), *Quercus montana* (chestnut oak), *Ribes rotundifolium* (Appalachian gooseberry), *Scutellaria saxatilis* (smooth rock skullcap), *Vaccinium angustifolium* (lowbush blueberry), *Vitis* spp.

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium)
Harpers Ferry National Historical Park: Vulnerable Plants: *Scutellaria saxatilis* (smooth rock skullcap, G3G4, globally and VA state-vulnerable)
Global: Vulnerable Plants: *Betula papyrifera* var. *cordifolia* (mountain paper birch, G5T5, VA state-rare), *Gymnocarpium appalachianum* (Appalachian oakfern, G3), *Heuchera americana* var. *hispida* (American alumroot, G5T3?), *Scutellaria saxatilis* (smooth rock skullcap, G3G4); **Other Plants**: *Hamamelis virginiana* (American witch-hazel, 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* Talus Woodland (CEGL006584)
- *Quercus montana - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057) of somewhat sheltered, often very rocky slopes.
- *Quercus rubra - Betula lenta / Polypodium virginianum* Woodland (CEGL006585)

Global Related Concepts:
- *Betula lenta - Quercus montana - Quercus rubra / Menziesia pilosa / Dryopteris marginalis* Forest (Young et al. 2007a) =
- *Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland (Lea 2003) =
- *Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland (Fleming and Taverna 2006) =
- *Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland (Fleming and Patterson 2009a) =
- *Betula lenta / Parthenocissus quinquefolia* Association (Rawinski et al. 1996) <
- *Betula lenta / Ribes rotundifolium - Menziesia pilosa / Parthenocissus quinquefolia - Polypodium appalachianum* Woodland (Fleming and Coulling 2001) <
- *Quercus rubra - Quercus montana - Betula lenta / Ilex montana / Menziesia pilosa* Forest (Fleming and Moorhead 2000) <
- *Quercus rubra - Quercus montana - Betula lenta / Parthenocissus quinquefolia* Forest (Fleming and Moorhead 2000) <
- Talus Slope Community (Walz 1996) <

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Catoctin Mountain Park Classification Comments: An observation point (KH_29May08_029) and a plot (CATO.06) putatively classified as this type occur embedded within High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125)and include *Tilia americana* (American basswood), *Fraxinus americana* (white ash), *Carya* (hickory) spp., *Solidago flexicaulis* (zigzag goldenrod), *Arisaema triphyllum* (Jack in the pulpit), and *Maianthemum racemosum* (feathery false lily of the valley). These were considered to be inclusions and not mapped separately. If this vegetation were to be encountered in patches large enough to be mapped, consideration should be given to *~Tilia americana - Fraxinus americana / Acer pensylvanicum / Parthenocissus quinquefolia - Impatiens pallida* Woodland (CEGL008528)$$ as the correct classification unit.
Chesapeake & Ohio Canal National Historical Park Classification Comments: The occurrences of this community documented at the park represent disturbed examples, dominated by the invasive exotic tree, *Ailanthus*

altissima (tree of heaven). The specialized substrate of this community is present and does support the characteristic rock-tripe lichens and native woody vines.

Harpers Ferry National Historical Park Classification Comments: Sweet Birch - Chestnut Oak Talus Woodland is easily identified in the park due to the distinct open talus slopes with scattered woodland species dominated by *Betula lenta* (sweet birch). Central Appalachian-Piedmont Rich Boulderfield Forest (CEGL006471) is also found on boulderfields, but it occurs as a closed-canopy forest on fertile soils, dominated by "rich-site" trees such as *Acer nigrum* (black maple) and *Carya cordiformis* (bitternut hickory) with *Staphylea trifolia* (American bladdernut) in the shrub layer. It also has a high cover of early-season forbs, whereas Sweet Birch - Chestnut Oak Talus Woodland has a very sparse herb layer.

Harpers Ferry National Historical Park Other Comments: Short Hill Mountain stands are small and somewhat marginal compared to mainstream, middle-elevation stands in the Blue Ridge and Ridge and Valley. The stands also have some "basic" elements (such as seedlings of *Acer saccharum var. saccharum* (sugar maple)) due to the adjacency of rich forests in an area where disparate geologic substrates occur in close proximity.

None of the open boulderfields at Short Hill Mountain are large enough to be considered "nonvascular," especially since most are partly overhung by tree branches and contain abundant *Parthenocissus quinquefolia* (Virginia creeper).

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* (eastern hemlock) is codominant with *Betula lenta* (sweet birch) and/or *Quercus* (oak) spp. has been reported from Virginia by Hupp (1983) and from Pennsylvania by Fike (1999) but may refer to bouldery variants of *~Tsuga canadensis - Quercus montana - Betula lenta* Forest (CEGL006923)$$. Many Virginia populations of the state-rare, northern tree *Betula papyrifera var. cordifolia* (mountain paper birch) are associated with this community type.

ELEMENT DISTRIBUTION

Catoctin Mountain Park Range: This association is limited to the eastern third of the park on the Weverton (and to a more limited extent, Harpers) Formation.

Chesapeake & Ohio Canal National Historical Park Range: This community is mapped at two locations at approximately 365 m (1200 feet) on Maryland Heights in an area that overlaps with Harpers Ferry National Historical Park.

Harpers Ferry National Historical Park Range: Seven stands of Sweet Birch - Chestnut Oak Talus Woodland are documented on Short Hill Mountain, five along the Potomac River and two at higher elevations. Four additional stands (separated from each other partly by a powerline right-of-way corridor) are found on the lower north-facing slopes of Loudoun Heights south of the confluence of the Potomac and Shenandoah rivers. Stands mapped at approximately 365 m (1200 feet) on Maryland Heights represent disturbed examples, dominated by the invasive exotic tree, *Ailanthus altissima.* The specialized substrate of this community is present and does support characteristic rock-tripe lichens.. The largest stands are located along the river. Stands at higher elevations are considerably smaller in size.

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:SNR, NJ:S2S3, NY:SNR, PA:SNR, VA:S4, WV:S3

TNC Ecoregions: 49:C, 59:C, 60:P, 61:C

USFS Ecoregions (2007): 211Fc:PPP, 221Bd:CCP, 221D:CC, 221Ea:CCP, M221Ac:CCC, M221B:CC

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

Chesapeake & Ohio Canal National Historical Park Inventory Notes: This association is mapped at two locations at approximately 365 m (1200 feet) on Maryland Heights in an area that overlaps with Harpers Ferry National Historical Park. The observation is documented a Rapid Assessment point (80916a) conducted by Chris Lea in 2002.

Harpers Ferry National Historical Park Inventory Notes: This association is mapped in many places on Loudoun Heights and Short Hill. Two small polygons are the only place this is mapped on Maryland Heights and documented by a Rapid Assessment point (80916a) conducted by Chris Lea in 2002.
Catoctin Mountain Park Plots: CATO.22.
Harpers Ferry National Historical Park Plots: HAFE.102, HAFE.106, HAFE.108.
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
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 Taverna 2006, Fleming et al. 2007a, Fleming et al. 2017, 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, WVNHP unpubl. data, Walz 1996, Young et al. 2006, Young et al. 2007a, Young et al. 2009

G905. SOUTHERN APPALACHIAN VIRGINIA PINE - TABLE MOUNTAIN PINE WOODLAND

A0677 *Pinus pungens - Pinus rigida - Quercus montana* Woodland Alliance

This alliance encompasses woodlands dominated by some combination of *Pinus pungens* (Table Mountain pine), *Pinus rigida* (pitch pine), and *Pinus virginiana* (Virginia pine), often with *Quercus montana* (chestnut oak). Common canopy and subcanopy associates include *Acer rubrum* (red maple), *Castanea dentata* (American chestnut), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), and *Quercus coccinea* (scarlet oak). Typical shrubs include *Fothergilla major* (mountain witchalder), *Gaylussacia baccata* (black huckleberry), *Gaylussacia ursina* (bear huckleberry), *Kalmia latifolia* (mountain laurel), *Leiophyllum buxifolium* (sandmyrtle), *Eubotrys recurva* (redtwig doghobble), *Quercus ilicifolia* (bear oak), *Rhododendron catawbiense* (Catawba rosebay), *Rhododendron carolinianum* (Carolina azalea), *Rhododendron maximum* (great laurel), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium corymbosum* (highbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium simulatum* (upland highbush blueberry), and *Vaccinium stamineum* (deerberry). 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* (Pennsylvania sedge), *Comptonia peregrina* (sweet fern), *Epigaea repens* (trailing arbutus), *Galax urceolata* (beetleweed), *Gaultheria procumbens* (eastern teaberry), *Pteridium aquilinum var. latiusculum* (western brackenfern), and *Xerophyllum asphodeloides* (eastern turkeybeard). 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 montana* (chestnut oak) and *Quercus coccinea* (scarlet oak), except on the most extreme sites, where this vegetation is more self-perpetuating.

[CEGL004996] *Pinus (pungens, rigida) - Quercus montana / (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	Southern Appalachian Virginia Pine - Table Mountain Pine Woodland (G905)
Alliance	*Pinus pungens - Pinus rigida - Quercus montana* 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* (Table Mountain pine) and *Pinus rigida* (pitch pine), individually or together, codominate the canopy with *Quercus montana* (chestnut oak). 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* (scarlet oak), *Quercus rubra* (northern red oak), *Quercus marilandica* (blackjack oak), *Pinus virginiana* (Virginia pine), *Castanea dentata* (American chestnut), *Acer rubrum* (red maple), *Sassafras albidum* (sassafras), *Nyssa sylvatica* (blackgum), and *Amelanchier arborea* (common serviceberry). *Quercus ilicifolia* (bear oak) often dominates a moderately open to very dense tall-shrub layer, while variable combinations of *Kalmia latifolia* (mountain laurel), *Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium stamineum* (deerberry), *Pieris floribunda* (mountain fetterbush), *Rhododendron catawbiense* (Catawba rosebay), and other ericads form a generally dense low-shrub layer. *Smilax rotundifolia* (roundleaf greenbrier) and *Smilax glauca* (cat greenbrier) 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* (trailing arbutus), *Gaultheria procumbens* (eastern teaberry), *Xerophyllum asphodeloides* (eastern turkeybeard), *Iris verna* (dwarf violet iris), *Pteridium aquilinum var. latiusculum* (western brackenfern), *Melampyrum lineare var. latifolium* (narrowleaf cowwheat), *Stenanthium gramineum var. micranthum* (eastern featherbells), *Uvularia puberula* (mountain bellwort), *Lycopodium tristachyum* (deeproot clubmoss), *Aralia hispida* (bristly sarsaparilla) (usually on outcrops), and *Carex tonsa* (shaved sedge). 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

Catoctin Mountain Park Environment: This association occurs in small patches embedded within, or adjacent to, Central Appalachian-Northern Piedmont Chestnut Oak Forest (CEGL006299). It occupies steep, south- or east-facing slopes and on ridge crests. Exposed rock is common, and soil, where present in small depressions and crevices, is very stony, well-drained sandy loam. Leaf litter covers most of the ground surface where rock is not exposed. In one location, charcoal was evident at the interface between the A and O horizons.

Chesapeake & Ohio Canal National Historical Park Environment: This pine-oak/heath woodland was sampled with plots at four locations in the park. It was also mapped and documented with observation and rapid assessment points. The sites are steep upper sideslopes and interfluves with south to northwest aspects. The soils at the plots are rapidly to well-drained sand, sandy loam and silt loam. The unvegetated surface is dominated by leaf litter (92-96% cover) with some exposed bedrock (0-5%), large rocks (1-7%), wood (1%), bare soil (0-1%), and mosses and lichens (1-30%). Evidence of disturbance includes past fire, deer and cow grazing/browsing, and the presence of exotic species.

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* (Table Mountain pine) 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* (pitch pine) 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

Catoctin Mountain Park Vegetation: This association is species-poor, with only a few tree and shrub species, and no herbs except *Pteridium aquilinum* (western brackenfern) noted at any of the locations. Lichens and mosses are common on exposed rocks. The tree canopy is characterized by a mixed canopy of stunted and gnarled trees, most frequently *Pinus rigida* (pitch pine) and *Quercus montana* (chestnut oak). Other associated canopy species include *Nyssa sylvatica* (blackgum), *Pinus pungens* (Table Mountain pine), and *Quercus rubra* (northern red oak). A tall-shrub layer is composed of patchy, and often dense, *Kalmia latifolia* (mountain laurel). Occasional *Acer rubrum* (red maple), *Sassafras albidum* (sassafras), and *Betula lenta* (sweet birch) may also occur in the understory. There is often a patchy dwarf-shrub layer of *Gaylussacia baccata* (black huckleberry) and *Vaccinium pallidum* (Blue Ridge blueberry).

Chesapeake & Ohio Canal National Historical Park Vegetation: The sparse to moderate (20-60% cover) tree canopy is generally 10-20 m tall, but one stand has a moderate (60%) emergent canopy 20-35 m tall. They are dominated by *Pinus rigida* (pitch pine), *Pinus virginiana* (Virginia pine), *Quercus coccinea* (scarlet oak), and *Quercus montana* (chestnut oak). The sparse (10-40%) tall-shrub (6-10 m) and short-shrub (1-6 m) layer are made up of canopy species as well as *Amelanchier arborea* (common serviceberry), *Kalmia latifolia* (mountain laurel), and *Nyssa sylvatica* (blackgum). The dense herbaceous/ dwarf-shrub layer (60-80+%) is dominated by heaths *Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium stamineum* (deerberry). Nonvascular species are present and cover up to 30% of the ground surface. Only one exotic species was reported from sampled stands.

Global Vegetation: The canopies of stands of this type are codominated by *Pinus pungens* (Table Mountain pine) and *Pinus rigida* (pitch pine), either individually or together, with *Quercus montana* (chestnut oak). Scattered canopy and subcanopy associates may include *Quercus coccinea* (scarlet oak), *Quercus rubra* (northern red oak), *Quercus marilandica* (blackjack oak), *Pinus virginiana* (Virginia pine), *Castanea dentata* (American chestnut), *Acer rubrum* (red maple), *Sassafras albidum* (sassafras), *Nyssa sylvatica* (blackgum), and *Amelanchier arborea* (common serviceberry). *Quercus ilicifolia* (bear oak) often dominates a moderately open to very dense tall-shrub layer, while variable combinations of *Kalmia latifolia* (mountain laurel), *Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium stamineum* (deerberry), *Pieris floribunda* (mountain fetterbush), *Rhododendron catawbiense* (Catawba rosebay), and other ericads form a generally dense low-shrub layer. *Smilax rotundifolia* (roundleaf greenbrier) and *Smilax glauca* (cat greenbrier) 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* (trailing arbutus), *Gaultheria procumbens* (eastern teaberry), *Xerophyllum asphodeloides* (eastern turkeybeard), *Iris verna* (dwarf violet iris), *Pteridium aquilinum var. latiusculum* (western brackenfern), *Melampyrum lineare var. latifolium* (narrowleaf cowwheat), *Stenanthium gramineum var. micranthum* (eastern featherbells), *Uvularia puberula* (mountain bellwort), *Lycopodium tristachyum* (deeproot clubmoss), *Aralia hispida* (bristly sarsaparilla) (usually on outcrops), and *Carex tonsa* (shaved sedge). Although fully intergradational, two variants recognized in Virginia are very distinct in their typical expressions. Both share *Quercus montana* (chestnut oak) as a codominant canopy tree and have a similar ericaceous shrub layer composed largely of *Kalmia latifolia* (mountain laurel), *Gaylussacia baccata* (black huckleberry), and *Vaccinium pallidum* (Blue Ridge blueberry). However, in the first variant, which is usually associated with cliffs and rocky slopes, *Pinus pungens* (Table Mountain pine) is the most constant and abundant pine. In the second variant, most often associated with xeric upper slopes and crests, *Pinus rigida* (pitch pine) 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* (bear oak) 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

Global Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus pungens* (Table Mountain pine), *Pinus rigida* (pitch pine)
Tree canopy	Broad-leaved deciduous tree	*Quercus montana* (chestnut oak)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia* (mountain laurel)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Acer rubrum* (red maple), *Gaylussacia baccata* (black huckleberry), *Kalmia latifolia* (mountain laurel), *Nyssa sylvatica* (blackgum), *Pinus pungens* (Table Mountain pine), *Pinus rigida* (pitch pine), *Quercus coccinea* (scarlet oak), *Quercus ilicifolia* (bear oak), *Sassafras albidum* (sassafras), *Vaccinium pallidum* (Blue Ridge blueberry)
Chesapeake & Ohio Canal National Historical Park: *Gaylussacia baccata* (black huckleberry), *Pinus rigida* (pitch pine), *Pinus virginiana* (Virginia pine), *Quercus montana* (chestnut oak)
Global: *Buckleya distichophylla* (piratebush), *Carex polymorpha* (variable sedge), *Galax urceolata* (beetleweed), *Gaultheria procumbens* (eastern teaberry), *Gaylussacia baccata* (black huckleberry), *Iris verna* (dwarf violet iris), *Kalmia latifolia* (mountain laurel), *Lycopodium tristachyum* (deeproot clubmoss), *Melampyrum lineare* var. *latifolium* (narrowleaf cowwheat), *Nyssa sylvatica* (blackgum), *Pinus pungens* (Table Mountain pine), *Pinus rigida* (pitch pine), *Quercus coccinea* (scarlet oak), *Quercus ilicifolia* (bear oak), *Quercus montana* (chestnut oak), *Sassafras albidum* (sassafras), *Vaccinium pallidum* (Blue Ridge blueberry), *Xerophyllum asphodeloides* (eastern turkeybeard)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Digitaria ischaemum* (smooth crabgrass)
Global: Vulnerable Plants: *Buckleya distichophylla* (piratebush, G3, Subtype 1), *Carex polymorpha* (variable sedge, G3, Subtype 2), *Tsuga caroliniana* (Carolina hemlock, G2G3), *Vaccinium myrtilloides* (velvetleaf huckleberry, G5, VA state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (01-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 montana) / Kalmia latifolia - Vaccinium pallidum* Woodland (CEGL007097)
- *Pinus rigida - (Pinus pungens) / Rhododendron catawbiense - Kalmia latifolia / Galax urceolata* Woodland (CEGL004985)
- *Pinus rigida - Quercus montana / Gaylussacia baccata / Carex pensylvanica* Woodland (CEGL004821)
- *Pinus rigida / (Quercus ilicifolia) / Aronia melanocarpa / Deschampsia flexuosa* Woodland (CEGL006116)
- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus montana) / Vaccinium pallidum* Forest (CEGL007119)

Global Related Concepts:
- *Pinus (pungens, rigida) - Quercus prinus / (Quercus ilicifolia) / Gaylussacia baccata* Woodland (Fleming and Patterson 2009a) =
- *Pinus (pungens, rigida) - Quercus prinus / (Quercus ilicifolia) / Gaylussacia baccata* Woodland (Fleming and Taverna 2006) =
- *Pinus (pungens, rigida) - Quercus prinus / (Quercus ilicifolia) / Gaylussacia baccata* Woodland (Fleming et al. 2007b) =
- *Pinus pungens - Pinus rigida / Quercus ilicifolia / Gaylussacia baccata* Association (Rawinski et al. 1996) <
- *Pinus pungens - Quercus montana / Kalmia latifolia / Gaylussacia baccata* Woodland (Fleming 2002b) =
- *Pinus pungens - Quercus prinus - (Quercus coccinea) / Kalmia latifolia - Gaylussacia baccata* Woodland (Fleming and Coulling 2001) <

- *Pinus pungens - Quercus prinus / Kalmia latifolia / Gaylussacia baccata* Woodland (Fleming and Patterson 2003) =
- *Pinus pungens / Quercus ilicifolia / Gaylussacia baccata - Pteridium aquilinum* Woodland (Fleming and Moorhead 2000) <
- *Pinus rigida - Quercus montana - (Pinus virginiana) / (Quercus marilandica) / Kalmia latifolia* Woodland (Fleming 2002b) =
- *Pinus rigida - Quercus prinus - (Pinus virginiana) / (Quercus marilandica) / Kalmia latifolia* Woodland (Fleming and Patterson 2003) =
- *Pinus rigida / Quercus ilicifolia / Gaylussacia baccata* Association (Rawinski et al. 1994) <
- *Quercus montana - Pinus rigida / Quercus ilicifolia / Gaylussacia baccata* Woodland (Young et al. 2007a) =
- *Quercus prinus - Pinus rigida / Quercus ilicifolia - Kalmia latifolia - Gaylussacia baccata / Gaultheria procumbens* Woodland (Fleming and Coulling 2001) <
- Chestnut Oak: 44 (Eyre 1980) >
- Pitch Pine: 45 (Eyre 1980) >

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Catoctin Mountain Park Classification Comments: The Central Appalachian Pine - Oak / Heath Woodland is sometimes referred to as simply the Pine - Oak / Heath Woodland.
Chesapeake & Ohio Canal National Historical Park Classification Comments: The Central Appalachian Pine - Oak / Heath Woodland is sometimes referred to as simply the Pine - Oak / Heath Woodland.
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* (bear oak), 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* (bear huckleberry), *Rhododendron carolinianum* (Carolina azalea), *Rhododendron minus* (piedmont rhododendron), *Leiophyllum buxifolium* (sandmyrtle), and *Fothergilla major* (mountain witchalder). In 68 plots from Virginia, the most constant (≥62%) species, in order of descending constancy, are *Kalmia latifolia* (mountain laurel), *Vaccinium pallidum* (Blue Ridge blueberry), *Quercus montana* (chestnut oak), *Gaylussacia baccata* (black huckleberry), *Quercus ilicifolia* (bear oak), *Sassafras albidum* (sassafras), *Nyssa sylvatica* (blackgum), *Pinus rigida* (pitch pine), *Acer rubrum* (red maple), and *Amelanchier arborea* (common serviceberry). Other less constant species from this community with more northern affinities, which are absent or infrequent south of Virginia, are *Pieris floribunda* (mountain fetterbush) and *Vaccinium angustifolium* (lowbush blueberry). 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

Catoctin Mountain Park Range: This association is limited to the eastern portion of the park, on the Weverton Formation.
Chesapeake & Ohio Canal National Historical Park Range: This community was sampled with plots near Old Towne (Lock 68) and Roundtop Hill. It was also documented with rapid assessment and observation points and was mapped in the Ridge and Valley (Canal mile 140 - 173).
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:SNR, PA:SNR, VA:S4, WV:S3
TNC Ecoregions: 51:C, 52:C, 59:C, 61:?

USFS Ecoregions (2007): 221De:CCC, 231Ib:CCC, M221Aa:CCP, 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

Catoctin Mountain Park Plots: CATO.02, CATO.03, CATO.24.
Chesapeake & Ohio Canal National Historical Park Plots: (4 plots): CHOH.042, CHOH.066, CHOH.067, CHOH.615.
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
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 Coulling 2001*, Fleming and Moorhead 2000, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Harrison 2004, Harrison 2011, Rawinski et al. 1994, Rawinski et al. 1996, Southeastern Ecology Working Group n.d., WVNHP unpubl. data, Young et al. 2006, Young et al. 2007a, Young et al. 2009

G906. CENTRAL APPALACHIAN - NORTHEAST PINE - OAK ROCKY WOODLAND

A3312 *Pinus virginiana - Quercus montana* Acidic Shale Woodland Alliance

These mixed evergreen-deciduous woodlands and sparse woodlands are dominated by some combination of *Juniperus virginiana var. virginiana* (eastern red-cedar), *Pinus virginiana* (Virginia pine), and *Quercus montana* (chestnut oak). Hardwood associates include *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Carya ovata* (shagbark hickory), *Fraxinus americana* (white ash), *Quercus rubra* (northern red oak), *Quercus stellata* (post oak), and *Quercus velutina* (black oak). The shrub layer includes *Amelanchier arborea* (common serviceberry), *Gaylussacia baccata* (black huckleberry), *Quercus ilicifolia* (bear oak), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium stamineum* (deerberry). The herbaceous layer is generally sparse; grass and other graminoid species include *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa* (wavy hairgrass), *Dichanthelium linearifolium* (slimleaf panicgrass), and *Schizachyrium scoparium* (little bluestem). Forbs include *Cunila origanoides* (common dittany), *Heuchera americana* (American alumroot), *Hieracium venosum* (rattlesnakeweed), *Penstemon hirsutus* (hairy beardtongue), *Phlox subulata* (moss phlox), *Symphyotrichum cordifolium* (common blue wood aster), and *Viola pedata* (birdfoot violet). Lichens such as *Cladonia* (cup lichen) spp. are abundant in some areas. These woods are found on acidic shale substrates from Maryland, Pennsylvania, Virginia and West Virginia.

[CEGL006288] *Pinus virginiana - Juniperus virginiana - Quercus rubra / Solidago arguta var. harrisii - Opuntia humifusa* Woodland

Translated Name: **Virginia Pine - Eastern Red-cedar - Northern Red Oak / Shale Barren Goldenrod - Eastern Prickly-pear Woodland**
Common Name: **Central Appalachian 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	Central Appalachian - Northeast Pine - Oak Rocky Woodland (G906)
Alliance	*Pinus virginiana - Quercus montana* Acidic Shale Woodland Alliance (A3312)

ELEMENT CONCEPT

Global Summary: This shale barren woodland occurs on steep unstable shale slopes with areas of exposed bedrock in the central Appalachian Mountains from south-central Pennsylvania to southwestern Virginia. Most are at less than 400 m elevation, but they can range up to 750 m. Soils are acidic and available moisture is scarce. Most substrates are shale-derived but sandstone may also be a component. Large expanses of exposed bedrock are typical.

Usually with a woodland or patchy woodland physiognomy, this association may occasionally occur as closed forest or sparse shrubland. The canopy is usually a mixture of oak and conifers but may have either one or the other dominant. Canopy cover varies widely but is typically less than 70% and may be sparse. The herb layer is likewise variable but is commonly less than 25%. Canopy dominants are *Pinus virginiana* (Virginia pine), *Juniperus virginiana* (eastern red-cedar) (often subordinate but occasionally dominant), *Quercus rubra* (northern red oak), and *Quercus montana* (chestnut oak). Associates vary and include *Quercus stellata* (post oak), *Carya glabra* (pignut hickory), *Celtis tenuifolia* (dwarf hackberry), *Quercus alba* (white oak), *Carya tomentosa* (mockernut hickory), and *Fraxinus americana* (white ash). Shrubs are typically sparse or scattered and include *Quercus ilicifolia* (bear oak), *Rhus copallinum* (winged sumac), *Hypericum prolificum* (shrubby St. Johnswort), and less frequently *Amelanchier arborea* (common serviceberry), *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Rhus aromatica* (fragrant sumac), and *Rosa carolina* (Carolina rose). *Carex pensylvanica* (Pennsylvania sedge) and *Danthonia spicata* (poverty oatgrass) are the most common ground-layer species; other graminoids that may be locally common at some sites include *Schizachyrium scoparium* (little bluestem) and *Deschampsia flexuosa* (wavy hairgrass). Typical forbs include *Antennaria plantaginifolia* (woman's tobacco), *Cunila origanoides* (common dittany), *Houstonia longifolia* (longleaf summer bluet), *Opuntia humifusa* (devil's-tongue), *Selaginella rupestris* (northern selaginella), *Hedeoma pulegioides* (American false pennyroyal), *Pellaea atropurpurea* (purple cliffbrake), *Polygonum scandens var. cristatum* (climbing false buckwheat), and *Cheilanthes lanosa* (hairy lipfern), as well as the shale barren endemics (or near-endemics) *Paronychia montana* (mountain nailwort), *Antennaria virginica* (shale barren pussytoes), *Allium oxyphilum* (lillydale onion), *Packera antennariifolia* (shale barren ragwort), *Oenothera argillicola* (shale barren evening-primrose), *Solidago arguta var. harrisii* (Harris' goldenrod), *Scutellaria ovata* (heartleaf skullcap), and *Trifolium virginicum* (Kates Mountain clover). Southern examples may contain *Clematis albicoma* (whitehair leather flower) and/or *Taenidia integerrima* (yellow pimpernel). This association differs from other acidic shale barren types in its more northerly distribution, and the absence of the more southerly shale barren endemics (or near-endemics) *Allium cernuum* (nodding onion), *Arabis serotina* (shale barren rockcress), and *Clematis coactilis* (Virginia whitehair leather flower), as well as the absence of some other species typical of the more species-rich barrens, such as *Silene caroliniana* (sticky catchfly), *Penstemon canescens* (eastern gray beardtongue), and *Penstemon pallidus* (pale beardtongue). Indicators include *Opuntia humifusa* (devil's-tongue) and *Solidago arguta var. harrisii* (Harris' goldenrod).

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This community occurs on steep, unstable shale slopes with large areas of exposed bedrock.

Global Environment: This association occurs on moderate to very steep, unstable shale slopes with areas of exposed bedrock (mean in Virginia plots = 82%, 42°). Aspect ranges from southeast to west, on convex slopes, ridge spurs, and clifftops which have maximum solar exposure. Most substrates are shale-derived but sandstone may also be a component. Soils, where present, are very strongly acidic (plots mean pH of about 4.8). Virginia plots have moderately high calcium and magnesium levels.

Vegetation Description

Chesapeake & Ohio Canal National Historical Park Vegetation: The canopy is dominated by a mix of scattered, stunted *Pinus virginiana* (Virginia pine), *Juniperus virginiana* (eastern red-cedar), *Quercus montana (=Quercus prinus)*, and *Quercus rubra. Pinus pungens* is occasionally present. The shrub layer is open and usually lacking *Vaccinium* (blueberry) spp. and *Quercus ilicifolia* (bear oak). Instead, *Amelanchier arborea* (common serviceberry) and *Rosa carolina* (Carolina rose) are somewhat common. The herb layer is open and characterized by *Carex pensylvanica* (Pennsylvania sedge) and *Danthonia spicata* (poverty oatgrass) with *Schizachyrium scoparium* (little bluestem) and *Deschampsia flexuosa* (wavy hairgrass) sometimes locally common. *Cunila origanoides* (common dittany), *Solidago arguta* var. *harrisii*, *Packera antennariifolia* (shale barren ragwort), and/or *Paronychia montana* (mountain nailwort) may also be present.

Global Vegetation: Usually with a woodland or patchy woodland physiognomy, this association may occasionally occur as closed forest or sparse shrubland. The canopy is usually a mixture of oak and conifers but may have either one or the other dominant. Canopy cover varies widely but is typically less than 70% and may be sparse. The herb layer is likewise variable but is commonly less than 25%. Canopy dominants are *Pinus virginiana* (Virginia pine), *Juniperus virginiana* (eastern red-cedar) (often subordinate but occasionally dominant), *Quercus rubra* (northern red oak), and *Quercus montana* (chestnut oak). Associates vary and include *Quercus stellata* (post oak), *Carya glabra* (pignut hickory), *Celtis tenuifolia* (dwarf hackberry), *Quercus alba* (white oak), *Carya tomentosa* (mockernut hickory), and *Fraxinus americana* (white ash). Shrubs are typically sparse or scattered and include *Quercus ilicifolia* (bear oak), *Rhus copallinum* (winged sumac), *Hypericum prolificum* (shrubby St. Johnswort), and less frequently

Amelanchier arborea (common serviceberry), *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Rhus aromatica* (fragrant sumac), and *Rosa carolina* (Carolina rose). *Carex pensylvanica* (Pennsylvania sedge) and *Danthonia spicata* (poverty oatgrass) are the most common ground-layer species; other graminoids that may be locally common at some sites include *Schizachyrium scoparium* (little bluestem) and *Deschampsia flexuosa* (wavy hairgrass). Typical forbs include *Antennaria plantaginifolia* (woman's tobacco), *Cunila origanoides* (common dittany), *Houstonia longifolia* (longleaf summer bluet), *Opuntia humifusa* (devil's-tongue), *Selaginella rupestris* (northern selaginella), *Hedeoma pulegioides* (American false pennyroyal), *Pellaea atropurpurea* (purple cliffbrake), *Polygonum scandens var. cristatum* (climbing false buckwheat), and *Cheilanthes lanosa* (hairy lipfern), as well as the shale barren endemics (or near-endemics) *Paronychia montana* (mountain nailwort), *Antennaria virginica* (shale barren pussytoes), *Allium oxyphilum* (lillydale onion), *Packera antennariifolia* (shale barren ragwort), *Oenothera argillicola* (shale barren evening-primrose), *Solidago arguta var. harrisii* (Harris' goldenrod), *Scutellaria ovata* (heartleaf skullcap), and *Trifolium virginicum* (Kates Mountain clover). Southern examples may contain *Clematis albicoma* (whitehair leather flower) and/or *Taenidia integerrima* (yellow pimpernel). High surficial rock cover appears to limit species richness in this type of shale barren. In 38 plots over the range of this association, vascular plant richness ranged from 8 to 56 and averaged 28.3 species per 400-m2 plot; with northern examples more depauperate than southern ones. The shale barren endemics *Packera antennariifolia* (shale barren ragwort) and, to a lesser extent, *Eriogonum allenii* (shale barren buckwheat) are characteristic plants in Virginia.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana* (eastern red-cedar), *Pinus virginiana* (Virginia pine)
Tree canopy	Broad-leaved deciduous tree	*Quercus rubra* (northern red oak)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa* (wavy hairgrass), *Juniperus virginiana* (eastern red-cedar), *Pinus virginiana* (Virginia pine), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak)
Global: *Campanula divaricata* (small bonny bellflower), *Clematis coactilis* (Virginia whitehair leather flower), *Deschampsia flexuosa* (wavy hairgrass), *Dicentra eximia* (turkey corn), *Juniperus virginiana* (eastern red-cedar), *Opuntia humifusa* (devil's-tongue), *Packera antennariifolia* (shale barren ragwort), *Phlox subulata* (moss phlox), *Pinus virginiana* (Virginia pine), *Quercus rubra* (northern red oak), *Selaginella rupestris* (northern selaginella), *Solidago arguta* var. *harrisii* (Harris' goldenrod), *Solidago bicolor* (white goldenrod)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Solidago arguta* var. *harrisii* (Harris' goldenrod, G5T4, WV state rare)
Global: Vulnerable Plants: *Allium oxyphilum* (lillydale onion, G2), *Arabis serotina* (shale barren rockcress, G2), *Clematis coactilis* (Virginia whitehair leather flower, G3), *Monarda fistulosa* var. *brevis* (wild bergamot, G5T1T2), *Solidago arguta* var. *harrisii* (Harris' goldenrod, G5T4, WV state rare), *Trifolium virginicum* (Kates Mountain clover, G3, endemic or near-endemic shale barren plant); **Other Plants**: *Eriogonum allenii* (shale barren buckwheat, G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (14-Dec-1998). This association is restricted to shale talus slopes of the central Appalachian Mountains. Fewer than 100 occurrences of this community are suspected to occur rangewide.

RELATED CONCEPTS

Global Similar Types:
- *Juniperus virginiana - Fraxinus americana / Carex pensylvanica - Cheilanthes lanosa* Open Woodland (CEGL006037)
- *Pinus virginiana - Quercus montana / Packera antennariifolia - Phlox subulata* Woodland (CEGL006562)
- *Pinus virginiana - Quercus montana / Quercus ilicifolia / (Hieracium greenii, Viola pedata)* Woodland (CEGL008525)
- *Quercus montana - Carya glabra / Cheilanthes lanosa - Carex pensylvanica - Camassia scilloides* Woodland (CEGL007070)

Global Related Concepts:

- *Pinus virginiana - Juniperus virginiana - (Quercus stellata) / (Opuntia humifusa, Viola pedata)* shale barren woodland (Vanderhorst 2002a) **?**
- *Pinus virginiana - Quercus montana - Quercus rubra / Deschampsia flexuosa - Paronychia montana* Woodland (Fleming and Patterson 2009b) **=**
- *Pinus virginiana - Quercus prinus / Oenothera argillicola - Solidago arguta var. harrisii* shale barren sparse woodland (Vanderhorst 2002a) **?**
- *Quercus prinus - Pinus virginiana / Deschampsia flexuosa - Selaginella rupestris - Packera antennariifolia* Woodland (Fleming and Coulling 2001) **?**
- Chestnut oak-Virginia pine/hairgrass acidic shale woodland (northern type) (CAP pers. comm. 1998) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: This association is mapped as Shale Barren Woodland Map Class (COMP_SBWO), which includes four associations, Central Appalachian Circumneutral Barrens (CEGL006037), North-Central Appalachian Acidic Shale Woodland (CEGL006288), Central Appalachian Xeric Shale Woodland (Virginia Pine / Sparse Herbs Type) (CEGL008525), and Central Appalachian Xeric Shale Woodland (Chestnut Oak / Mixed Herbs Type) (CEGL008526).
Global Classification Comments: This community is representative of shale barren vegetation to the north and southwest of the region of highest floristic endemism (west-central Virginia and adjacent West Virginia).

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This association is one of four communities mapped as Shale Barren Woodland Map Class (COMP_SBWO) along the Chesapeake & Ohio Canal at many locations on dry slopes in the Ridge and Valley (Canal mile 137-173).
Global Range: This community occurs in the central Appalachian Mountains from the Ridge and Valley of south-central Pennsylvania and Maryland to eastern West Virginia and west-central Virginia. It appears to be the typical vegetation type of more northern shale barrens. In Virginia, this unit is restricted to the Ridge and Valley province.
Nations: US
States/Provinces: MD:SNR, PA:SNR, VA:S3, WV:S3
TNC Ecoregions: 59:C
USFS Ecoregions (2007): M221Aa:CCP, M221Ab:CC?, M221Bd:CCC
Federal Lands: NPS (C&O Canal); USFS (George Washington, Monongahela)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
Global Description Author(s): G. Fleming, P. Coulling, and S.C. Gawler
References: Braunschweig et al. 1999, CAP pers. comm. 1998, Eastern Ecology Working Group n.d.*, Fike 1999, Fleming and Coulling 2001, Fleming and Patterson 2009b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Vanderhorst 2002a, Vanderhorst 2017a, WVNHP unpubl. data

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[CEGL008525] *Pinus virginiana - Quercus montana / 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	Central Appalachian - Northeast Pine - Oak Rocky Woodland (G906)
Alliance	*Pinus virginiana - Quercus montana* 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. In some areas, 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* (Virginia pine) and *Quercus montana* (chestnut oak), usually as a mixture but occasionally with one strongly dominant. *Pinus pungens* (Table Mountain pine) and *Quercus rubra* (northern red oak) are occasional canopy associates. Mean canopy cover is usually <50%, and dominant pines are <15 m tall. A sparse understory of younger *Pinus virginiana* (Virginia pine) and *Quercus montana* (chestnut oak) 6-10 m tall is usually present, often with *Amelanchier arborea* (common serviceberry). The sparse shrub layer is characterized by patchy *Quercus ilicifolia* (bear oak) and tree saplings. Low-growing *Vaccinium pallidum* (Blue Ridge blueberry) is the most abundant component of the short-shrub layer, sometimes occurring with *Vaccinium stamineum* (deerberry). The herbaceous flora of this vegetation is depauperate. *Carex pensylvanica* (Pennsylvania sedge) and *Danthonia spicata* (poverty oatgrass) are typical, although at low cover. Forbs tend to be variable among sites; the most typical are *Hieracium greenei* (Greene's hawkweed), *Viola pedata* (birdfoot violet), *Houstonia longifolia* (longleaf summer bluet), and *Solidago bicolor* (white goldenrod). Scattered individuals of the shale-barren endemics *Antennaria virginica* (shale barren pussytoes), *Packera antennariifolia* (shale barren ragwort), *Paronychia montana* (mountain nailwort), and *Eriogonum allenii* (shale barren buckwheat) 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 *Cladonia* (cup lichen) spp. lichens. This association differs from related shale-barren associations in its extremely depauperate flora, absence of *Juniperus virginiana* (eastern red-cedar), and presence of *Hieracium greenei* (Greene's hawkweed) and *Quercus ilicifolia* (bear oak). *Pinus pungens* (Table Mountain pine) may occur in this type and is very rarely found in other shale barren types.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: These open woodlands occur on relatively stable xeric slopes in the shale districts of the central Ridge and Valley.

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. In some areas, 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 other shale barren soils.

Vegetation Description

Chesapeake & Ohio Canal National Historical Park Vegetation: This community has an open canopy dominated or co-dominated by *Pinus virginiana* (Virginia pine) and *Quercus montana* (chestnut oak), with *Pinus pungens* (Table Mountain pine) as an occasional associate. The sparse to patchy shrub layer is characterized by *Quercus ilicifolia* (bear oak), *Vaccinium stamineum* (deerberry), and/or *Vaccinium pallidum* (Blue Ridge blueberry), and the herb layer is depauperate.

Global Vegetation: Vegetation is an open woodland dominated by *Pinus virginiana* (Virginia pine) and *Quercus montana* (chestnut oak), usually as a mixture but occasionally with one strongly dominant. *Pinus pungens* (Table Mountain pine) and *Quercus rubra* (northern red oak) are occasional canopy associates. Mean canopy cover is usually <50% and dominant pines are <15 m tall. A sparse understory of younger *Pinus virginiana* (Virginia pine) and *Quercus montana* (chestnut oak) 6-10 m tall is usually present, often with *Amelanchier arborea* (common serviceberry). The sparse shrub layer is characterized by patchy *Quercus ilicifolia* (bear oak) and tree saplings. Low-growing *Vaccinium pallidum* (Blue Ridge blueberry) is the most abundant component of the short-shrub layer, sometimes occurring with *Vaccinium stamineum* (deerberry). The herbaceous flora of this vegetation is depauperate. *Carex pensylvanica* (Pennsylvania sedge) and *Danthonia spicata* (poverty oatgrass) are typical, although at low cover. Forbs tend to be variable among sites; the most typical are *Hieracium greenei* (Greene's hawkweed), *Viola pedata* (birdfoot violet), *Houstonia longifolia* (longleaf summer bluet), and *Solidago bicolor* (white goldenrod). Scattered individuals of the shale-barren endemics *Antennaria virginica* (shale barren pussytoes), *Packera*

antennariifolia (shale barren ragwort), *Paronychia montana* (mountain nailwort), and *Eriogonum allenii* (shale barren buckwheat) 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 *Cladonia* (cup lichen) spp. lichens. Several mosses, including *Leucobryum glaucum* (leucobryum moss), *Polytrichum* (haircap moss) sp., and *Dicranum* (broom moss) sp., were also present in plots. This association has extraordinarily low species richness (range in Virginia plots = 9-20 taxa per 400 m2; 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* (Virginia pine) 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 montana* (chestnut oak), *Quercus alba* (white oak), and *Carya* (hickory) 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

Global Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus pungens* (Table Mountain pine), *Pinus virginiana* (Virginia pine)
Tree canopy	Broad-leaved deciduous tree	*Quercus montana* (chestnut oak)
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum* (Blue Ridge blueberry)

CHARACTERISTIC SPECIES

Global: *Antennaria virginica* (shale barren pussytoes), *Hieracium greenii* (Maryland hawkweed), *Pinus pungens* (Table Mountain pine), *Pinus virginiana* (Virginia pine), *Quercus ilicifolia* (bear oak), *Viola pedata* (birdfoot violet)

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 montana / Gaylussacia baccata / Carex pensylvanica* Woodland (CEGL004821)
- *Pinus virginiana - Juniperus virginiana - Quercus rubra / Solidago arguta var. harrisii - Opuntia humifusa* Woodland (CEGL006288)
- *Quercus montana / Quercus ilicifolia / Danthonia spicata* Woodland (CEGL008526) is a deciduous or mixed shale woodland with higher shrub and herb cover and overall species richness.

Global Related Concepts:

- *Pinus virginiana - Quercus prinus / Deschampsia flexuosa - Cunila origanoides* Woodland (Lea 2003) **?**
- *Pinus virginiana - Quercus prinus / Quercus ilicifolia / (Hieracium greenii)* Woodland (Fleming and Coulling 2001) **=**
- *Pinus virginiana - Quercus prinus / Quercus ilicifolia / (Hieracium greenii, Viola pedata)* Woodland (Fleming and Taverna 2006) **=**
- *Pinus virginiana - Quercus prinus / Quercus ilicifolia / (Hieracium greenii, Viola pedata)* Woodland (Fleming and Patterson 2009a) **=**
- *Pinus virginiana / Quercus ilicifolia / Coreopsis verticillata* Woodland (Fleming and Moorhead 2000) **?**

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Chesapeake & Ohio Canal National Historical Park Classification Comments: This association is mapped as Shale Barren Woodland Map Class (COMP_SBWO), which includes four associations, Central Appalachian

Circumneutral Barrens (CEGL006037), North-Central Appalachian Acidic Shale Woodland (CEGL006288), Central Appalachian Xeric Shale Woodland (Virginia Pine / Sparse Herbs Type) (CEGL008525), and Central Appalachian Xeric Shale Woodland (Chestnut Oak / Mixed Herbs Type) (CEGL008526). Central Appalachian Xeric Shale Woodland (Virginia Pine / Sparse Herbs Type) (CEGL008525) is also referred to as Central Appalachian Virginia Pine / Sparse Herbs Shale Woodland.
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* (Virginia pine), *Quercus ilicifolia* (bear oak), *Quercus montana* (chestnut oak), *Vaccinium pallidum* (Blue Ridge blueberry), *Amelanchier arborea* (common serviceberry), *Quercus rubra* (northern red oak), and *Danthonia spicata* (poverty oatgrass). 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

Chesapeake & Ohio Canal National Historical Park Range: This association is one of four communities mapped as Shale Barren Woodland Map Class (COMP_SBWO) along the Chesapeake & Ohio Canal at many locations on dry slopes in the Ridge and Valley (Canal mile 137-173).
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 Devonian shales in Pendleton, Hardy, and Hampshire counties, with a southern outlier in Monroe County.
Nations: US
States/Provinces: MD:SNA, VA:S3, WV:S3
TNC Ecoregions: 59:C
USFS Ecoregions (2007): M221Aa:CCP, M221Ab:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal); USFS (George Washington, Jefferson)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
Global Description Author(s): G.P. Fleming, P.P. Coulling, and S.C. Gawler
References: Eastern Ecology Working Group n.d., Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Taverna 2006, Fleming et al. 2017, Fowells 1965, Lea 2003, Vanderhorst 2017a, WVNHP unpubl. data

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[CEGL008449] *Pinus virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata / Leucobryum glaucum* Woodland

Translated Name: **Virginia Pine - Post Oak / Running Serviceberry / Poverty Oatgrass / Pincushion Moss Woodland**
Common Name: **Appalachian-Northern Piedmont Riverside Outcrop Woodland**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Central Appalachian - Northeast Pine - Oak Rocky Woodland (G906)
Alliance	*Pinus virginiana - Quercus montana* Acidic Shale Woodland Alliance (A3312)

ELEMENT CONCEPT

Global Summary: This community occupies exposed, xeric outcrops along high-gradient stretches of the New River in West Virginia and the Potomac River in Maryland and northern Virginia. It has an open to nearly closed canopy dominated by a mixture of evergreen conifer and deciduous tree species over a diverse understory of shrubs and herbs often with heavy ground cover by mosses and lichens. In West Virginia stands, the open canopy is dominated by about equal amounts of *Juniperus virginiana var. virginiana* (eastern red-cedar) and *Pinus virginiana* (Virginia pine). Associated deciduous tree species include *Quercus stellata* (post oak), *Fraxinus americana* (white

ash), *Celtis occidentalis* (common hackberry), *Ulmus americana* (American elm), and *Cercis canadensis* (eastern redbud). The dense shrub layer includes *Amelanchier stolonifera* (running serviceberry), *Rhus copallinum* (winged sumac), *Rosa carolina* (Carolina rose), and *Viburnum prunifolium* (blackhaw). Vines include *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis aestivalis* (summer grape). The exotics *Ligustrum vulgare* (European privet), *Rubus phoenicolasius* (wine raspberry), *Lonicera japonica* (Japanese honeysuckle), and *Rosa multiflora* (multiflora rose) may also be present. The herbaceous layer has high representation of grasses; species include *Andropogon virginicus* (broomsedge bluestem), *Danthonia spicata* (poverty oatgrass), *Leersia virginica* (whitegrass), *Melica mutica* (twoflower melicgrass), and *Piptochaetium avenaceum* (blackseed speargrass). The fern ally *Selaginella rupestris* (northern selaginella) may also contribute significant ground cover. Cover by mosses and lichens is variable and may approach 90%. The Potomac Gorge stands are woodlands or open forests of stunted trees (usually 7 m tall or less). The overstory may be strongly dominated by *Pinus virginiana* (Virginia pine) or by a mix of *Pinus virginiana* (Virginia pine), *Carya glabra* (pignut hickory), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), and *Quercus stellata* (post oak). *Fraxinus americana* (white ash) and *Juniperus virginiana var. virginiana* (eastern red-cedar) are minor, but constant, associates and are most often limited to the subcanopy, where *Juniperus virginiana var. virginiana* (eastern red-cedar) is often abundant. A sparse tall-shrub layer is present, with *Chionanthus virginicus* (white fringetree), *Viburnum prunifolium* (blackhaw), *Amelanchier arborea* (common serviceberry), and *Rhus copallinum* (winged sumac) most frequent. A short-shrub layer is often present and dominated by *Vaccinium pallidum* (Blue Ridge blueberry); *Hypericum prolificum* (shrubby St. Johnswort), *Rosa carolina* (Carolina rose), and *Amelanchier stolonifera* (running serviceberry) are less frequent. The herbaceous layer is somewhat sparse to moderately dense, with *Danthonia spicata* (poverty oatgrass) the most abundant species, and *Carex umbellata* (parasol sedge), *Carex tonsa var. tonsa* (shaved sedge), *Carex nigromarginata* (black edge sedge), *Helianthus divaricatus* (woodland sunflower), *Comandra umbellata* (bastard toadflax), *Solidago ulmifolia* (elmleaf goldenrod), *Eupatorium hyssopifolium var. laciniatum* (hyssopleaf thoroughwort), *Potentilla canadensis* (dwarf cinquefoil), *Silene caroliniana* (sticky catchfly), *Stylosanthes biflora* (sidebeak pencilflower), *Symphyotrichum patens* (late purple aster), *Dichanthelium laxiflorum* (openflower rosette grass), *Dichanthelium depauperatum* (starved panicgrass), *Dichanthelium commutatum* (variable panicgrass), *Dichanthelium sphaerocarpon* (roundseed panicgrass), *Dichanthelium villosissimum* (whitehair rosette grass), *Houstonia caerulea* (azure bluet), and *Houstonia longifolia* (longleaf summer bluet) often present. Vines are occasional; *Smilax glauca* (cat greenbrier) and *Vitis aestivalis* (summer grape) are the most frequent species.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: In the Potomac Gorge, this vegetation occurs on the rimrock of high bedrock terraces of metamorphic rocks (schists, gneisses, metagraywacke) below Great Falls that are flooded with an average return interval of 12 to 30 years. Soils are extremely shallow, often gravelly sands or loamy sands, with modest organic horizon development in protected areas. Samples collected from plots are extremely acidic with very low base status. Bedrock cover is high, usually from 20 -70%.

George Washington Memorial Parkway Environment: Appalachian-Northern Piedmont Riverside Outcrop Woodland is restricted in the Potomac Gorge section of George Washington Memorial Parkway to the rocky rims and high ledges of the bedrock terraces from the vicinity of Great Falls to Sandy Landing. The patches are linear and discontinuous and cover less than 2 ha (5 acre). The habitat of this community is characterized by massive, resistant exposures of Mather Gorge schist, metagraywacke, and migmatite that are violently scoured by flood events with a mean return interval of 12 to 30 years (Lea 2000). Site curvature is typically convex, while microtopography and slope inclination are highly variable. Soils are very shallow, sandy, and only locally developed in depressions and interstices. Soil samples collected from plots are consistently extremely acidic, with low calcium, magnesium, and total base saturation, and high iron and aluminum.

Global Environment: This community occupies exposed, xeric outcrops along high-gradient stretches of the New River in West Virginia and the Potomac River west of Washington, DC. In West Virginia, the type is associated with areas of flat sandstone along the New River Gorge National River (Camp Brookside and Sandstone Falls), West Virginia. These areas are above the normal river floodplain but are hypothesized to have been impacted by catastrophic floods in the late 1800s resulting in establishment of primary successional species on the scoured bedrock (McDonald and Trianosky 1995). The soils are shallow with considerable areas of exposed rock. Soils are extremely acidic (pH = 3.9) with high organic matter content and low levels of major nutrients (Mitchem 2004). Soil moisture regime is relatively xeric. Slopes range from level to moderate (mapping unit values range from 0-13°, mean = 4°). Elevations of mapped stands range from 379 to 402 m. In the Potomac Gorge, this vegetation occurs on the rimrock of high bedrock terraces of metamorphic rocks (schists, gneisses, metagraywacke) below Great Falls

that are flooded with an average return interval of 12 to 30 years. Soils are extremely shallow, often gravelly sands or loamy sands, with modest organic horizon development in protected areas. Samples collected from plots are extremely acidic with very low base status. Bedrock cover is high, usually from 20-70%.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: Dominant or codominant trees include *Carya glabra* (pignut hickory), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus stellata* (post oak), and *Pinus virginiana.* Other common trees include *Fraxinus americana* (white ash), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Quercus alba* (white oak), and *Robinia pseudoacacia* (black locust). Shrubs include *Amelanchier arborea*, *Carpinus caroliniana* (American hornbeam), *Celtis tenuifolia* (dwarf hackberry), *Chionanthus virginicus* (white fringetree), *Cornus florida* (flowering dogwood), *Euonymus americanus* (bursting-heart), *Fagus grandifolia* (American beech), *Hypericum prolificum* (shrubby St. Johnswort), *Ilex decidua*, *Juniperus virginiana var. virginiana* (eastern red-cedar), *Quercus marilandica* (blackjack oak), *Rhus copallinum* (winged sumac), *Rosa carolina var. carolina* (Carolina rose), *Vaccinium pallidum*, *Viburnum prunifolium* (blackhaw), and *Viburnum rafinesquianum.* Common herbaceous plants include *Carex albicans* (whitetinge sedge), *Carex nigromarginata* (black edge sedge), *Carex umbellata* (parasol sedge), *Chasmanthium latifolium* (Indian woodoats), *Comandra umbellata ssp. umbellata* (bastard toadflax), *Danthonia spicata* (poverty oatgrass), *Dichanthelium boscii* (Bosc's panicgrass), *Dichanthelium commutatum* (variable panicgrass), *Dichanthelium depauperatum* (starved panicgrass), *Juncus tenuis* (poverty rush), *Piptochaetium avenaceum* (blackseed speargrass), and *Schizachyrium scoparium.*

George Washington Memorial Parkway Vegetation: The vegetation is an open, stunted woodland of small trees between 9 and 12 m (30-39 feet) tall. The total mean cover contributed by trees in all height classes is about 50%. *Pinus virginiana* (Virginia pine) is strongly dominant in the canopy, with younger recruitment also present in gaps. *Juniperus virginiana var. virginiana* (eastern red-cedar), *Carya glabra* (pignut hickory), *Quercus rubra* (northern red oak), *Quercus montana* (chestnut oak), *Quercus stellata* (post oak), and *Fraxinus americana* (white ash) are less important trees that are often confined to a subcanopy layer. The shrub layer is very open (34% mean stratum cover) and includes tree saplings, *Chionanthus virginicus* (white fringetree), *Amelanchier stolonifera* (running serviceberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and other species at low constancy. The herb layer is rather sparse and consists of low patches of *Vaccinium pallidum* (Blue Ridge blueberry) and scattered xerophytic grasses and forbs. The most constant of these are *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Dichanthelium dichotomum var. dichotomum* (cypress panicgrass), *Polygonatum biflorum var. biflorum* (smooth Solomon's seal), and *Schizachyrium scoparium* (little bluestem). Additional, less constant herbs that have relatively high fidelity to this type include *Aristida dichotoma var. dichotoma* (churchmouse threeawn), *Andropogon virginicus var. virginicus* (broomsedge bluestem), *Dichanthelium depauperatum* (starved panicgrass), *Comandra umbellata ssp. umbellata* (bastard toadflax), *Silene caroliniana ssp. pensylvanica* (Pennsylvania catchfly), *Cardamine parviflora var. arenicola* (sand bittercress), and *Coreopsis verticillata* (whorled tickseed). Lithophytes such as *Arabis lyrata* (lyrate rockcress) and *Solidago simplex var. racemosa* (Rand's goldenrod) are often present in rock crevices. Prominent lichens growing on rocks in this community include *Xanthoparmelia conspersa* (xanthoparmelia lichen), *Flavoparmelia baltimorensis* (Baltimore flavoparmelia lichen), *Dimelaena oreina* (mountain lichen), and *Lasallia papulosa* (blistered naval lichen). *Cladonia* (cup lichen) spp. and the bryophytes *Leucobryum glaucum* (leucobryum moss), *Dicranum* (broom moss) spp., *Hedwigia ciliata* (ciliate hedwigia moss), and *Polytrichum* (haircap moss) sp. often grow on rocks and soils that are sheltered from trampling. Total species richness is low to moderate, ranging from 25 to 50 taxa/plot.

Global Vegetation: This woodland has an open to nearly closed canopy (40-75% total cover) dominated by a mixture of evergreen conifer and deciduous tree species over a diverse understory of shrubs and herbs often with heavy ground cover by mosses and lichens. The open canopy is dominated by about equal amounts of *Juniperus virginiana var. virginiana* (eastern red-cedar) and *Pinus virginiana* (Virginia pine). Associated deciduous tree species occurring in lesser amounts include *Quercus stellata* (post oak), *Fraxinus americana* (white ash), *Celtis occidentalis* (common hackberry), *Chionanthus virginicus* (white fringetree), *Ulmus americana* (American elm), *Gleditsia triacanthos* (honeylocust), *Ostrya virginiana* (hophornbeam), and *Cercis canadensis* (eastern redbud). In addition to saplings of tree species, the dense shrub layer (60% total cover) layer includes *Amelanchier stolonifera* (running serviceberry), *Rhus copallinum* (winged sumac), *Rosa carolina* (Carolina rose), and *Viburnum prunifolium* (blackhaw). The exotics *Ligustrum vulgare* (European privet) and *Rosa multiflora* (multiflora rose) may also be present. Vines (5% total cover) include *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis aestivalis* (summer grape). The invasive exotics *Lonicera japonica* (Japanese honeysuckle) and *Rubus phoenicolasius* (wine raspberry) may invade this stratum as well. The herbaceous layer

(20-40% cover) has high representation of grasses compared to most woodland communities in this region; species include *Andropogon virginicus* (broomsedge bluestem), *Danthonia spicata* (poverty oatgrass), *Leersia virginica* (whitegrass), *Melica mutica* (twoflower melicgrass), and *Piptochaetium avenaceum* (blackseed speargrass). Unusually high cover by the small fern *Asplenium platyneuron* (ebony spleenwort) has been noted in examples of this community; in addition, the fern ally *Selaginella rupestris* (northern selaginella) may contribute significant ground cover (Suiter 1995). Additional characteristic species in the herb layer include *Hypericum gentianoides* (orangegrass), *Krigia virginica* (Virginia dwarfdandelion), *Lespedeza virginica* (slender lespedeza), *Potentilla simplex* (common cinquefoil), *Salvia lyrata* (lyreleaf sage), *Symphyotrichum patens* (late purple aster), and *Toxicodendron radicans* (eastern poison-ivy). Vascular plant species richness in the 5 sampled plots at New River Gorge ranges from 19 to 53 (mean = 36.4). Cover by mosses and lichens is variable, though typically high, approaching 90%. Mosses identified in plots include *Dicranum condensatum* (condensed dicranum moss), *Dicranum scoparium* (dicranum moss), *Grimmia pilifera* (grimmia dry rock moss), *Hedwigia ciliata* (ciliate hedwigia moss), *Hypnum imponens* (hypnum moss), *Isopterygium tenerum* (isopterygium moss), *Leucobryum glaucum* (leucobryum moss), *Plagiomnium ciliare* (plagiomnium moss), *Polytrichum juniperinum* (juniper polytrichum moss), and *Thuidium delicatulum* (delicate thuidium moss). Lichens in the plots include *Cladonia furcata* (cup lichen), *Cladonia grayi* (Gray's cup lichen), *Cladonia robbinsii* (Robbins' cup lichen), *Cladonia strepsilis* (cup lichen), *Cladonia subtenuis* (reindeer lichen), *Parmotrema hypotropum* (parmotrema lichen), and *Punctelia rudecta* (punctelia).

Global Dynamics: The oldest trees in this community at Camp Brookside are estimated to be about 100 years in age based on increment cores taken from larger *Pinus virginiana* (Virginia pine) and *Juniperus virginiana* (eastern red-cedar) in 1994 (McDonald and Trianosky 1995). Although it is similar to other types which have fire ecologies, fire was probably not an important part of the natural disturbance regime of this association, and its herbaceous component is distinct from related fire-maintained communities. The use of fire to maintain conifer dominance is likely to have adverse effects on populations of rare plants. Management to maintain conifer dominance should proceed slowly with small trials and emphasize close monitoring of rare plant and exotic species populations as well as community composition and structure. Management of weed populations should take precedence over altering successional trends. Despite the above, in 2002 a controlled burn was conducted in this community at Camp Brookside with the objective of maintaining conifer dominance (Gellerstedt and Johnson 2005). The exotic *Rubus phoenicolasius* (wine raspberry) was found in the shrub layer of one plot at Sandstone Falls in 1999 and has since become abundant in this community at Camp Brookside, apparently in positive response to the controlled burn conducted in 2002. Fires have also occurred at Sandstone Falls where they were related to unregulated camping and other forms of recreation. This community continues to be subject to trampling by recreational visitors. Lea (2000) suggested that frequent mechanical damage to trees and xeric conditions were responsible for the ability of *Pinus virginiana* (Virginia pine) to maintain long-term dominance in the Potomac Gorge stands.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Juniperus virginiana* (eastern red-cedar), *Pinus virginiana* (Virginia pine)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Chionanthus virginicus* (white fringetree), *Danthonia spicata* (poverty oatgrass), *Piptochaetium avenaceum* (blackseed speargrass), *Quercus stellata* (post oak), *Rhus copallinum* (winged sumac), *Viburnum prunifolium* (blackhaw)

George Washington Memorial Parkway: *Amelanchier stolonifera* (running serviceberry), *Danthonia spicata* (poverty oatgrass), *Dichanthelium dichotomum* var. *dichotomum* (cypress panicgrass), *Juniperus virginiana* var. *virginiana* (eastern red-cedar), *Pinus virginiana* (Virginia pine), *Quercus stellata* (post oak)

Global: *Amelanchier stolonifera* (running serviceberry), *Andropogon virginicus* (broomsedge bluestem), *Celtis occidentalis* (common hackberry), *Chionanthus virginicus* (white fringetree), *Cladonia* spp., *Danthonia spicata* (poverty oatgrass), *Dicranum condensatum* (condensed dicranum moss), *Dicranum scoparium* (dicranum moss), *Fraxinus americana* (white ash), *Grimmia pilifera* (grimmia dry rock moss), *Hypericum gentianoides* (orangegrass), *Krigia virginica* (Virginia dwarfdandelion), *Leersia virginica* (whitegrass), *Leucobryum glaucum* (leucobryum moss), *Melica mutica* (twoflower melicgrass), *Piptochaetium avenaceum* (blackseed speargrass), *Polytrichum juniperinum* (juniper polytrichum moss), *Quercus stellata* (post oak), *Rhus copallinum* (winged sumac), *Rosa carolina* (Carolina rose), *Ulmus americana* (American elm), *Viburnum prunifolium* (blackhaw)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Cerastium glomeratum* (sticky chickweed), *Commelina communis* (Asiatic dayflower), *Dianthus armeria* (Deptford pink, Low/Insignificant), *Humulus japonicus* (Japanese hop, Medium/Low), *Lespedeza cuneata* (sericea lespedeza, Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Vicia cracca* (bird vetch)
George Washington Memorial Parkway: Vulnerable Plants: *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?, VA state-critically imperiled)
Global: Vulnerable Plants: *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?); **Invasive/Exotic Plants**: *Ligustrum vulgare* (European privet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (23-May-2011). The natural distribution of this community has no doubt always been extremely limited by its high environmental specificity and restriction to high-gradient river gorges. There are currently only two occurrences of this vegetation known (New River Gorge and occurrences on the Maryland and Virginia sides of the Potomac) totaling less than 100 hectares in aggregate. This community hosts several rare plant species and is itself a rare element of biodiversity. Unfortunately, its long-term persistence is uncertain due to altered flooding regimes since building of Bluestone Dam in 1949. Succession of this community towards deciduous woodland has been very slow, probably due to shallow, droughty soils and occasional catastrophic flooding impacts. Occurrences of this community are in extremely rocky areas which are protected and not vulnerable to resource extraction, conversion, or development; however, these areas may be impacted by trampling associated with recreational activities. Currently stands of this association are probably most threatened by encroachment of exotic weeds such as *Lonicera japonica* (Japanese honeysuckle), *Rubus phoenicolasius* (wine raspberry), and *Rosa multiflora* (multiflora rose).

RELATED CONCEPTS

Global Related Concepts:

- *Juniperus virginiana - Pinus virginiana - Quercus stellata / Asplenium platyneuron* woodland (Vanderhorst 2001b) <
- *Juniperus virginiana var. virginiana - Pinus virginiana - Quercus stellata / Amelanchier (stolonifera, nantucketensis) / Danthonia spicata* Woodland (Lea 2004) <
- *Pinus virginiana - Juniperus virginiana - Quercus stellata / Amelanchier stolonifera / Asplenium platyneuron / Leucobryum glaucum* Bedrock Terrace Woodland [Virginia Pine - Eastern Red-cedar Bedrock Terrace Woodland] (Vanderhorst 2017a) =
- *Pinus virginiana - Juniperus virginiana - Quercus stellata* woodland (Suiter 1995) <
- *Pinus virginiana - Juniperus virginiana - Quercus stellata* woodland (Suiter and Evans 1999) <
- *Pinus virginiana - Juniperus virginiana var. virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata / Leucobryum glaucum* Woodland (Fleming et al. 2007b) =
- *Pinus virginiana - Quercus stellata / Vaccinium pallidum / Helianthus divaricatus* Forest (Lea 2000) <
- Appalachian river flatrock (Rouse and McDonald 1986) >
- sub-mesic Virginia pine woodland (McDonald and Trianosky 1995) <

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Chesapeake & Ohio Canal National Historical Park Classification Comments: The Appalachian-Northern Piedmont Riverside Outcrop Woodland is sometimes referred to as Riverside Outcrop Woodland.
George Washington Memorial Parkway Classification Comments: The Appalachian-Northern Piedmont Riverside Outcrop Woodland, sometimes referred to as Riverside Outcrop Woodland, is readily distinguished by its rimrock habitat, open woodland physiognomy, and dominance by the evergreen trees *Pinus virginiana* (Virginia pine) and *Juniperus virginiana var. virginiana* (eastern red-cedar). In Great Falls Park, it mostly occurs adjacent to, but is usually sharply distinct from, Potomac River Bedrock Terrace Oak - Hickory Forest (CEGL006209), which is a more diverse, open deciduous forest. On the Maryland side of the river (particularly on Bear Island), where these types are much more extensive, compositional intergradation is more frequent.

George Washington Memorial Parkway Other Comments: Because of the more extensive terrace development, Maryland-side stands of this community cover a much larger area (>10 ha [25 acres]) than their Virginia counterparts.
Global Classification Comments: This community was first described by Rouse and McDonald (1986) as a part of the "Appalachian river flatrock" community, by McDonald and Trianosky (1995) as sub-mesic Virginia pine woodland, and by Suiter (1995) and Suiter and Evans (1999) as *Pinus virginiana - Juniperus virginiana - Quercus stellata* woodland. McDonald and Trianosky (1995) identified communities described from other eastern states which are superficially similar to the community described here, but their ecology is related to fire and/or edaphic regimes rather than flooding. They suggested this community may be most similar to xeric *Pinus virginiana* (Virginia pine) woodlands in the vicinity of Great Falls on the Potomac River in Maryland. The community at Great Falls has been described as *Pinus virginiana - Carya glabra - Quercus (rubra*, *stellata) / Chasmanthium latifolium* (Thomson et al. 1999) and *Pinus virginiana - Quercus stellata / Vaccinium pallidum / Helianthus divaricatus* Forest (Lea 2000). In a previous report (Vanderhorst 2001b), this association was divided into a woodland type and a sparsely vegetated type, however, floristic similarities, small size of openings, and constant co-occurrence of these physiognomic expressions support recognition of just one woodland association. Two separate community types within this association at Camp Brookside were also recognized and described by Mitchem (2004). In 2007, as part of the NCR parks vegetation mapping project, ecologists at VDNH and WVNHP compared classifications of the New River and Potomac Gorge stands. They agreed that, both compositionally and environmentally, the vegetation of the two areas was very similar and should be treated as a single USNVC association. Plots of the Potomac Gorge vegetation were examined in a large regional dataset assembled for the NCR project and performed as a discrete group. However, the Maryland plots sampled by Lea (2000) are much more species-rich (n = 72) and contain more species typical of the adjacent oak-hickory forest ~*Carya glabra - Quercus (rubra*, *montana) - Fraxinus americana / Viburnum rafinesqueanum* Forest (CEGL006209)$$ than the Virginia plots sampled by VDNH (n = 35), in which *Juniperus virginiana var. virginiana* (eastern red-cedar) is also much more important. These differences may have resulted from the different purposes and protocols of the two studies.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: In the Potomac Gorge, this vegetation occurs on the rimrock of high bedrock terraces below Great Falls (Canal mile 11-14).
George Washington Memorial Parkway Range: Appalachian-Northern Piedmont Riverside Outcrop Woodland is endemic to riverside outcrops of the Potomac Gorge (Maryland and Virginia) and the New River Gorge in West Virginia. The natural distribution of the type has no doubt always been extremely limited by its high environmental specificity and restriction to high-gradient river gorges. In George Washington Memorial Parkway, it is restricted to a small area of Great Falls Park, below Great Falls in Mather Gorge.
Global Range: This community is currently restricted to the New River Gorge of West Virginia and the Potomac Gorge in Maryland and Virginia.
Nations: US
States/Provinces: MD:S1, VA:S1, WV:S1
TNC Ecoregions: 50:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, M221Cb:CCC
Federal Lands: NPS (C&O Canal, George Washington Parkway, New River Gorge)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (6 plots): POTO_030.02, POTO_033.07, POTO_033.09, POTO_037.01, POTO_037.06, POTO_037.13.
George Washington Memorial Parkway Plots: GFNP_009, GFNP_010.
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Global Description Author(s): M. Pyne, after Vanderhorst (2000), S.C. Gawler and G.P. Fleming
References: Eastern Ecology Working Group n.d., Fleming 2007, Fleming et al. 2007b, Fleming et al. 2017, Gellerstedt and Johnson 2005, Harrison 2004, Harrison 2011, Lea 2000, Lea 2004, McDonald and Trianosky 1995, Mitchem 2004, Mitchem and Johnson 2001, Rouse and McDonald 1986, Suiter 1995, Suiter and Evans 1999, Thomson et al. 1999, Vanderhorst 2000a*, Vanderhorst 2001b, Vanderhorst 2017a, Vanderhorst et al. 2007, Vanderhorst pers. comm., WVNHP unpubl. data

[CEGL008540] *Quercus montana - 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	Central Appalachian - Northeast Pine - Oak Rocky Woodland (G906)
Alliance	*Pinus virginiana - Quercus montana* 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 montana* (chestnut oak) and *Pinus virginiana* (Virginia pine) in variable proportions; in some slightly more mesic occurrences, *Quercus rubra* (northern red oak) may occur with or in place of *Quercus montana* (chestnut oak). *Pinus pungens* (Table Mountain pine) is an important, even dominant, associate in a minority of stands. Minor but relatively constant tree associates include *Carya glabra* (pignut hickory), *Amelanchier arborea* (common serviceberry), and *Sassafras albidum* (sassafras). Minor, inconstant tree associates include *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Quercus stellata* (post oak), *Quercus marilandica* (blackjack oak), *Quercus alba* (white oak), *Carya tomentosa* (mockernut hickory), *Carya ovata* (shagbark hickory), *Juniperus virginiana* (eastern red-cedar), *Pinus strobus* (eastern white pine), and *Fraxinus americana* (white ash). The shrub layer varies from moderately dense to sparse, with *Vaccinium pallidum* (Blue Ridge blueberry) and *Vaccinium stamineum* (deerberry) the most constant and abundant species. *Quercus ilicifolia* (bear oak), *Kalmia latifolia* (mountain laurel), *Rhus copallinum* (winged sumac), *Rhus aromatica* (fragrant sumac), *Rosa carolina* (Carolina rose), *Castanea pumila* (chinquapin), *Viburnum acerifolium* (mapleleaf viburnum), and *Toxicodendron pubescens* (Atlantic poison-oak) are inconstant, but occasionally common, in the type. Herbaceous composition and density vary with shrub density. Graminoid-rich openings dominated by *Schizachyrium scoparium* (little bluestem), *Dichanthelium depauperatum* (starved panicgrass), *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), and *Dichanthelium commutatum* (variable panicgrass) are frequent. Also present is a surprising variety of low-cover forbs, among the most characteristic of which are *Hieracium venosum* (rattlesnakeweed), *Solidago erecta* (showy goldenrod), *Potentilla canadensis* (dwarf cinquefoil), *Campanula divaricata* (small bonny bellflower), *Viola sagittata* (arrowleaf violet), *Houstonia longifolia* (longleaf summer bluet), *Antennaria plantaginifolia* (woman's tobacco), *Aureolaria laevigata* (entireleaf yellow false foxglove), *Helianthus divaricatus* (woodland sunflower), *Cunila origanoides* (common dittany), *Symphyotrichum undulatum* (wavyleaf aster), *Coreopsis verticillata* (whorled tickseed), *Tephrosia virginiana* (Virginia tephrosia), *Lespedeza frutescens* (shrubby lespedeza), *Polygonatum biflorum var. biflorum* (smooth Solomon's seal), *Taenidia integerrima* (yellow pimpernel), *Asplenium platyneuron* (ebony spleenwort), and *Clitoria mariana* (Atlantic pigeonwings).

Environmental Description

Catoctin Mountain Park Environment: This association is known from only one location in the park, although other small patches may occur. It occupies a ledge atop a steep slope at an elevation of approximately 425 m (1400 feet). Boulders and exposed rock are common. Soil, where present, is sandy loam.

Chesapeake & Ohio Canal National Historical Park Environment: This chestnut oak woodland was sampled at three locations in the park. The sites are moderate to steep south to southwest facing slopes with well-drained loam soil. The unvegetated surface is dominated by leaf litter (70% cover) with some exposed bedrock (3%), large rocks (2%), wood (5%), and bare soil (20%). Evidence of disturbance includes the presence of exotic species.

Harpers Ferry National Historical Park Environment: Central Appalachian Chestnut Oak - Virginia Pine Woodland is scattered on middle slopes at the southern end of Maryland Heights, directly above the confluence of the Potomac and Shenandoah rivers. These sites are steep and convex with high solar exposure (south to southwest aspects) and significant cover of bedrock and large boulders. Underlying bedrock consists of quartzite and metasandstone of the Chilhowee Group. Soil samples are extremely acidic and very low in base status.

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

Catoctin Mountain Park Vegetation: The vegetation is characterized by a very open canopy of widely spaced, gnarled trees with dbh of 25-50 cm (10-20-inches). The understory is very open and grassy, with few shrubs present. The tree canopy is characterized by a mostly deciduous canopy with admixed pines; species include *Quercus rubra* (northern red oak), *Nyssa sylvatica* (blackgum), *Quercus montana* (chestnut oak), *Acer rubrum* (red maple), *Prunus serotina* (black cherry), *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), *Juniperus virginiana* (eastern red-cedar), *Pinus virginiana* (Virginia pine), and a single individual of *Pinus pungens* (Table Mountain pine). The field layer is made up of *Danthonia spicata* (poverty oatgrass), *Schizachyrium scoparium* (little bluestem), *Dichanthelium boscii* (Bosc's panicgrass), *Viola sagittata* (arrowleaf violet), *Asclepias verticillata* (whorled milkweed), *Brachyelytrum erectum* (bearded shorthusk), *Hypericum gentianoides* (orangegrass), *Hypoxis hirsuta* (common goldstar), *Lespedeza virginica* (slender lespedeza), *Muhlenbergia sobolifera* (rock muhly), *Pycnanthemum tenuifolium* (narrowleaf mountainmint), *Thalictrum thalictroides* (rue-anemone), *Epigaea repens* (trailing arbutus), *Cunila origanoides* (common dittany), *Carex pensylvanica* (Pennsylvania sedge), and *Parthenocissus quinquefolia* (Virginia creeper). Lichens and mosses are abundant on exposed rock; *Umbilicaria mammulata* (navel lichen) and *Cladina rangiferina* are two species of lichen, and mosses include species of *Polytrichum* (haircap moss) and *Leucobryum* (leucobryum moss).

Chesapeake & Ohio Canal National Historical Park Vegetation: The sparse to moderate (20%-60% cover) tree canopy, 10-20 m tall, is dominated by *Carya alba*, *Fraxinus americana* (white ash), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Pinus virginiana* (Virginia pine). Common woody plants in the sparse (20%-40%) tall-shrub (6-10 m) layer are *Amelanchier arborea* (common serviceberry), *Cary glabra*, *Fraxinus americana* (white ash), *Kalmia latifolia* (mountain laurel), *Pinus virginiana* (Virginia pine), *Prunus serotina* and *Sassafras albidum* (sassafras). Dominant short-shrubs include *Gaylussacia baccata* (black huckleberry) and *Vaccinium pallidum* (Blue Ridge blueberry). Some other short-shrubs (1-6 m) include *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), *Cornus florida* (flowering dogwood), *Kalmia latifolia* (mountain laurel), *Quercus montana* and *Quercus rubra* (northern red oak). The herbaceous layer (60%) is dominated by *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Dichanthelium boscii* (Bosc's panicgrass), and *Dichanthelium depauperatum* (starved panicgrass). Other common herbaceous plants include *Agrostis capillaris* (colonial bentgrass), *Antennaria plantaginifolia* (woman's tobacco), *Antennaria howellii ssp. neodioica* (Howell's pussytoes), *Cunilla origanoides*, *Dichanthelium commutatum* (variable panicgrass), *Hieracium venosum* (rattlesnakeweed), *Lespedeza repens* (creeping lespedeza), *Paronychia canadensis* (smooth forked nailwort), *Potentilla canadensis* (dwarf cinquefoil), *Schizachyrium scoparium* (little bluestem), and *Symphyotrichum undulatum* (wavyleaf aster). Two exotic species were reported from sampled stands.

Harpers Ferry National Historical Park Vegetation: The vegetation is a mixed oak-pine woodland with a canopy of stunted, often gnarled trees, varying from semi-open to very open. The canopy is codominated by *Quercus montana* (chestnut oak) and *Pinus virginiana* (Virginia pine) in variable proportions. In some slightly more mesic patches of the stand, *Quercus rubra* (northern red oak) and *Fraxinus americana* (white ash) may occur with or in place of *Quercus montana* (chestnut oak). Minor tree associates include *Carya glabra* (pignut hickory), *Amelanchier arborea* (common serviceberry), *Sassafras albidum* (sassafras), *Quercus coccinea* (scarlet oak), *Acer rubrum* (red maple), and *Cornus florida* (flowering dogwood). The shrub layer varies throughout the stand from moderately dense to sparse, with *Vaccinium pallidum* (Blue Ridge blueberry) the most constant and abundant species. In addition, *Rubus flagellaris* (northern dewberry), *Vitis aestivalis* (summer grape), *Smilax glauca* (cat greenbrier), and *Toxicodendron radicans* (eastern poison-ivy) also occur with low cover (<2%).

Herbaceous composition and density vary with shrub density. Scattered graminoid-rich openings dominated by *Danthonia spicata* (poverty oatgrass), *Schizachyrium scoparium* (little bluestem), *Dichanthelium depauperatum* (starved panicgrass), *Carex pensylvanica* (Pennsylvania sedge), and *Dichanthelium commutatum* (variable panicgrass) are frequent. Also present is a variety of low-cover forbs, among the most characteristic of which are *Hieracium venosum* (rattlesnakeweed), *Potentilla canadensis* (dwarf cinquefoil), *Houstonia longifolia* (longleaf summer bluet), *Antennaria plantaginifolia* (woman's tobacco), *Triodanis perfoliata* (clasping Venus' looking-glass), *Hypericum perforatum* (common St. Johnswort), *Cunila origanoides* (common dittany), *Symphyotrichum undulatum* (wavyleaf aster), *Tephrosia virginiana* (Virginia tephrosia), *Polygonatum biflorum var. biflorum* (smooth Solomon's seal), *Agrostis capillaris* (colonial bentgrass), *Antennaria howellii ssp. neodioica* (Howell's pussytoes), and *Desmodium paniculatum var. paniculatum* (panicledleaf ticktrefoil).

Global Vegetation: The canopy cover of stunted, often gnarled trees varies from semi-open to very open. *Quercus montana* (chestnut oak) and *Pinus virginiana* (Virginia pine) are usually codominant in variable proportions; in some slightly more mesic occurrences, *Quercus rubra* (northern red oak) may occur with or in place of *Quercus montana* (chestnut oak). *Pinus pungens* (Table Mountain pine) is an important, even dominant, associate in a minority of stands. Minor but relatively constant tree associates include *Carya glabra* (pignut hickory), *Amelanchier arborea* (common serviceberry), and *Sassafras albidum* (sassafras). Minor, inconstant tree associates include *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Quercus stellata* (post oak), *Quercus marilandica* (blackjack oak), *Quercus alba* (white oak), *Carya tomentosa* (mockernut hickory), *Carya ovata* (shagbark hickory), *Juniperus virginiana* (eastern red-cedar), *Pinus strobus* (eastern white pine), and *Fraxinus americana* (white ash). The shrub layer varies from moderately dense to sparse, with *Vaccinium pallidum* (Blue Ridge blueberry) and *Vaccinium stamineum* (deerberry) the most constant and abundant species. *Quercus ilicifolia* (bear oak), *Kalmia latifolia* (mountain laurel), *Rhus copallinum* (winged sumac), *Rhus aromatica* (fragrant sumac), *Rosa carolina* (Carolina rose), *Castanea pumila* (chinquapin), *Viburnum acerifolium* (mapleleaf viburnum), and *Toxicodendron pubescens* (Atlantic poison-oak) are inconstant, but occasionally common, in the type. Herbaceous composition and density vary with shrub density. Graminoid-rich openings dominated by *Schizachyrium scoparium* (little bluestem), *Dichanthelium depauperatum* (starved panicgrass), *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), and *Dichanthelium commutatum* (variable panicgrass) are frequent. Occasional stands feature patch-dominance by *Sorghastrum nutans* (Indiangrass) or *Andropogon gerardii* (big bluestem). Also present is a surprising variety of low-cover forbs, among the most characteristic of which are *Hieracium venosum* (rattlesnakeweed), *Solidago erecta* (showy goldenrod), *Potentilla canadensis* (dwarf cinquefoil), *Campanula divaricata* (small bonny bellflower), *Viola sagittata* (arrowleaf violet), *Houstonia longifolia* (longleaf summer bluet), *Antennaria plantaginifolia* (woman's tobacco), *Aureolaria laevigata* (entireleaf yellow false foxglove), *Helianthus divaricatus* (woodland sunflower), *Cunila origanoides* (common dittany), *Symphyotrichum undulatum* (wavyleaf aster), *Coreopsis verticillata* (whorled tickseed), *Tephrosia virginiana* (Virginia tephrosia), *Lespedeza frutescens* (shrubby lespedeza), *Polygonatum biflorum var. biflorum* (smooth Solomon's seal), *Taenidia integerrima* (yellow pimpernel), *Asplenium platyneuron* (ebony spleenwort), and *Clitoria mariana* (Atlantic pigeonwings). Additional herbs occurring less frequently include *Lespedeza hirta* (hairy lespedeza), *Solidago odora* (anisescented goldenrod), *Deschampsia flexuosa* (wavy hairgrass), *Coreopsis major* (greater tickseed), *Solidago puberula var. puberula* (downy goldenrod), *Solidago bicolor* (white goldenrod), *Solidago arguta var. caroliniana* (Atlantic goldenrod), *Solidago sphacelata* (autumn goldenrod), *Hypericum hypericoides ssp. multicaule* (St. Andrew's cross), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Asclepias amplexicaulis* (clasping milkweed), *Sericocarpus asteroides* (toothed whitetop aster), *Dicentra eximia* (turkey corn), *Paronychia fastigiata* (hairy forked nailwort), *Sericocarpus linifolius* (narrowleaf whitetop aster), *Ionactis linariifolius* (flaxleaf whitetop aster), *Symphyotrichum laeve* (smooth blue aster), *Phlox subulata* (moss phlox), *Pellaea atropurpurea* (purple cliffbrake), *Polygonum scandens var. cristatum* (climbing false buckwheat), *Viola x palmata* (early blue violet), *Arabis laevigata* (smooth rockcress), and *Zizia trifoliata* (meadow alexanders). Vascular plant species richness of plot-sampled stands ranges from 17 to 56 taxa per 400 m2 (mean = 37). Nonvascular cover tends to be sparse and characterized by fruticose lichens, including *Cladonia arbuscula* (reindeer lichen).

MOST ABUNDANT SPECIES

Global Stratum	**Lifeform**	**Species**
Tree canopy	Needle-leaved tree	*Pinus virginiana* (Virginia pine)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry)

Herb (field)	Graminoid	*Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Dichanthelium depauperatum* (starved panicgrass), *Schizachyrium scoparium* (little bluestem)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Carex pensylvanica* (Pennsylvania sedge), *Fraxinus americana* (white ash), *Pinus virginiana* (Virginia pine), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Schizachyrium scoparium* (little bluestem)
Chesapeake & Ohio Canal National Historical Park: *Dichanthelium depauperatum* (starved panicgrass), *Quercus montana* (chestnut oak)
Harpers Ferry National Historical Park: *Danthonia spicata* (poverty oatgrass), *Dichanthelium depauperatum* (starved panicgrass), *Pinus virginiana* (Virginia pine), *Quercus montana* (chestnut oak), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry)
Global: *Carex pensylvanica* (Pennsylvania sedge), *Carex umbellata* (parasol sedge), *Castanea pumila* (chinquapin), *Danthonia spicata* (poverty oatgrass), *Dichanthelium commutatum* (variable panicgrass), *Dichanthelium depauperatum* (starved panicgrass), *Hieracium venosum* (rattlesnakeweed), *Lespedeza hirta* (hairy lespedeza), *Pinus virginiana* (Virginia pine), *Quercus marilandica* (blackjack oak), *Rhus copallinum* (winged sumac), *Schizachyrium scoparium* (little bluestem), *Solidago odora* (anisescented goldenrod), *Tephrosia virginiana* (Virginia tephrosia), *Toxicodendron pubescens* (Atlantic poison-oak), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Rumex acetosella* (common sheep sorrel, Medium/Low)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium)
Global: Vulnerable Plants: *Allium oxyphilum* (lillydale onion, G2), *Monarda fistulosa* var. *brevis* (wild bergamot, G5T1T2), *Taenidia montana* (mountain pimpernel, G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (08-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 montana / 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 montana - 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 montana / Quercus ilicifolia / Danthonia spicata* Woodland (CEGL008526) on dry shale slopes of the Central Appalachians.

Global Related Concepts:
- *Pinus pungens - Pinus rigida / Quercus ilicifolia / Gaylussacia baccata* Association: *Andropogon scoparius - Coreopsis verticillata - Dichanthelium depauperatum* Subassociation, *pro parte* (Rawinski et al. 1996) <
- *Quercus prinus - Pinus virginiana - (Pinus pungens) / Schizachyrium scoparium - Dichanthelium depauperatum* Woodland (Fleming and Patterson 2009a) =
- *Quercus prinus - Pinus virginiana - Quercus (marilandica, stellata) / Dichanthelium depauperatum* Woodland (Fleming and Coulling 2001) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

Catoctin Mountain Park Classification Comments: Central Appalachian Chestnut Oak - Virginia Pine Woodland is sometimes referred to as Xeric Chestnut Oak - Virginia Pine Woodland.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Central Appalachian Chestnut Oak - Virginia Pine Woodland is sometimes referred to as Xeric Chestnut Oak - Virginia Pine Woodland.
Harpers Ferry National Historical Park Classification Comments: Central Appalachian Chestnut Oak - Virginia Pine Woodland (sometimes referred to as Xeric Chestnut Oak - Virginia Pine Woodland) is clearly distinguishable in the park, occurring as a mixed oak-pine woodland with a canopy of stunted, often gnarled trees. The dominant canopy species *Quercus prinus* and *Pinus virginiana* (Virginia pine) clearly separate this type from the other woodlands in the park, Central Appalachian Basic Woodland (CEGL003683) and Northeastern Red-cedar Limestone Glade (CEGL006047). CEGL003683 occurs as open woodland dominated by *Fraxinus americana* (white ash) and *Carya glabra* (pignut hickory). CEGL006047 occurs as small grassy openings with scattered woody species dominated by *Juniperus virginiana var. virginiana* (eastern red-cedar).
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

Catoctin Mountain Park Range: Only one small polygon of this type is mapped in the park, in the south-central portion.
Chesapeake & Ohio Canal National Historical Park Range: This community was sampled near Blockhouse Point (Canal mile 21), Point of Rocks (between Canal miles 48 and 49), and Maryland Heights at Harpers Ferry (Canal mile 60-61).
Harpers Ferry National Historical Park Range: Central Appalachian Chestnut Oak - Virginia Pine Woodland occurs at one site in the park, at the southern end of Maryland Heights. The vegetation occurs on the steep, dry middle slopes above the Potomac River.
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:SNR, VA:S3, WV:S2
TNC Ecoregions: 52:C, 59:C, 61:C
USFS Ecoregions (2007): 231Ib:CCC, M221Aa:CCP, 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

Catoctin Mountain Park Plots: CATO.027.
Chesapeake & Ohio Canal National Historical Park Plots: (3 plots): CHOH.539, HAFE_015, HAFE_301.
Harpers Ferry National Historical Park Plots: HAFE.301.
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman and M.J. Russo
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Global Description Author(s): G.P. Fleming, P.P. Coulling, S.C. Gawler
References: Braunschweig et al. 1999, Eastern Ecology Working Group n.d., Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Taverna 2006, Fleming et al. 2007a, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2004, Rawinski et al. 1996, Vanderhorst et al. 2008, WVNHP unpubl. data, Young et al. 2009

M883. Appalachian-Interior-Northeastern Mesic Forest

G020. APPALACHIAN-CENTRAL INTERIOR MESIC FOREST

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* (tuliptree), *Prunus serotina* (black cherry), *Acer saccharum* (sugar maple), *Tilia americana* (American basswood) (both *var. americana* and *var. heterophylla*, the latter being especially characteristic), and *Fagus grandifolia* (American beech). Other associates can include *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), and *Magnolia* (magnolia) spp. (e.g., *Magnolia acuminata* (cucumber-tree), *Magnolia tripetala* (umbrella-tree), *Magnolia macrophylla* (bigleaf magnolia)). Stands are typically dominated by genera other than *Carya* (hickory) and *Quercus* (oak), although some species of these genera may be present, including *Carya cordiformis* (bitternut hickory), *Carya ovalis* (red hickory), *Carya ovata* (shagbark hickory), *Quercus alba* (white oak), *Quercus muehlenbergii* (chinquapin oak), *Quercus pagoda* (cherrybark oak), *Quercus rubra* (northern red oak), and *Quercus shumardii* (Shumard oak). A diverse herbaceous layer will contain species such as *Adiantum pedatum* (northern maidenhair), *Arisaema triphyllum* (Jack in the pulpit), *Galium* (bedstraw) spp., *Osmorhiza claytonii* (Clayton's sweetroot), *Podophyllum peltatum* (mayapple), *Polygonatum biflorum* (smooth Solomon's seal), *Trillium* (trillium) spp., and *Viola* (violet) spp.

A0235 *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava* Forest Alliance

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* (sugar maple), *Aesculus flava* (yellow buckeye), *Liriodendron tulipifera* (tuliptree), and *Tilia americana var. heterophylla* (American basswood). Other species that may occur in the canopy include *Acer nigrum* (black maple), *Carya cordiformis* (bitternut hickory), *Halesia tetraptera var. monticola* (mountain silverbell), *Fraxinus americana* (white ash), and *Quercus rubra* (northern red oak). Species composition varies with geology and/or elevation. Shrub strata are open to sparse and can include *Hydrangea arborescens* (wild hydrangea) or *Lindera benzoin* (northern spicebush). Herbaceous strata are typically lush and diverse. Species commonly found include *Actaea racemosa* (black baneberry), *Asarum canadense* (Canadian wildginger), *Caulophyllum thalictroides* (blue cohosh), *Hydrophyllum canadense* (bluntleaf waterleaf), *Hydrophyllum virginianum* (eastern waterleaf), *Laportea canadensis* (Canadian woodnettle), and *Sanguinaria canadensis* (bloodroot). However, the herbaceous layer is usually very diverse and variable. A partial list of other typical species includes *Adiantum pedatum* (northern maidenhair), *Ageratina altissima var. roanensis* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Carex plantaginea* (plantainleaf sedge), *Cystopteris protrusa* (lowland bladderfern), *Delphinium tricorne* (dwarf larkspur), *Dicentra canadensis* (squirrel corn), *Dicentra cucullaria* (Dutchman's breeches), *Hepatica nobilis var. acuta* (sharplobe hepatica), *Impatiens capensis* (orange jewelweed), *Impatiens pallida* (pale touch-me-not), *Osmorhiza claytonii* (Clayton's sweetroot), *Polystichum acrostichoides* (Christmas fern), *Prosartes lanuginosa* (yellow fairybells), *Tiarella cordifolia* (heartleaf foamflower), *Trillium erectum* (red trillium), *Trillium grandiflorum* (white trillium), and *Viola canadensis* (Canadian white violet). 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.

[CEGL008412] *Acer saccharum - Tilia americana / Asimina triloba / Jeffersonia diphylla - Caulophyllum thalictroides* Forest

Translated Name: **Sugar Maple - American Basswood / Pawpaw / Twinleaf - Blue Cohosh Forest**

Common Name: **Central Appalachian-Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh 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 community type occurs on mesic lower slopes at low elevations, over nutrient-rich substrates in the Ridge and Valley, Cumberlands, Central Appalachians, and Piedmont. Soils may be derived from limestone, dolomite, shale, siltstone, and various metamorphic and igneous rocks. Rock outcrops and bouldery colluvium are often prominent, but the soils supporting this unit are apparently deep, dark, and very fertile, with high mean pH and Ca levels. Canopy composition is mixed and variable, but either *Acer saccharum var. saccharum* (sugar maple) or *Acer nigrum* (black maple), or both, are consistently important and characteristic. *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Quercus muehlenbergii* (chinquapin oak), *Quercus rubra* (northern red oak), *Tilia americana* (American basswood), and *Ulmus rubra* (slippery elm) are frequent canopy associates. From the James River south, *Aesculus flava* (yellow buckeye) is a frequent canopy associate. The most typical and abundant shrub layer species are *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush), with shrub layers usually somewhat to very open (mean stratum cover = 35%). The herb layer is dense (>80% cover) and contains a number of leafy early-flowering species, among the most abundant of which are *Jeffersonia diphylla* (twinleaf), *Hydrophyllum canadense* (bluntleaf waterleaf), and *Caulophyllum thalictroides* (blue cohosh). Somewhat more delicate spring ephemerals that are frequent to locally abundant include *Chaerophyllum procumbens var. procumbens* (spreading chervil), *Delphinium tricorne* (dwarf larkspur), *Dicentra canadensis* (squirrel corn), *Dicentra cucullaria* (Dutchman's breeches), *Erigenia bulbosa* (harbinger of spring), *Erythronium americanum ssp. americanum* (dogtooth violet), *Floerkea proserpinacoides* (false mermaidweed), *Mertensia virginica* (Virginia bluebells), *Phlox divaricata* (wild blue phlox), *Sanguinaria canadensis* (bloodroot), and *Trillium sessile* (toadshade). Additional characteristic herbs are *Asarum canadense* (Canadian wildginger), *Carex albursina* (white bear sedge), *Carex jamesii* (James' sedge), *Cystopteris protrusa* (lowland bladderfern), *Hydrophyllum virginianum* (eastern waterleaf), *Impatiens pallida* (pale touch-me-not), *Osmorhiza claytonii* (Clayton's sweetroot), *Osmorhiza longistylis* (longstyle sweetroot), and *Viola pubescens var. scabriuscula* (downy yellow violet).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This sugar maple - American basswood / pawpaw forest was sampled at eight locations in the park. Sites range from steep to extremely steep mid and lower side slopes with mostly northern and western aspects. Soils are well-drained silt loam. The unvegetated surface is made up of leaf litter (4-94% cover), exposed bedrock (0-10%), large rocks (0-10%), small rocks (0-90%), wood (1-3%), bare soil (1-30%), and mosses and lichens (0-15%). Evidence of disturbance includes erosion and rockslide, some deer grazing/browsing, trails, and the presence of exotic species.

George Washington Memorial Parkway Environment: Central Appalachian-Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type) is restricted to lower slopes subtending the Potomac River floodplain. These slopes are moderately steep to very steep (range = 10-34 degrees) and generally north- to northeast-facing, contributing to somewhat sheltered and highly mesic site conditions. Rock outcrops and/or boulders may occasionally cover up to 25% of a 400-square-m plot, but most sites lack surface rocks and have a nearly continuous cover of leaf litter. Soils are dark brown, often stony, silt loams with moderately high calcium, magnesium, and manganese levels. The distribution of this type corresponds closely to areas where the prevalent acidic, metasedimentary bedrock units are extensively intruded by mafic igneous rocks or contain mafic clasts. Presumably, the mafic minerals (e.g., pyroxene, amphibole, hornblende) in these rocks are the primary contributors to enhanced soil fertility.

Harpers Ferry National Historical Park Environment: Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type) is restricted to toeslopes and lower slopes bordering the Potomac River floodplain. These slopes are moderately steep and generally north- to northeast-facing, contributing to somewhat sheltered and highly mesic site conditions. Rock outcrops and/or boulders may occasionally cover up to 25% of a 400-square-meter plot, but most

sites lack surface rocks and have a nearly continuous cover of leaf litter. Soils are dark brown, often stony, silt loams with moderately high calcium, magnesium, and manganese levels. The distribution of this type corresponds closely to areas where the prevalent acidic, metasedimentary bedrock units are extensively intruded by mafic igneous rocks or contain mafic clasts.

Global Environment: This community type occurs on mesic lower slopes at low elevations (40-567 m [130-1860 feet]). In Virginia, most occurrences are associated with north- to east-facing slopes along major waterways in the mountains and Piedmont, including the Potomac River, the Shenandoah River and its two forks, the James River and its major tributaries, the Roanoke (Staunton) River and its major tributaries, the New River and its major tributaries, the Clinch River and its major tributaries, the Powell River, and forks of the Holston River. Soils may be derived from limestone, dolomite, shale, siltstone, and various metamorphic and igneous rocks. Rock outcrops and bouldery colluvium are often prominent, but the soils supporting this unit are apparently deep, dark, and very fertile, with high mean pH and Ca levels. The type is widely but somewhat locally distributed in valleys of the central Appalachian Mountains, generally in small to medium-sized patches. East of the Blue Ridge, it becomes more local and confined to sheltered slopes and bluffs along western Piedmont rivers. In Virginia and Maryland, the most extensive occurrences are probably in carbonate rock districts of the Ridge and Valley province (Fleming 1999).

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: The sparse to very dense (20-80+% cover) tree canopy, 20-35 m tall, is dominated by *Acer saccharum var. saccharum* (sugar maple), *Quercus rubra* (northern red oak), and *Tilia americana* (American basswood). The sparse to very dense (20-80+%) subcanopy (10-20 m) is dominated by *Acer saccharum var. saccharum* (sugar maple) and *Tilia americana* (American basswood); additional tree species may include *Acer nigrum* (black maple), *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Juglans cinerea* (butternut), and others. The very sparse to moderate (5-50%) tall-shrub layer (6-10 m) and very sparse to dense (5-70%) short-shrub layer (0.5-1 m) are made up of canopy species as well as *Acer nigrum* (black maple), *Asimina triloba* (pawpaw), *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush), *Ostrya virginiana* (hophornbeam), *Staphylea trifolia* (American bladdernut), *Ulmus rubra* (slippery elm), and *Viburnum prunifolium* (blackhaw). Common species in the herbaceous layer (10-100%) include *Alliaria petiolata* (garlic mustard) (exotic), *Arabis laevigata* (smooth rockcress), *Asarum canadense* (Canadian wildginger), *Arisaema triphyllum* (Jack in the pulpit), *Cardamine concatenata* (cutleaf toothwort), *Dicentra canadensis* (squirrel corn), *Eurybia divaricata* (white wood aster), *Maianthemum racemosum* (feathery false lily of the valley), *Parthenocissus quinquefolia* (Virginia creeper), *Sanguinaria canadensis* (bloodroot), *Thalictrum dioicum* (early meadowrue), and many others. Nonvascular species may cover up to 50% of the ground surface. A total of 16 exotic species were reported from sampled stands. This community also supports 8 Maryland state-vulnerable species.

George Washington Memorial Parkway Vegetation: Mature stands are uneven-aged and have a closed canopy of tall (>32 m [105 feet]), well-formed trees, the largest >60 cm (24 inches) dbh and occasionally >80 cm (31 inches) dbh. Overstory composition is mixed, with variable combinations of *Liriodendron tulipifera* (tuliptree), *Fagus grandifolia* (American beech), *Acer saccharum var. saccharum* (sugar maple), *Fraxinus americana* (white ash), *Tilia americana var. americana* (American basswood), and *Carya cordiformis* (bitternut hickory) usually characteristic. Minor, less frequent overstory associates include *Betula lenta* (sweet birch), *Quercus rubra* (northern red oak), *Quercus muehlenbergii* (chinquapin oak), and *Ulmus rubra* (slippery elm). The subcanopy tree layers are usually open (10-25% cover) and contain *Ulmus rubra* (slippery elm) and small trees of *Acer saccharum var. saccharum* (sugar maple) and *Fagus grandifolia* (American beech). *Asimina triloba* (pawpaw) is abundant in both the lowest tree layer and the shrub layer, far exceeding any other woody species in total stem density. *Lindera benzoin* (northern spicebush) is a constant shrub-layer associate.

The herb layer is dense (80% mean stratum cover), lush, and characterized by a number of leafy, early-flowering species. *Caulophyllum thalictroides* (blue cohosh), *Claytonia virginica* (Virginia springbeauty), *Asarum canadense* (Canadian wildginger), *Trillium sessile* (toadshade), *Dicentra cucullaria* (Dutchman's breeches), *Dicentra canadensis* (squirrel corn), *Hydrophyllum canadense* (bluntleaf waterleaf), and *Erigenia bulbosa* (harbinger of spring) are the most frequent and abundant patch-dominants. Other characteristic, but less frequent or abundant herbs, include *Viola pubescens var. pubescens* (downy yellow violet), *Hydrophyllum virginianum* (eastern waterleaf), *Erythronium americanum* (dogtooth violet), *Deparia acrostichoides* (silver false spleenwort), *Osmorhiza claytonii* (Clayton's sweetroot), *Sanicula odorata* (clustered blacksnakeroot), *Cystopteris protrusa* (lowland bladderfern), *Allium tricoccum* (ramp), *Jeffersonia diphylla* (twinleaf), *Diplazium pycnocarpon* (glade fern), *Carex albursina* (white bear sedge), and *Phacelia covillei* (Coville's phacelia). The exotics *Alliaria petiolata* (garlic

mustard) and *Veronica hederifolia* (ivyleaf speedwell) are aggressive and problematic invaders of this vegetation type, even in undisturbed stands.

Harpers Ferry National Historical Park Vegetation: Mature stands are uneven-aged and have a closed canopy of tall, well-formed trees. Overstory composition is mixed, with *Acer nigrum* (black maple) the most common. Other overstory species include *Carya cordiformis* (bitternut hickory), *Carya ovalis* (red hickory), *Fraxinus americana* (white ash), and *Celtis occidentalis* (common hackberry). The subcanopy tree layers are usually open (10-25% cover) and contain *Acer nigrum* (black maple) and scattered trees of *Sassafras albidum* (sassafras). *Acer nigrum* (black maple) can also be abundant in the lowest tree layer. Other shrub layer species include *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush), either or both of which may be abundant.

The herb layer is dense (80% mean stratum cover), lush, and characterized by a number of leafy, early-flowering species. In the park, *Mertensia virginica* (Virginia bluebells), *Asarum canadense* (Canadian wildginger), *Erigenia bulbosa* (harbinger of spring), *Dicentra cucullaria* (Dutchman's breeches), *Dicentra canadensis* (squirrel corn), *Caulophyllum thalictroides* (blue cohosh), *Claytonia virginica* (Virginia springbeauty), and *Trillium sessile* (toadshade) are the most frequent and abundant patch-dominants. Other characteristic, but less frequent or abundant, herbs include *Viola canadensis var. canadensis* (Canadian white violet), *Erythronium americanum* (dogtooth violet), *Actaea racemosa* (black baneberry), *Jeffersonia diphylla* (twinleaf), *Hydrophyllum canadense* (bluntleaf waterleaf), *Laportea canadensis* (Canadian woodnettle), *Cardamine concatenata* (cutleaf toothwort), *Podophyllum peltatum* (mayapple), *Allium tricoccum* (ramp), and *Polystichum acrostichoides* (Christmas fern). The exotics *Alliaria petiolata* (garlic mustard) and *Veronica hederifolia* (ivyleaf speedwell) are aggressive and problematic invaders of this vegetation type, even in undisturbed stands.

Global Vegetation: Relatively undisturbed second-growth stands generally have a closed (80-100% cover) canopy of tall (>28 m), well-formed trees, the largest with dbh >50 cm and occasionally >80 cm. Canopy composition is mixed and variable, but either *Acer saccharum var. saccharum* (sugar maple) or *Acer nigrum* (black maple), or both, are consistently important and characteristic. *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Quercus muehlenbergii* (chinquapin oak), *Quercus rubra* (northern red oak), *Tilia americana* (American basswood), and *Ulmus rubra* (slippery elm) are frequent canopy associates. From the James River south, *Aesculus flava* (yellow buckeye) is a frequent canopy associate. A sparse (30-40% cover) understory layer of trees 15-20 m tall contains smaller representatives of the canopy trees, especially the two *Acer* (maple) species. Cover in the vertical strata below 15 m is usually very sparse. The most typical and abundant shrub layer species are *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush), with shrub layers usually somewhat to very open (mean stratum cover = 35%). The herb layer is dense (>80% cover) and contains a number of leafy early-flowering species, among the most abundant of which are *Jeffersonia diphylla* (twinleaf), *Hydrophyllum canadense* (bluntleaf waterleaf), and *Caulophyllum thalictroides* (blue cohosh). Somewhat more delicate spring ephemerals that are frequent to locally abundant include *Chaerophyllum procumbens var. procumbens* (spreading chervil), *Delphinium tricorne* (dwarf larkspur), *Dicentra canadensis* (squirrel corn), *Dicentra cucullaria* (Dutchman's breeches), *Erigenia bulbosa* (harbinger of spring), *Erythronium americanum ssp. americanum* (dogtooth violet), *Floerkea proserpinacoides* (false mermaidweed), *Mertensia virginica* (Virginia bluebells), *Phlox divaricata* (wild blue phlox), *Sanguinaria canadensis* (bloodroot), and *Trillium sessile* (toadshade). Additional characteristic herbs are *Asarum canadense* (Canadian wildginger), *Carex albursina* (white bear sedge), *Carex jamesii* (James' sedge), *Cystopteris protrusa* (lowland bladderfern), *Hydrophyllum virginianum* (eastern waterleaf), *Impatiens pallida* (pale touch-me-not), *Osmorhiza claytonii* (Clayton's sweetroot), *Osmorhiza longistylis* (longstyle sweetroot), and *Viola pubescens var. scabriuscula* (downy yellow violet). The exotics *Alliaria petiolata* (garlic mustard), *Veronica hederifolia* (ivyleaf speedwell), and *Stellaria media* (common chickweed), along with the weedy native *Galium aparine* (stickywilly), are aggressive and problematic invaders of this vegetation type, even in undisturbed stands. Herbaceous layers of this community typically exhibit strong patch dominance and pronounced seasonal aspects. Although the constancies of dominants in sampled stands are very high, observations indicate that *Jeffersonia diphylla* (twinleaf), *Hydrophyllum canadense* (bluntleaf waterleaf), and other species may be abundant in some stands and absent from others. Herbaceous growth and flowering begins early and reaches maximal diversity in mid to late spring, after which many species begin to die back with the onset of summer temperatures and full canopy closure. As a result the late-summer aspect of these herbaceous layers is one of low cover and depauperate floristics, a stark contrast to the lush and vibrant aspect of spring (Fleming 1999).

Global Dynamics: All of the sampled stands have largely recovered from logging in the distant past. Recent and current disturbances documented in plot sampling included excessive deer browse and invasive exotic weeds. Because of its locations adjacent to frequently flooded stream and river bottoms, which serve as migration corridors for many weedy plants, this association is particularly prone to degradation by nutrient-demanding, shade-tolerant

exotics. Observations indicate that *Dicentra* (bleedingheart) spp. and *Trillium sessile* (toadshade) are particularly favored by grazing deer, while *Caulophyllum thalictroides* (blue cohosh), *Delphinium tricorne* (dwarf larkspur), *Hydrophyllum* (waterleaf) spp., *Jeffersonia diphylla* (twinleaf) are rarely, if ever, grazed. Reduction of native herb cover by deer probably promotes the establishment and abundance of the unpalatable, noxious weed *Alliaria petiolata* (garlic mustard), perhaps the most serious exotic threat to native vegetation in these habitats (Fleming 1999).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer nigrum* (black maple), *Acer saccharum* var. *saccharum* (sugar maple), *Tilia americana* (American basswood)
Tall shrub/sapling	Broad-leaved deciduous tree	*Asimina triloba* (pawpaw)
Herb (field)	Flowering forb	*Floerkea proserpinacoides* (false mermaidweed), *Hydrophyllum canadense* (bluntleaf waterleaf), *Jeffersonia diphylla* (twinleaf)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Acer saccharum* var. *saccharum* (sugar maple), *Asimina triloba* (pawpaw), *Tilia americana* (American basswood)
George Washington Memorial Parkway: *Acer saccharum* var. *saccharum* (sugar maple), *Asimina triloba* (pawpaw), *Caulophyllum thalictroides* (blue cohosh), *Dicentra cucullaria* (Dutchman's breeches), *Ulmus rubra* (slippery elm)
Harpers Ferry National Historical Park: *Acer nigrum* (black maple), *Asarum canadense* (Canadian wildginger), *Carya cordiformis* (bitternut hickory), *Mertensia virginica* (Virginia bluebells)
Global: *Acer negundo* (box-elder), *Acer nigrum* (black maple), *Asarum canadense* (Canadian wildginger), *Asimina triloba* (pawpaw), *Blephilia hirsuta* (hairy pagoda-plant), *Carex jamesii* (James' sedge), *Carex sparganioides* (bur-reed sedge), *Caulophyllum thalictroides* (blue cohosh), *Chaerophyllum procumbens* var. *procumbens* (spreading chervil), *Claytonia virginica* (Virginia springbeauty), *Cystopteris protrusa* (lowland bladderfern), *Dicentra cucullaria* (Dutchman's breeches), *Erigenia bulbosa* (harbinger of spring), *Erythronium americanum* (dogtooth violet), *Floerkea proserpinacoides* (false mermaidweed), *Galium aparine* (stickywilly), *Hydrophyllum canadense* (bluntleaf waterleaf), *Jeffersonia diphylla* (twinleaf), *Mertensia virginica* (Virginia bluebells), *Morus rubra* (red mulberry), *Phlox divaricata* (wild blue phlox), *Staphylea trifolia* (American bladdernut), *Stellaria media* (common chickweed), *Trillium sessile* (toadshade), *Veronica hederifolia* (ivyleaf speedwell)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Carex albursina* (white bear sedge, G5, MD-vulnerable), *Cystopteris bulbifera* (bulblet bladderfern, G5, MD-vulnerable), *Dodecatheon meadia* (pride of Ohio, G5, MD-vulnerable), *Erigenia bulbosa* (harbinger of spring, G5, MD-vulnerable), *Galium concinnum* (shining bedstraw, G5, MD-vulnerable), *Hybanthus concolor* (eastern greenviolet, G5, MD-vulnerable), *Juglans cinerea* (butternut, G3, MD-vulnerable), *Symphyotrichum shortii* (Short's aster, G5, MD-vulnerable);
Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Berberis thunbergii* (Japanese barberry, High/Medium), *Cardamine hirsuta* (hairy bittercress), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Euonymus alatus* (burningbush, Low), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Humulus japonicus* (Japanese hop, Medium/Low), *Lamium purpureum* (purple deadnettle), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Stellaria media* (common chickweed, Low), *Veronica hederifolia* (ivyleaf speedwell)
George Washington Memorial Parkway: Vulnerable Plants: *Carex careyana* (Carey's sedge, G4G5, VA state-vulnerable), *Erigenia bulbosa* (harbinger of spring, G5, VA state-vulnerable), *Floerkea proserpinacoides* (false mermaidweed, G5, VA state-vulnerable), *Panax quinquefolius* (American ginseng, G3G4, under collection pressure), *Phacelia covillei* (Coville's phacelia, G3, VA state-critically imperiled), *Sanicula trifoliata* (largefruit blacksnakeroot, G4, VA state-vulnerable); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Veronica hederifolia* (ivyleaf speedwell)

Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Veronica hederifolia* (ivyleaf speedwell)
Global: Vulnerable Plants: *Actaea rubifolia* (Appalachian bugbane, G3, VA state-rare), *Arabis shortii* (Short's rockcress, G5, VA state-rare), *Enemion biternatum* (eastern false rue anemone, G5, VA state-rare), *Erythronium albidum* (white fawnlily, G5, VA state-rare), *Panax quinquefolius* (American ginseng, G3G4, under collection pressure), *Phacelia covillei* (Coville's phacelia, G3), *Stylophorum diphyllum* (celandine poppy, G5, VA state-rare), *Synandra hispidula* (Guyandotte beauty, G4, VA state-rare), *Valeriana pauciflora* (largeflower valerian, G4, VA state-rare); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Stellaria media* (common chickweed, Low), *Veronica hederifolia* (ivyleaf speedwell)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (14-Apr-2000). This community type is widely distributed and reasonably secure over its global range. Patches, however, tend to be small and invasive exotic weeds degrade the compositional integrity of most occurrences.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharum - Fraxinus americana / Carpinus caroliniana / Podophyllum peltatum* Forest (CEGL006459)
- *Acer saccharum - Tilia americana / Staphylea trifolia / Dryopteris marginalis - (Impatiens pallida)* Forest (CEGL006471)

Global Related Concepts:
- *Acer (nigrum, saccharum var. saccharum) / Asimina triloba / Jeffersonia diphylla - Hydrophyllum canadense* Forest (Fleming 1999) =
- *Acer (nigrum, saccharum) - Tilia americana / Asimina triloba / Jeffersonia diphylla - Hydrophyllum canadense* Forest (Fleming and Coulling 2001) =
- *Acer (nigrum, saccharum) - Tilia americana / Asimina triloba / Jeffersonia diphylla - Hydrophyllum canadense* Forest (Fleming 2007) =
- *Aesculus flava - Acer saccharum / Dicentra cucullaria - Jeffersonia diphylla* Association (Rawinski et al. 1996) <
- Sugar Maple - Basswood: 26 (Eyre 1980) >

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Central Appalachian-Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type) is also referred to simply as Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type).
George Washington Memorial Parkway Classification Comments: Central Appalachian-Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type), also referred to as Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type), co-occurs in the Potomac Gorge and sometimes intergrades with both Central Appalachian-Piedmont Rich Boulderfield Forest (CEGL006471) and Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest (CEGL006055). It can be generally distinguished from CEGL006471 by its relatively low cover of surface rocks and its lush vernal cover of herbaceous mesophytes. Differences with CEGL006055 include the much greater importance of *Acer saccharum var. saccharum* (sugar maple) (inconstant and confined to the understory in CEGL006055) and a suite of diagnostic herbs that includes *Caulophyllum thalictroides* (blue cohosh), *Trillium sessile* (toadshade), *Erigenia bulbosa* (harbinger of spring), *Dicentra canadensis* (squirrel corn), *Hydrophyllum canadense* (bluntleaf waterleaf), and *Diplazium pycnocarpon* (glade fern).
George Washington Memorial Parkway Other Comments: Exotic plants were present in every plot of this community, with *Veronica hederifolia* (ivyleaf speedwell) (10-25% mean cover) and *Alliaria petiolata* (garlic mustard) (5-10% mean cover) by far the most constant and abundant. Each plot contained an average of three exotics with a mean aggregate cover of 17%. Herbivory damage to herbaceous plants, ice or wind damage to overstory trees, and dogwood anthracnose were each noted in one plot. Observations made over a 25-year period also suggest that the number of canopy-class *Ulmus rubra* (slippery elm) have declined due to mortality from Dutch elm disease (*Ophiostoma ulmi* and *Ophiostoma novo-ulmi*). Over-grazing by deer does not seem to be as serious a problem in this vegetation in the Potomac Gorge as at many other sites. Data from plots outside this area suggest that *Dicentra* (bleedingheart) spp. and *Trillium sessile* (toadshade) are particularly favored by deer, while *Caulophyllum thalictroides* (blue cohosh), *Delphinium tricorne* (dwarf larkspur), and *Jeffersonia diphylla* (twinleaf)

are rarely, if ever, grazed (Fleming 1999). Reduction of native herb cover by deer may promote the establishment and abundance of *Alliaria petiolata* (garlic mustard), probably the most serious invasive threat to this community.

The Potomac Gorge plots showed strong fidelity to and overall floristic similarity with the larger group of plots representing this type in the NCR regional analysis. However, the Potomac Gorge stands differ notably from the classic Ridge and Valley limestone stands in the importance of *Fagus grandifolia* (American beech) and the infrequency and low abundance of *Jeffersonia diphylla* (twinleaf). The general paucity of oaks in the area's stands is also noteworthy but hardly surprising given the abundance of the long-lived, shade-tolerant competitors *Acer saccharum var. saccharum* (sugar maple) and *Fagus grandifolia* (American beech). There is little recruitment of *Liriodendron tulipifera* (tuliptree) in this type, except in scattered gaps, and both *Acer saccharum var. saccharum* (sugar maple) and *Fagus grandifolia* (American beech) can be expected to become even more dominant in the overstory of future stands.

Harpers Ferry National Historical Park Classification Comments: Central Appalachian-Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type), also referred to as Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type), co-occurs in the study area and sometimes intergrades with both Central Appalachian-Piedmont Rich Boulderfield Forest (CEGL006471) and Southern Appalachian Rich Cove Forest (Typic Type) (CEGL007710). It can be generally distinguished from CEGL006471 by its relatively low cover of surface rocks and its lush vernal cover of herbaceous mesophytes. Differences with CEGL007710 include the much greater importance of *Acer nigrum* (black maple) (absent or sparse in CEGL007710), location on the lowest slopes, and a suite of diagnostic herbs that includes *Mertensia virginica* (Virginia bluebells), *Trillium sessile* (toadshade), *Erigenia bulbosa* (harbinger of spring), and *Dicentra canadensis* (squirrel corn).

Global Classification Comments: Although its canopy composition is similar to that of other rich forests, this type may be distinguished by the prevalence of *Asimina triloba* (pawpaw) and herbaceous species that are confined to low elevations and are absent (or mostly so) from rich forest communities of mountain coves and ravines. Likewise, mountain species characteristic of medium to high elevations are generally absent. This community may be further distinguished by its relatively low-elevation habitats bordering major streams and alluvial floodplains. Because of the proximity to floodplains, species perhaps most often associated with alluvial habitats, e.g., *Acer negundo* (box-elder), *Celtis occidentalis* (common hackberry), *Juglans nigra* (black walnut), *Ulmus americana* (American elm), *Mertensia virginica* (Virginia bluebells), etc., are occasionally important.

Since many characteristic plants of this unit (e.g., *Acer nigrum* (black maple), *Carex jamesii* (James' sedge), *Erigenia bulbosa* (harbinger of spring), *Floerkea proserpinacoides* (false mermaidweed), *Hydrophyllum canadense* (bluntleaf waterleaf), *Jeffersonia diphylla* (twinleaf), *Phlox divaricata* (wild blue phlox), and *Trillium sessile* (toadshade)) have ranges centered west or northwest of Virginia, it seems likely that the geographic distribution of this type lies primarily west of the Appalachians. Bowen et al. (1995) describe similar vegetation in the Tennessee River Gorge as a "north slope mixed mesophytic community." In a study of Jessamine Gorge, Kentucky, Campbell and Meijer (1989) detail another similar community, among the characteristic species of which are *Acer saccharum* (sugar maple), *Quercus rubra* (northern red oak), *Fraxinus americana* (white ash), *Tilia* (basswood) spp., *Carex albursina* (white bear sedge), *Carex jamesii* (James' sedge), *Erythronium* (fawnlily) spp., *Trillium sessile* (toadshade), *Jeffersonia diphylla* (twinleaf), and *Dicentra* (bleedingheart) spp. Forests of well-drained floodplain terraces in this gorge have a similar composition, but with *Fagus grandifolia* (American beech), *Erigenia bulbosa* (harbinger of spring), *Phlox divaricata* (wild blue phlox), and *Polemonium reptans* (Greek valerian) more prominent. Additional species with more western affinities that have been recorded in stands of this type include, in the Potomac River drainage, *Arabis shortii* (Short's rockcress), *Enemion biternatum* (eastern false rue anemone), *Erythronium albidum* (white fawnlily), *Phacelia ranunculacea* (oceanblue phacelia), and *Valeriana pauciflora* (largeflower valerian); in southwestern Virginia, *Actaea rubifolia* (Appalachian bugbane), *Phacelia purshii* (Miami mist), *Stellaria corei* (Tennessee starwort), *Stylophorum diphyllum* (celandine poppy), and *Synandra hispidula* (Guyandotte beauty); and scattered throughout, *Allium tricoccum* (ramp), *Carex careyana* (Carey's sedge), *Ellisia nyctelea* (Aunt Lucy), *Panax trifolius* (dwarf ginseng), and *Polemonium reptans* (Greek valerian) (Fleming 1999).

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This forest association was sampled at Devil's Alley, Chilton Woods, Ferry Hill, Mountain Lock, south of Dargan Bend and south of Williamsport.

George Washington Memorial Parkway Range: Central Appalachian-Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type) is restricted in George Washington Memorial Parkway to lower slopes subtending the Potomac River floodplain in Turkey Run Park.

Harpers Ferry National Historical Park Range: Central Appalachian-Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type) is restricted to two sites in the park on lower slopes subtending the Potomac River

floodplain. The stands are located on the Virginia side of the Potomac River, east of the confluence with the Shenandoah River.
Global Range: This community probably occurs at low elevations throughout the central Appalachian region, Cumberlands, and Piedmont in Virginia, Maryland, West Virginia, Kentucky, and probably Tennessee. Its full geographic range, however, has not been determined. In Virginia, most occurrences are along major waterways of the Piedmont and mountains, including the Potomac River, the Shenandoah River and its two forks, the James River and its major tributaries, the Roanoke (Staunton) River and its major tributaries, and the New River and its major tributaries. The status of the type in the Clinch River, Powell River, and Holston River drainages of southwestern Virginia is less certain.
Nations: US
States/Provinces: KY:SNR, MD:SNR, TN:SNR, VA:S4, WV:S2
TNC Ecoregions: 50:C, 52:C, 59:C, 61:P
USFS Ecoregions (2007): 221Db:CCP, 221Dd:CCC, 221De:CCC, 221Hc:CCC, 221Ja:CCC, 231Aa:CCP, 231Ib:CCC, 231Ic:CCC, M221Aa:CCP, M221Ab:CCC, M221Bd:C??, M221Ce:CCP, M221Da:CCC, M221Db:CC?
Federal Lands: NPS (Big South Fork, C&O Canal, George Washington Parkway, Harpers Ferry); USFS (George Washington, Jefferson); USFWS (National Conservation Training Center)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (8 plots): CHOH.5, CHOH.9, CHOH.31, CHOH.48, CHOH.49, CHOH.50, CHOH.54, CHOH.241.
George Washington Memorial Parkway Plots: TURK_001, TURK_003, TURK_005, TURK_008, TURK_010, TURK_037, TURK_038, TURK_042.
Harpers Ferry National Historical Park Plots: HAFE.101.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Global Description Author(s): G.P. Fleming
References: Bowen et al. 1995, Campbell and Meijer 1989, Eyre 1980, Fleming 1999, Fleming 1999*, Fleming 2002b, Fleming 2007, Fleming and Coulling 2001, Fleming and Patterson 2003, Fleming and Patterson 2009b, Fleming and Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2004, Muller 2003, Rawinski et al. 1996, Southeastern Ecology Working Group n.d., WVNHP unpubl. data

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[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* (white ash), *Tilia americana var. heterophylla* (American basswood), *Aesculus flava* (yellow buckeye), and *Magnolia acuminata* (cucumber-tree), occurring with more widely tolerant tree species such as *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Tsuga canadensis* (eastern hemlock), and *Betula lenta* (sweet birch). In stands that have been impacted by the last cycle of industrial logging (70-80 years BP), *Liriodendron tulipifera* (tuliptree) may dominate. The herbaceous stratum is diverse and often very lush. Typical herbaceous species include *Actaea racemosa* (black baneberry), *Caulophyllum thalictroides* (blue cohosh), *Prosartes lanuginosa* (yellow fairybells), *Aruncus dioicus* (bride's feathers), *Adiantum*

pedatum (northern maidenhair), *Collinsonia canadensis* (richweed), *Osmorhiza claytonii* (Clayton's sweetroot), and *Laportea canadensis* (Canadian woodnettle). This association is distinguished by the absence or scarcity of calciphilic species, such as *Diplazium pycnocarpon* (glade fern), *Asplenium rhizophyllum* (walking fern), *Dryopteris goldieana* (Goldie's woodfern), *Aquilegia canadensis* (red columbine), *Solidago flexicaulis* (zigzag goldenrod), *Deparia acrostichoides* (silver false spleenwort), and *Cystopteris protrusa* (lowland bladderfern), 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

Chesapeake & Ohio Canal National Historical Park Environment: Lower slopes and ravines above the Potomac River upstream from Maryland Heights.
Harpers Ferry National Historical Park Environment: Stands of Southern Appalachian Rich Cove Forest (Typic Type) are located on lower to middle slopes over metamorphic and metasedimentary rocks along the Potomac and Shenandoah rivers. Sites typically have north to northwest aspects and are often rocky (but not rockslides or boulderfields). Soils are deep, dark and fertile, with high mean pH, calcium, and magnesium levels.
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

Chesapeake & Ohio Canal National Historical Park Vegetation: Dominant trees are *Liriodendron tulipifera* (tuliptree), *Carya cordiformis* (bitternut hickory), *Ulmus rubra* (slippery elm), *Quercus alba* (white oak), *Acer rubrum* (red maple), and *Fagus grandifolia.* Other trees include *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Acer negundo* (box-elder), *Acer saccharum* (sugar maple), *Quercus muehlenbergii* (chinquapin oak), *Prunus serotina var. serotina* (black cherry), *Tilia americana* (American basswood), and *Quercus montana.* Tall shrubs include *Asimina triloba* (pawpaw), *Carya alba*, *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), and *Morus rubra.* Short shrubs include *Asimina triloba* (pawpaw), *Lindera benzoin* (northern spicebush), and seedlings of the canopy trees and tall shrubs. Native vines include *Lonicera sempervirens* (trumpet honeysuckle), *Parthenocissum quinquefolia*, *Toxicodendron radicans* (eastern poison-ivy), and *Vitis rotundifolia.* Dominant herbaceous plants include the exotic plants *Alliaria petiolata* and *Urtica dioica.* Native herbaceous plants include *Actaea racemosa* (black baneberry), *Ageratina altissima* (white snakeroot), *Arabis laevigata* (smooth rockcress), *Asplenium platyneuron* (ebony spleenwort), *Botrychium virginianum* (rattlesnake fern), *Cardamine concatenata* (cutleaf toothwort), *Carex blanda* (eastern woodland sedge), *Carex digitalis* (slender woodland sedge), *Carex platyphylla* (broadleaf sedge), *Carex oligocarpa* (richwoods sedge), *Carex rosea* (rosy sedge), *Chimaphila maculata* (striped prince's pine), *Cimicifuga racemosa*, *Dioscorea villosa* (wild yam), *Epifagus virginiana* (beechdrops), *Eurybia divaricata* (white wood aster), *Festuca subverticillata* (nodding fescue), *Galium aparine* (stickywilly), *Galium coninnum*, *Hackelia virginiana* (beggarslice), *Hepatica americana*, *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Osmorhiza claytonii* (Clayton's sweetroot), *Polygonatum biflorum* (smooth Solomon's seal), *Polystichum acrostichoides* (Christmas fern), *Podophyllum peltatum* (mayapple), *Prenanthes altissima* (tall rattlesnakeroot), *Sanguinaria canadensis* (bloodroot), *Stellaria pubera* (star chickweed), *Uvularia perfoliata* (perfoliate bellwort), and *Viola sororia.* Other exotic plants include *Ailanthus altissima* (tree of heaven), *Berberis thunbergii* (Japanese barberry), *Lonicera japonica* (Japanese honeysuckle), *Microstegium vimineum* (Nepalese browntop), *Perilla frutescens* (beefsteakplant), and *Polygonum caespitosum var. longisetum*, *Rubus phoenicolasius.*
Harpers Ferry National Historical Park Vegetation: Stands have a mixed overstory composition with variable combinations of mesophytic trees. *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Quercus rubra* (northern red oak), *Tilia americana var. heterophylla* (American basswood), *Carya ovalis* (red hickory), and *Carya cordiformis* (bitternut hickory) are usually characteristic. Minor, less frequent overstory associates include *Acer rubrum* (red maple), *Acer saccharum var. saccharum* (sugar maple), and *Fagus grandifolia* (American beech). The subcanopy tree layer is usually open (10-25% cover) and contains variable cover of *Acer negundo* (box-elder),

Celtis occidentalis (common hackberry), and *Celtis laevigata* (sugarberry), and small trees of *Acer saccharum var. saccharum* (sugar maple), *Carya cordiformis* (bitternut hickory), and *Fraxinus americana* (white ash). *Asimina triloba* (pawpaw) is abundant in both the lowest tree layer and the shrub layer, far exceeding any other woody species in total stem density. *Lindera benzoin* (northern spicebush) and *Carpinus caroliniana* (American hornbeam) are common shrub-layer associates.

The herb layer is dense (80% mean stratum cover) and is characterized by a mixture of forbs, with *Osmorhiza claytonii* (Clayton's sweetroot) the most prevalent. Other characteristic, frequent to abundant herbs include *Impatiens pallida* (pale touch-me-not), *Hydrophyllum virginianum* (eastern waterleaf), *Galium aparine* (stickywilly), *Circaea lutetiana* (broadleaf enchanter's nightshade), *Actaea racemosa* (black baneberry), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), and *Podophyllum peltatum* (mayapple). Vines species, such as *Vitis aestivalis* (summer grape) and *Parthenocissus quinquefolia* (Virginia creeper), are frequently found in the herb layer growing up into the subcanopy.

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* (white ash), *Tilia americana var. heterophylla* (American basswood), and *Aesculus flava* (yellow buckeye), in association with more wide-ranging tree species such as *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Tsuga canadensis* (eastern hemlock), and *Betula lenta* (sweet birch). Herb layers are diverse and often very lush. Typical herbaceous species include *Actaea racemosa* (black baneberry), *Caulophyllum thalictroides* (blue cohosh), *Aruncus dioicus* (bride's feathers), *Adiantum pedatum* (northern maidenhair), *Collinsonia canadensis* (richweed), *Laportea canadensis* (Canadian woodnettle), *Osmorhiza claytonii* (Clayton's sweetroot), and *Prosartes lanuginosa* (yellow fairybells). In the Southern Blue Ridge, this association is distinguished by the scarcity of calciphilic species such as *Diplazium pycnocarpon* (glade fern), *Asplenium rhizophyllum* (walking fern), *Dryopteris goldieana* (Goldie's woodfern), *Aquilegia canadensis* (red columbine), *Solidago flexicaulis* (zigzag goldenrod), *Deparia acrostichoides* (silver false spleenwort), and *Cystopteris protrusa* (lowland bladderfern); 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* (yellow buckeye) in areas north of the James River. *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Tilia americana* (American basswood) (both *var. heterophylla* and *var. americana*), and *Quercus rubra* (northern red oak) are the most important canopy species. *Acer saccharum* (sugar maple), *Betula lenta* (sweet birch), *Carya glabra* (pignut hickory), and *Carya cordiformis* (bitternut hickory) are minor canopy associates. *Ulmus rubra* (slippery elm) is a constant understory tree that occasionally reaches the overstory. Most occurrences have a patchy to moderately dense shrub layer dominated by *Lindera benzoin* (northern spicebush) (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* (black baneberry), *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Sanguinaria canadensis* (bloodroot), *Stellaria pubera* (star chickweed), *Osmorhiza claytonii* (Clayton's sweetroot), *Amphicarpaea bracteata* (American hogpeanut), *Adiantum pedatum* (northern maidenhair), *Asarum canadense* (Canadian wildginger), *Galearis spectabilis* (showy orchid), *Ageratina altissima var. altissima* (white snakeroot), *Laportea canadensis* (Canadian woodnettle), and *Trillium grandiflorum* (white trillium). Species richness of 51 Virginia plots ranges from 29 to 98 taxa per 400 m2 (mean = 60).

Global Dynamics: The contemporary abundance of *Liriodendron tulipifera* (tuliptree) in this association no doubt reflects the influence of past logging. However, it is likely that *Liriodendron* (tuliptree) 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* (sugar maple) 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* (tuliptree).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis* (eastern hemlock)
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Aesculus flava* (yellow buckeye), *Betula lenta* (sweet birch), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Tilia americana* var. *heterophylla* (American basswood)

Tree subcanopy	Broad-leaved deciduous tree	*Ulmus rubra* (slippery elm)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin* (northern spicebush)

Characteristic Species

Chesapeake & Ohio Canal National Historical Park: *Asimina triloba* (pawpaw), *Carya cordiformis* (bitternut hickory), *Liriodendron tulipifera* (tuliptree), *Ulmus rubra* (slippery elm)
Harpers Ferry National Historical Park: *Asimina triloba* (pawpaw), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Osmorhiza claytonii* (Clayton's sweetroot)
Global: *Actaea racemosa* (black baneberry), *Adiantum pedatum* (northern maidenhair), *Ageratina altissima* var. *altissima* (white snakeroot), *Amphicarpaea bracteata* (American hogpeanut), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), *Circaea lutetiana* ssp. *canadensis* (broadleaf enchanter's nightshade), *Fraxinus americana* (white ash), *Galearis spectabilis* (showy orchid), *Laportea canadensis* (Canadian woodnettle), *Osmorhiza claytonii* (Clayton's sweetroot), *Sanguinaria canadensis* (bloodroot), *Tilia americana* var. *heterophylla* (American basswood)

Other Noteworthy Species

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rubus phoenicolasius* (wine raspberry, Medium), *Urtica dioica* (stinging nettle)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Veronica hederifolia* (ivyleaf speedwell)
Global: Vulnerable Plants: *Aconitum reclinatum* (trailing white monkshood, G3G4), *Actaea racemosa* (black baneberry, G3G4), *Ageratina altissima* var. *roanensis* (white snakeroot, G5T3T4, Southern Blue Ridge endemic), *Cardamine flagellifera* (Blue Ridge bittercress, G3), *Carex ruthii* (Ruth's sedge, G3G4), *Euphorbia purpurea* (Darlington's glade spurge, G3, Southern Blue Ridge endemic), *Panax quinquefolius* (American ginseng, G3G4, under collection pressure), *Stachys clingmanii* (Clingman's hedgenettle, G2), *Tsuga caroliniana* (Carolina hemlock, G2G3); **Other Plants**: *Stellaria pubera* (star chickweed, G5), *Trillium grandiflorum* (white trillium, G5), *Trillium rugelii* (illscented wakerobin, G4)

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* (sugar maple).
- *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* (sugar maple) 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* (northern red oak).
- *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)

Global Related Concepts:
- *Liriodendron tulipifera - Fraxinus americana - Tilia americana / Lindera benzoin / Cimicifuga racemosa - Laportea canadensis* Forest (Fleming et al. 2007b) =
- *Liriodendron tulipifera - Quercus rubra - Magnolia acuminata / Cornus florida* Forest (Fleming and Coulling 2001) <
- *Liriodendron tulipifera - Tilia americana - Fraxinus americana / Lindera benzoin / Trillium grandiflorum - Impatiens pallida* Forest (Fleming and Coulling 2001) =
- Rich Cove Forest (Montane Intermediate Subtype) (Schafale 2012) =
- Yellow-Poplar - White Oak - Northern Red Oak: 59 (Eyre 1980) >

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Southern Appalachian Rich Cove Forest (Typic Type) is also referred to as Cove Forest (Typic Montane Type).
Harpers Ferry National Historical Park Classification Comments: Southern Appalachian Rich Cove Forest (Typic Type) is also referred to as Cove Forest (Typic Montane Type). It co-occurs in the study area and sometimes intergrades with both Central Appalachian-Piedmont Rich Boulderfield Forest (CEGL006471) and Central Appalachian-Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type) (CEGL008412). In both cases, Southern Appalachian Rich Cove Forest (Typic Type) occurs higher on the slopes, and intergradation occurs on the lower slopes along the boundary of the communities. It can be generally distinguished from CEGL006471 by its relatively low cover of surface rocks and its lush vernal cover of herbaceous species. Differences with CEGL008412 include the absence of *Acer nigrum* (black maple), the much greater importance of *Liriodendron tulipifera* (tuliptree) (absent or sparse in CEGL008412), location on middle slopes, and the dominance of *Osmorhiza claytonii* (Clayton's sweetroot) in the herb layer.
Harpers Ferry National Historical Park Other Comments: The stands of Southern Appalachian Rich Cove Forest (Typic Type) at Harpers Ferry constitute the northernmost known occurrence of the community.
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* (glade fern), *Asplenium rhizophyllum* (walking fern), *Dryopteris goldieana* (Goldie's woodfern), *Aquilegia canadensis* (red columbine), *Solidago flexicaulis* (zigzag goldenrod), *Deparia acrostichoides* (silver false spleenwort), and *Cystopteris protrusa* (lowland bladderfern), 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* (tuliptree), *Fraxinus americana* (white ash), *Polystichum acrostichoides* (Christmas fern), *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Actaea racemosa* (black baneberry), *Tilia americana* (American basswood) (both *var. heterophylla* and *var. americana*), and *Amphicarpaea bracteata* (American hogpeanut). The most diagnostic species (relative to similar types) are *Lindera benzoin* (northern spicebush), *Amphicarpaea bracteata* (American hogpeanut), *Liriodendron tulipifera* (tuliptree), *Actaea racemosa* (black baneberry), *Polystichum acrostichoides* (Christmas fern), and *Galearis spectabilis* (showy orchid).

Although lacking *Aesculus flava* (yellow buckeye) 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* (garlic mustard), pose a serious threat to the integrity of this community's herbaceous flora.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: Occurs on east side of the Potomac River in Maryland near Dargan Bend, just upstream of Maryland Heights and Harpers Ferry.
Harpers Ferry National Historical Park Range: Southern Appalachian Rich Cove Forest (Typic Type) is located on lower to middle slopes along both the Potomac and Shenandoah rivers. The majority of stands are on north-facing slopes on the Virginia side of the two rivers, except for one extensive stand along the west side of Short Hill Mountain.
Global Range: This association occurs in the southern and central Appalachian Mountains of eastern Tennessee, western North Carolina, South 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 and Washington County, Maryland, but ranges into the adjacent Ridge and Valley and extreme northern part of the Cumberland Mountains in Virginia.
Nations: US
States/Provinces: GA:SNR, MD:SNR, NC:SNR, SC:SNR, TN:SNR, VA:S4, WV?:SNA
TNC Ecoregions: 50:C, 51:C, 59:C
USFS Ecoregions (2007): M221Aa:CCP, M221Ab:CCC, M221Ce:CCP, 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, Sumter, Sumter (Mountains))

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: CHOH 306; Rapid Assessment Point 52710a.
Harpers Ferry National Historical Park Plots: HAFE.103, HAFE.116.
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
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 Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Fowells 1965, Major et al. 1999, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Schafale 2012*, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, WVNHP unpubl. data, Young et al. 2006, Young et al. 2009

[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	*Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava* Forest Alliance

(A0235)

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* (tuliptree), occurring with or codominating with *Quercus rubra* (northern red oak) or *Fraxinus americana* (white ash). 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* (white oak), *Quercus montana* (chestnut oak), *Carya*

ovalis (red hickory), *Carya tomentosa* (mockernut hickory), *Carya cordiformis* (bitternut hickory), *Ulmus rubra* (slippery elm), *Nyssa sylvatica* (blackgum), *Fagus grandifolia* (American beech), and *Juglans nigra* (black walnut). Subcanopy tree layers contain representatives of the overstory species and *Acer rubrum* (red maple). The lowest tree and shrub layers usually contain small to large colonies of *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush), along with *Cercis canadensis* (eastern redbud) and *Cornus florida* (flowering dogwood). 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* (northern maidenhair), *Amphicarpaea bracteata* (American hogpeanut), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), *Actaea racemosa* (black baneberry), *Deparia acrostichoides* (silver false spleenwort), *Hydrastis canadensis* (goldenseal), *Phegopteris hexagonoptera* (broad beechfern), *Polystichum acrostichoides* (Christmas fern), and *Uvularia perfoliata* (perfoliate bellwort). Other constant or characteristic herbaceous species include *Botrychium virginianum* (rattlesnake fern), *Carex laxiflora var. laxiflora* (broad looseflower sedge), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Collinsonia canadensis* (richweed), *Cypripedium parviflorum var. pubescens* (greater yellow lady's slipper), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Galearis spectabilis* (showy orchid), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Hepatica nobilis var. obtusa* (roundlobe hepatica), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Phryma leptostachya* (American lopseed), *Podophyllum peltatum* (mayapple), *Sanguinaria canadensis* (bloodroot), *Sanicula canadensis* (Canadian blacksnakeroot), and *Stellaria pubera* (star chickweed). This association is distinguished from more montane rich cove forests by its lower-elevation habitats, shrub layer dominance by *Asimina triloba* (pawpaw) (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* (sugar maple), *Tilia americana* (American basswood), *Caulophyllum thalictroides* (blue cohosh), *Laportea canadensis* (Canadian woodnettle), *Osmorhiza claytonii* (Clayton's sweetroot), *Impatiens pallida* (pale touch-me-not), and *Trillium grandiflorum* (white trillium).

Environmental Description

Prince William Forest Park Environment: This is a rich mesophytic forest with relatively high diversity (average 90 species in 400-square-meter plot) found on clay-rich soils weathered from mafic rocks. It is documented at two sites with intrusions of mafic rocks in Prince William Forest Park, in the otherwise acidic "gorge" of South Quantico Creek.

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

Prince William Forest Park Vegetation: Upper Piedmont-Northern Blue Ridge Basic Mesic Hardwood Forest is a deciduous forest with a distinctive suite of species indicative of high levels of base cations in the soil. The canopy is dominated by *Liriodendron tulipifera* (tuliptree), *Carya tomentosa* (mockernut hickory), and *Quercus alba* (white oak). Other species that can have high cover in the canopy and subcanopy include *Quercus rubra* (northern red oak), *Carya ovalis* (red hickory), *Carya cordiformis* (bitternut hickory), *Fraxinus americana* (white ash), *Acer rubrum* (red maple), and *Fagus grandifolia* (American beech). The short- and tall-shrub layers can be moderately to very dense. Typical shrub and small-tree species include *Cercis canadensis* (eastern redbud), *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), and *Asimina triloba* (pawpaw). The herb layer is moderately dense and is dominated by a mix of graminoids and rich-site forbs. The herb layer is diverse and no one species is dominant, but *Polystichum acrostichoides* (Christmas fern) and *Amphicarpaea bracteata* (American hogpeanut) can have high cover (5-25%). *Adiantum pedatum* (northern maidenhair) and *Sanguinaria canadensis* (bloodroot) are herbs that are particularly indicative of this community, but they occur with low cover. Other low-cover herbs typical of this community are *Carex albicans var. australis* (stellate sedge), *Brachyelytrum erectum* (bearded shorthusk), *Dichanthelium boscii* (Bosc's panicgrass), *Galearis spectabilis* (showy orchid), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), and *Thalictrum thalictroides* (rue-anemone). Stands of this community tend to be notably species-rich with upwards of 90 species per 400 square meters.

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* (tuliptree) often exceeding 35 m in height. *Fraxinus americana* (white ash) and *Quercus rubra* (northern red oak) are the most frequent overstory associates and often codominate. Less frequent overstory associates that can sometimes codominate in discrete areas include *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Carya ovalis* (red hickory), *Carya tomentosa* (mockernut hickory), *Carya cordiformis* (bitternut hickory), *Ulmus rubra* (slippery elm), *Nyssa sylvatica* (blackgum), *Fagus grandifolia* (American beech), and *Juglans nigra* (black walnut). Subcanopy tree layers contain representatives of the overstory species and *Acer rubrum* (red maple). The lowest tree and shrub layers usually contain small to large colonies of *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush), along with *Cercis canadensis* (eastern redbud) and *Cornus florida* (flowering dogwood). More locally important small trees and shrubs include *Carpinus caroliniana* (American hornbeam) and *Hamamelis virginiana* (American witch-hazel). High-climbing vines of *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), and *Vitis* (grape) 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* (northern maidenhair), *Amphicarpaea bracteata* (American hogpeanut), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), *Actaea racemosa* (black baneberry), *Deparia acrostichoides* (silver false spleenwort), *Hydrastis canadensis* (goldenseal), *Phegopteris hexagonoptera* (broad beechfern), *Polystichum acrostichoides* (Christmas fern), and *Uvularia perfoliata* (perfoliate bellwort). The most constant, low-cover herbs in 22 Virginia and Maryland plots of the type are *Botrychium virginianum* (rattlesnake fern), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Phryma leptostachya* (American lopseed), *Sanguinaria canadensis* (bloodroot), and *Sanicula canadensis* (Canadian blacksnakeroot). Additional characteristic herbs include *Carex laxiflora var. laxiflora* (broad looseflower sedge), *Collinsonia canadensis* (richweed), *Cypripedium parviflorum var. pubescens* (greater yellow lady's slipper), *Galearis spectabilis* (showy orchid), *Hepatica nobilis var. obtusa* (roundlobe hepatica), *Podophyllum peltatum* (mayapple), and *Stellaria pubera* (star chickweed).

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* (tuliptree) in stands is no doubt indicative of establishment following abandonment of fields, logging, and natural, large-scale forest disturbances. The ability of *Liriodendron* (tuliptree) 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* (tuliptree), their future development is unclear. Most plots contain *Quercus rubra* (northern red oak) or *Quercus alba* (white oak) 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 tomentosa* (mockernut hickory), *Carya cordiformis* (bitternut hickory), and *Carya ovalis* (red hickory)), *Fraxinus americana* (white ash), and *Nyssa sylvatica* (blackgum). In the absence of longer-lived and more tolerant species such as *Fagus grandifolia* (American beech) or *Acer saccharum* (sugar maple) (usually unimportant or absent in the type), it appears that maturing stands will gradually contain more mixed dominance by *Liriodendron* (tuliptree), *Carya* (hickory) spp., *Fraxinus* (ash), and perhaps *Nyssa* (tupelo), with fewer *Quercus* (oak) 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* (Nepalese browntop), *Rubus phoenicolasius* (wine raspberry), *Lonicera japonica* (Japanese honeysuckle), and *Alliaria petiolata* (garlic mustard). Mortality or partial die-back of *Cornus florida* (flowering dogwood) 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

Global Stratum	**Lifeform**	**Species**
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Quercus rubra* (northern red oak)

Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin* (northern spicebush)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Asimina triloba* (pawpaw)
Herb (field)	Liana	*Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy)
Herb (field)	Fern (Spore-bearing forb)	*Botrychium virginianum* (rattlesnake fern)

CHARACTERISTIC SPECIES

Prince William Forest Park: *Adiantum pedatum* (northern maidenhair), *Carya cordiformis* (bitternut hickory), *Cercis canadensis* (eastern redbud), *Liriodendron tulipifera* (tuliptree), *Polystichum acrostichoides* (Christmas fern)
Global: *Actaea racemosa* (black baneberry), *Asimina triloba* (pawpaw), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree)

OTHER NOTEWORTHY SPECIES

Prince William Forest Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium)
Global: Vulnerable Plants: *Actaea racemosa* (black baneberry, G3G4)

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* (American beech) and *Carya cordiformis* (bitternut hickory) as major overstory components, as well as a number of more coastal-ranging species such as *Ilex opaca var. opaca* (American holly).
- *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* (pawpaw), *Cercis canadensis* (eastern redbud)) 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* (tuliptree) and an herb layer frequently dominated by shade-tolerant weeds (e.g., *Alliaria petiolata* (garlic mustard), etc.).

Global Related Concepts:

- *Liriodendron tulipifera - Quercus rubra - Fraxinus americana / Lindera benzoin / Arisaema triphyllum* Forest (Fleming and Patterson 2003) =
- *Liriodendron tulipifera - Quercus rubra / Asimina triloba / Arisaema triphyllum - Cimicifuga racemosa* Forest (Fleming 2002b) =
- *Liriodendron tulipifera - Quercus rubra / Asimina triloba / Arisaema triphyllum - Cimicifuga racemosa* Forest (Fleming 2002a) =
- Yellow-Poplar - White Oak - Northern Red Oak: 59 (Eyre 1980) >
- Yellow-Poplar: 57 (Eyre 1980) >

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Prince William Forest Park Other Comments: Many indicator species of this association are spring ephemerals that are only visible early in the growing season. Sampling / survey of this association is ideally done in April or May.
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* (pawpaw) (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* (sugar maple), *Tilia americana* (American basswood), *Caulophyllum thalictroides* (blue cohosh), *Laportea canadensis* (Canadian

woodnettle), *Osmorhiza claytonii* (Clayton's sweetroot), *Impatiens pallida* (pale touch-me-not), and *Trillium grandiflorum* (white trillium). 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

Prince William Forest Park Range: Upper Piedmont-Northern Blue Ridge Basic Mesic Hardwood Forest is only documented at two sites in Prince William Forest Park, on sideslopes near and adjacent to South Fork Quantico Creek. It is a rare, small-patch community type in this region.
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?:SNA, MD:SNR, PA:SNR, VA:S4, WV?:SNA
TNC Ecoregions: 52:C, 59:C, 61:C
USFS Ecoregions (2007): 221Da:CCC, 221Dd:CCC, 221De:CCC, 231Aa:CCP, 231Ab:CCC, 231Ai:CCC, 231Ib:CCC, 231Ic:CCC, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Appomattox Court House, Blue Ridge Parkway, Booker T. Washington, Gettysburg, Prince William)

ELEMENT SOURCES

Prince William Forest Park Plots: PRWI.23, PRWI.31.
Prince William Forest Park Description Author(s): K. Taverna
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 2002a*, Fleming 2002b, Fleming and Patterson 2003, Fleming and Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Orwig and Abrams 1994, Patterson 2008a, Patterson 2008b, Perles et al. 2006c, Townsend 2006

A3304 *Tsuga canadensis - Liriodendron tulipifera* Forest Alliance

Forests in this alliance are acidic cove forests dominated by *Tsuga canadensis* (eastern hemlock), occurring with various hardwood species of mesic forests, including *Betula lenta* (sweet birch), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Halesia tetraptera* (mountain silverbell), *Liriodendron tulipifera* (tuliptree), *Magnolia acuminata* (cucumber-tree), *Quercus rubra* (northern red oak), and *Tilia americana var. heterophylla* (American basswood), and others. Common shrubs are *Kalmia latifolia* (mountain laurel), *Leucothoe fontanesiana* (highland doghobble), and *Rhododendron maximum* (great laurel). Herbaceous cover is typically sparse and includes acid-loving species such as *Galax urceolata* (beetleweed), *Goodyera pubescens* (downy rattlesnake plantain), *Hexastylis* (heartleaf) sp., *Polystichum acrostichoides* (Christmas fern), *Thelypteris noveboracensis* (New York fern), and *Tiarella cordifolia* (heartleaf foamflower). 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* (eastern hemlock) 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).

[CEGL006474] *Tsuga canadensis - Fagus grandifolia - Quercus (montana, alba)* Forest

Translated Name: **Eastern Hemlock - American Beech - (Chestnut Oak, White Oak) Forest**
Common Name: **Piedmont-Coastal Plain Eastern Hemlock - 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	*Tsuga canadensis - Liriodendron tulipifera* Forest Alliance (A3304)

ELEMENT CONCEPT

Global Summary: This association is known from steep, north-facing sites along rivers and large streams in the Piedmont, Central Appalachians, and rarely the Inner Coastal Plain, of Virginia and Maryland. It typically occurs on steep, sheltered bluffs, slopes, and ravines with northerly aspects and infertile soils weathered from acidic or intermediate metamorphic and sedimentary rocks. Composition is usually that of a mixed forest, with overstory codominance by *Tsuga canadensis* (eastern hemlock), which is most abundant, and several hardwoods, most frequently *Fagus grandifolia* (American beech), *Quercus alba* (white oak), and/or *Quercus montana* (chestnut oak). *Tsuga canadensis* (eastern hemlock), *Fagus grandifolia* (American beech), and *Quercus montana* (chestnut oak) are most constant, with *Tsuga* (hemlock) and *Fagus* (beech) typically having high cover in the understory and shrub, as well as overstory layers. *Liriodendron tulipifera* (tuliptree), *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), and *Nyssa sylvatica* (blackgum) are constant but minor overstory associates. *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) also occur commonly in the understory. *Quercus alba* (white oak) and *Betula lenta* (sweet birch) are less constant in the overstory mixtures, but each is important in a subset of stands. True shrubs are often sparse but frequently include *Viburnum acerifolium* (mapleleaf viburnum), *Kalmia latifolia* (mountain laurel), *Hamamelis virginiana* (American witch-hazel), *Rhododendron periclymenoides* (pink azalea), and scrambling vines of *Smilax rotundifolia* (roundleaf greenbrier). The herb layer is generally sparse to very sparse, but a number of species frequently occur at low cover, including *Eurybia divaricata* (white wood aster), *Polystichum acrostichoides* (Christmas fern), *Medeola virginiana* (Indian cucumber), *Dioscorea quaternata* (fourleaf yam), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Thelypteris noveboracensis* (New York fern), *Goodyera pubescens* (downy rattlesnake plantain), and *Carex digitalis* (slender woodland sedge). Less constant herbs that are occasionally important include *Hexastylis virginica* (Virginia heartleaf), *Epigaea repens* (trailing arbutus), *Dryopteris marginalis* (marginal woodfern), *Polypodium virginianum* (rock polypody), and *Dennstaedtia punctilobula* (eastern hayscented fern).

ENVIRONMENTAL DESCRIPTION

Harpers Ferry National Historical Park Environment: Piedmont-Coastal Plain Eastern Hemlock - Hardwood Forest is found at two sites in the park, on short, steep slopes above the Potomac River. The vegetation occurs on north-facing slopes with infertile soils weathered from acidic or intermediate metamorphic and sedimentary rocks.
Manassas National Battlefield Park Environment: Piedmont-Coastal Plain Eastern Hemlock - Hardwood Forest is found at three sites in the park, on short, steep slopes and bluffs fronting the Bull Run floodplain. The vegetation occurs on north-facing slopes with infertile soils weathered from acidic or intermediate metamorphic and sedimentary rocks.
Prince William Forest Park Environment: Piedmont-Coastal Plain Eastern Hemlock - Hardwood Forest occurs on sheltered, usually north-facing, stream-fronting bluffs in Prince William Forest Park. This forest type is locally restricted and occurs on steep, bouldery slopes.
Global Environment: This community typically occurs on steep, sheltered, stream-fronting bluffs, slopes, and ravines with northerly aspects. Except on the few Coastal Plain sites, acidic or intermediate metamorphic or sedimentary bedrock underlies most sites. Rock outcrops or large boulders have moderate substrate cover (up to 15%) at some sites, and bryophyte cover is also often significant. Soils often have a thick organic surface horizon with a dense root mat. Samples collected from nine plots were extremely acidic (mean pH = 4.1), with low base saturation and cation status, except for high levels of iron and aluminum.

VEGETATION DESCRIPTION

Harpers Ferry National Historical Park Vegetation: The canopy of this forest is dominated by *Fagus grandifolia* (American beech) with *Quercus montana* (chestnut oak), *Betula lenta* (sweet birch), and *Quercus rubra* (northern red oak) common associates. *Tsuga canadensis* (eastern hemlock) is common in the understory but was formerly codominant in the canopy; stands now contain a number of snags of trees killed by outbreaks of hemlock woolly adelgid. Additional common subcanopy species include *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Amelanchier arborea* (common serviceberry). The most common shrub species is *Hamamelis virginiana* (American witch-hazel). Additional shrub species include *Kalmia latifolia* (mountain laurel), *Viburnum acerifolium* (mapleleaf viburnum), and *Vaccinium pallidum* (Blue Ridge blueberry). Herb cover varies but is often quite sparse. Common herb species include *Eurybia divaricata* (white wood aster), *Medeola virginiana* (Indian cucumber), *Mitchella repens* (partridgeberry), *Polystichum acrostichoides* (Christmas fern), and *Carex digitalis* (slender woodland sedge).
Manassas National Battlefield Park Vegetation: The canopy of this forest is dominated by *Quercus montana* (chestnut oak), with *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Pinus strobus* (eastern white pine) occurring as frequent associates. *Tsuga canadensis* (eastern hemlock) typically dominates the understory and

occasionally reaches the canopy, although many of the larger individuals have recently died from infestation of the hemlock woolly adelgid. Additional common subcanopy species include *Pinus virginiana* (Virginia pine), *Nyssa sylvatica* (blackgum), and *Acer rubrum* (red maple). Shrub species include *Kalmia latifolia* (mountain laurel), *Viburnum acerifolium* (mapleleaf viburnum), *Cornus florida* (flowering dogwood), *Asimina triloba* (pawpaw), *Vaccinium stamineum* (deerberry), and *Vaccinium pallidum* (Blue Ridge blueberry). Herb cover varies but is often quite sparse. Characteristic herb species include *Polystichum acrostichoides* (Christmas fern), *Polygonatum biflorum* (smooth Solomon's seal), and *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley).

Prince William Forest Park Vegetation: The canopy of this forest is typically dominated by *Tsuga canadensis* (eastern hemlock), but density varies and it often occurs with *Fagus grandifolia* (American beech), *Quercus alba* (white oak), *Liriodendron tulipifera* (tuliptree), and *Pinus virginiana* (Virginia pine) (in more disturbed sites). *Tsuga canadensis* (eastern hemlock) can also be more dominant in the subcanopy, with a mixed hardwood canopy. Additional common subcanopy species include *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), and *Acer rubrum* (red maple). Shrub species include *Hamamelis virginiana* (American witch-hazel), *Kalmia latifolia* (mountain laurel), *Viburnum acerifolium* (mapleleaf viburnum), *Cornus florida* (flowering dogwood), and *Ilex opaca var. opaca* (American holly). Herb cover varies but is often quite sparse. Characteristic herb species include *Mitchella repens* (partridgeberry), *Eurybia divaricata* (white wood aster), *Polystichum acrostichoides* (Christmas fern), and *Thelypteris noveboracensis* (New York fern). *Lycopodium digitatum* (fan clubmoss) can be abundant in more disturbed examples.

Global Vegetation: Composition is usually that of a mixed forest, with overstory codominance by *Tsuga canadensis* (eastern hemlock), which is most abundant, and several hardwoods, most frequently *Fagus grandifolia* (American beech), *Quercus alba* (white oak), and/or *Quercus montana* (chestnut oak). *Tsuga canadensis* (eastern hemlock), *Fagus grandifolia* (American beech), and *Quercus montana* (chestnut oak) are most constant, with *Tsuga* (hemlock) and *Fagus* (beech) typically having high cover in the understory and shrub, as well as overstory layers. *Liriodendron tulipifera* (tuliptree), *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), and *Nyssa sylvatica* (blackgum) are constant but minor overstory associates. *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) also occur commonly in the understory. *Quercus alba* (white oak) and *Betula lenta* (sweet birch) are less constant in the overstory mixtures, but each is important in a subset of stands. True shrubs are often sparse but frequently include *Viburnum acerifolium* (mapleleaf viburnum), *Kalmia latifolia* (mountain laurel), *Hamamelis virginiana* (American witch-hazel), *Rhododendron periclymenoides* (pink azalea), and scrambling vines of *Smilax rotundifolia* (roundleaf greenbrier). The herb layer is generally sparse to very sparse, but a number of species frequently occur at low cover, including *Eurybia divaricata* (white wood aster), *Polystichum acrostichoides* (Christmas fern), *Medeola virginiana* (Indian cucumber), *Dioscorea quaternata* (fourleaf yam), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Thelypteris noveboracensis* (New York fern), *Goodyera pubescens* (downy rattlesnake plantain), and *Carex digitalis* (slender woodland sedge). Less constant herbs that are occasionally important include *Hexastylis virginica* (Virginia heartleaf), *Epigaea repens* (trailing arbutus), *Dryopteris marginalis* (marginal woodfern), *Polypodium virginianum* (rock polypody), and *Dennstaedtia punctilobula* (eastern hayscented fern). Species richness of 13 plot-sampled stands averaged 31 taxa per 400 m2.

Global Dynamics: The restriction of hemlock-hardwood forests to steep, sheltered slopes in the Piedmont and Coastal Plain is likely a function of both a suitably cool microclimate and protection from fire and logging. Such sites have been hypothesized to be Pleistocene refugia, i.e., stations where *Tsuga* (hemlock) has persisted from a wider distribution in colder climates of the late Wisconsin and early Holocene (Nemeth 1973). However, paleoecological studies indicate that these hemlock communities became established later in the Holocene, when streams probably served as migration corridors for *Tsuga* (hemlock) as the climate warmed (Prentice et al. 1991). The introduced Asiatic insect hemlock woolly adelgid (*Adelges tsugae*) is present in most, if not all, contemporary stands of this community. Outbreaks over the past two decades have caused at least some mortality of larger hemlocks in most stands, and some stands have been essentially devastated by the loss of most or all overstory hemlock. Increased sunlight from canopy gaps in these stands appears to have increased shrub densities, and likely contributes to less mesic site conditions, which decreases suitability for hemlock germination and growth. Although individual trees can be treated, there are currently no practical and economical treatments for forest stands.

MOST ABUNDANT SPECIES

Global

Stratum	**Lifeform**	**Species**
Tree canopy	Needle-leaved tree	*Tsuga canadensis* (eastern hemlock)

Tree canopy	Broad-leaved deciduous tree	*Fagus grandifolia* (American beech), *Quercus alba* (white oak), *Quercus montana* (chestnut oak)

CHARACTERISTIC SPECIES

Harpers Ferry National Historical Park: *Fagus grandifolia* (American beech), *Hamamelis virginiana* (American witch-hazel), *Tsuga canadensis* (eastern hemlock)
Manassas National Battlefield Park: *Pinus strobus* (eastern white pine), *Quercus montana* (chestnut oak), *Tsuga canadensis* (eastern hemlock)
Prince William Forest Park: *Fagus grandifolia* (American beech), *Quercus alba* (white oak), *Tsuga canadensis* (eastern hemlock)
Global: *Fagus grandifolia* (American beech), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Tsuga canadensis* (eastern hemlock)

OTHER NOTEWORTHY SPECIES

Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Manassas National Battlefield Park: Vulnerable Plants: *Taxus canadensis* (Canada yew, G5, regionally rare); **Invasive/Exotic Plants**: *Lonicera japonica* (Japanese honeysuckle, High/Medium)
Prince William Forest Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (31-May-2007). This association occurs in small patches and has high environmental specificity. There are probably fewer than 100 occurrences rangewide, and widespread degradation of stands by adelgid outbreaks raises doubt about long-term viability of the type.

RELATED CONCEPTS

Global Similar Types:
- *Quercus montana - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest (CEGL008523) a floristically depauperate type of steep, rocky, north-facing slopes in the Central Appalachians.
- *Quercus rubra - Tsuga canadensis - Liriodendron tulipifera / Hamamelis virginiana* Forest (CEGL006566) of north- and east-facing slopes and coves in the mountains and Piedmont of Pennsylvania and New Jersey; this type has a larger and more diverse deciduous component.
- *Tsuga canadensis - Acer saccharum - Fagus grandifolia / Dryopteris intermedia* Forest (CEGL006639)
- *Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest (CEGL006638)
- *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088) a type rich in northern species, occurring from southern New England to the High Allegheny Mountains of Virginia.

Global Related Concepts:
- *Tsuga canadensis - Fagus grandifolia - Quercus (prinus, alba)* Forest (Fleming et al. 2007b) =
- *Tsuga canadensis - Fagus grandifolia - Quercus (prinus, alba)* Forest (Fleming and Taverna 2006) =
- *Tsuga canadensis - Fagus grandifolia - Quercus alba* Forest (Coulling 1999) <
- *Tsuga canadensis - Quercus alba - Fagus grandifolia* Forest (Fleming and Patterson 2003) =
- *Tsuga canadensis - Quercus alba - Fagus grandifolia* Forest (Lea 2003) <
- *Tsuga canadensis - Quercus montana* Forest (Lea 2003) ><
- *Tsuga canadensis - Quercus montana* Forest (Fleming and Patterson 2003) =
- *Tsuga canadensis - Quercus prinus* Forest (Fleming 2002a) =
- *Tsuga canadensis / Hamamelis virginiana* Forest (Fleming 2002b) =
- *Tsuga canadensis* Piedmont Forest (Coulling 1999) <

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Harpers Ferry National Historical Park Classification Comments: Piedmont-Coastal Plain Eastern Hemlock - Hardwood Forest, also referred to as Eastern Hemlock - Hardwood Forest, is distinguished by its location on north-facing slopes above the Potomac River and canopy dominated by *Fagus grandifolia* (American beech) and *Quercus montana* (chestnut oak) with an understory of *Tsuga canadensis* (eastern hemlock).
Manassas National Battlefield Park Classification Comments: Piedmont-Coastal Plain Eastern Hemlock - Hardwood Forest, also referred to as Eastern Hemlock - Hardwood Forest, is distinguished by its location

on steep, north-facing slopes along Bull Run and canopy dominated by *Quercus montana* (chestnut oak) with an understory dominated by *Tsuga canadensis* (eastern hemlock). At least one stand of this type in the park is transitional to Central Appalachian-Piedmont White Pine - Subxeric Oak Forest (CEGL008539) due to the high cover of *Pinus strobus* (eastern white pine) in the understory with *Tsuga canadensis* (eastern hemlock). Additional stands of Piedmont-Coastal Plain Eastern Hemlock - Hardwood Forest are distinguished by a canopy dominated by *Quercus montana* (chestnut oak) with *Tsuga canadensis* (eastern hemlock) dominant in the understory (over *Pinus strobus* (eastern white pine)).

Prince William Forest Park Classification Comments: Piedmont-Coastal Plain Eastern Hemlock - Hardwood Forest can occur in similar landscape positions as Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest (CEGL006919) (north-facing, stream-fronting bluffs), and both typically have high cover of *Fagus grandifolia* (American beech). Piedmont-Coastal Plain Eastern Hemlock - Hardwood Forest can be identified based on the presence of *Tsuga canadensis* (eastern hemlock) in the canopy or subcanopy.

Prince William Forest Park Other Comments: Trees of *Tsuga canadensis* (eastern hemlock) in Prince William Forest Park often have crown damage but did not yet show significant mortality because of hemlock woolly adelgid as of 2007.

Global Classification Comments: The classification of this type was supported by analysis of data from 13 Virginia and Maryland plots during the National Capital Region Parks vegetation mapping project, plus observation data from additional sites.

ELEMENT DISTRIBUTION

Harpers Ferry National Historical Park Range: Piedmont-Coastal Plain Eastern Hemlock - Hardwood Forest occurs in the park as four stands in two separate locations on north-facing slopes above the Potomac River. Three of the stands are near to each other (two are separated by a ravine) on the east end of Short Hill Mountain, and one on the east end of Loudoun Heights. Four stands are mapped; One of the three on the east end of Short Hill Mountain may actually be on adjacent private land. They collectively measure about 2.75 hectares.

Manassas National Battlefield Park Range: Piedmont-Coastal Plain Eastern Hemlock - Hardwood Forest occurs as locally restricted patches on north-facing, stream-fronting bluffs in Manassas National Battlefield Park. Only three stands are documented along Bull Run in the park. A stand dominated solely by hemlock and containing the regionally rare coniferous shrub *Taxus canadensis* (Canada yew) occurs on a north-facing bluff along Bull Run just outside the park near Sudley.

Prince William Forest Park Range: Piedmont-Coastal Plain Eastern Hemlock - Hardwood Forest occurs as locally restricted patches on north-facing, stream-fronting bluffs in Prince William Forest Park. Three stands are documented along the South Fork of Quantico Creek, and five stands are documented along and near Chopawamsic Creek in the southern end of the park, north of Breckenridge Reservoir.

Global Range: The type is known from steep, north-facing bluffs along rivers and large streams in the Piedmont, and rarely the Inner Coastal Plain, of Virginia and Maryland. Stands at Harpers Ferry National Historical Park are located in the Central Appalachians of Virginia.

Nations: US

States/Provinces: MD:S2, PA:SNR, VA:S1, WV?:SNA

TNC Ecoregions: 52:C, 58:C, 59:C, 61:C

USFS Ecoregions (2007): 221Db:CCC, 221De:CCC, 231Ib:CCC, 231Ic:CCC, 232Ha:CC?, 232Je:C??

Federal Lands: NPS (Harpers Ferry, Manassas, Prince William); USFWS (Mason Neck)

ELEMENT SOURCES

Harpers Ferry National Historical Park Plots: HAFE.111.

Manassas National Battlefield Park Plots: MANA.18.

Prince William Forest Park Plots: PRWI.11.

Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming

Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming

Prince William Forest Park Description Author(s): K. Taverna

Global Description Author(s): G.P. Fleming

References: Abrahamson and Gohn 2004, Burns and Honkala 1990a, Coulling 1999, Eastern Ecology Working Group n.d., Fleming 2002a, Fleming 2002b, Fleming 2007, Fleming and Patterson 2003, Fleming and Taverna 2006, Fleming et al. 2007b, Fleming et al. 2007b*, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2003, Mahan et al. 2004, Nemeth 1973, Prentice et al. 1991, Zawadzkas and Abrahamson 2003

[CEGL006923] *Tsuga canadensis - Quercus montana - 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 - chestnut 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, Allegheny Mountains, Western Allegheny Plateau, and Piedmont provinces of Maryland and West Virginia. Stands occur at elevations from 150 m to about 920 m (500-3010 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 montana* (chestnut oak) and *Tsuga canadensis* (eastern hemlock). *Betula lenta* (sweet birch) and, less commonly, *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), and *Quercus rubra* (northern red oak) are major overstory associates, each attaining codominance in a subset of stands. *Quercus alba* (white oak), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Pinus strobus* (eastern white pine), *Sassafras albidum* (sassafras), and *Fagus grandifolia* (American beech) are minor overstory associates. Small trees and shrubs can be absent or sparse due to dense shading by hemlock, with *Hamamelis virginiana* (American witch-hazel) most consistently providing moderate cover. Less frequently, *Kalmia latifolia* (mountain laurel), *Rhododendron maximum* (great laurel), and *Viburnum acerifolium* (mapleleaf viburnum) are shrub components. At some New Jersey sites, a single dense stratum or multiple open strata of ericaceous species can develop, including *Rhododendron maximum* (great laurel), *Kalmia latifolia* (mountain laurel), *Gaylussacia baccata* (black huckleberry), and *Vaccinium pallidum* (Blue Ridge blueberry). The herb layer of this community is typically very sparse or absent; typical scattered species include *Maianthemum canadense* (Canada mayflower), *Dennstaedtia punctilobula* (eastern hayscented fern), *Chimaphila maculata* (striped prince's pine), *Deschampsia flexuosa* (wavy hairgrass), *Carex swanii* (Swan's sedge), and *Aralia nudicaulis* (wild sarsaparilla).

Environmental Description

Catoctin Mountain Park Environment: This association occurs on steep slopes (30-39%), reaching from upper slopes up to 425 m (1400 feet) to nearly level adjacent to the watercourse at the base of the slope, 215-260 m (700-850 feet) in elevation. Only two locations are mapped in the park, both on essentially opposite aspects, northeast- and southwest-facing slopes. Soils are sandy loam or loam, sometimes very stony. Large rocks and boulders are common on the ground surface. Leaf litter forms the greatest component of the ground surface, where it forms a thick duff. This association is confined to the east-central portion of the park on bedrock mapped as the Weverton Formation.

Chesapeake & Ohio Canal National Historical Park Environment: This hemlock-oak forest was sampled at five locations in the park. The sites are extremely to very steep lower to upper sideslopes and ravines with northern aspects. Soils are rapidly to well-drained sandy loam and silt loam. The unvegetated surface is dominated by leaf litter (74-93% cover) with some exposed bedrock (0-5%), large rocks (0-20%), small rocks (0-5%), wood (1-2%), bare soil (1-10%), and mosses and lichens (1-12%). Evidence of disturbance includes the presence of trails and hemlock woolly adelgid.

Monocacy National Battlefield Environment: This oak-hemlock forest occurs on a very steep, northwest-facing sideslope. The soil is extremely rocky, with loamy sand residing between boulders and large rocks. The forest floor is characterized by boulders and large rocks (20% cover), small rocks (30%), leaf litter (35%) with some wood (5%) and bare soil (10%). As of 2006, many of the eastern hemlocks in this forest type were dead or dying in Monocacy National Battlefield. Many dead hemlock canopy trees had already fallen.

Global Environment: Stands occur at elevations from 150 m to about 920 m (500-3010 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

Catoctin Mountain Park Vegetation: This vegetation is species-poor, with a poorly developed shrub layer, and nearly absent herbaceous layer. *Tsuga canadensis* (eastern hemlock) is present but tree mortality in this type is high, allowing substantial light penetration to the forest floor. Other associated canopy trees include *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus coccinea* (scarlet oak), and *Betula lenta* (sweet birch). The sparse subcanopy is composed of *Acer rubrum* (red maple), *Betula lenta* (sweet birch), and *Nyssa sylvatica* (blackgum). The shrub layer, if present, is characterized by *Amelanchier arborea* (common serviceberry) and *Hamamelis virginiana* (American witch-hazel). The herbaceous layer is nearly absent, with scattered tree seedlings including *Liriodendron tulipifera* (tuliptree), *Sassafras albidum* (sassafras), and *Prunus serotina* (black cherry), as well as *Monotropa uniflora* (Indianpipe) and *Dryopteris intermedia* (intermediate woodfern). No individuals of any invasive species were noted at any plot or observation point.

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderate to dense (40-80+% cover) tree canopy can be 20-35 m tall or 10-20 m tall, in which case a subcanopy is not differentiated. It is dominated *Tsuga canadensis* (eastern hemlock) and may include *Pinus strobus* (eastern white pine), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), and *Quercus rubra* (northern red oak). The sparse to moderate (20-60%) subcanopy (10-20 m), when present, includes canopy species as well as *Amelanchier arborea* (common serviceberry) and *Betula lenta* (sweet birch). The very sparse to moderate (10-60%) tall-shrub layer (6-10 m) and sparse to dense (20-80+%) short-shrub layer (1-6 m) are dominated by *Tsuga canadensis* (eastern hemlock) along with *Amelanchier arborea* (common serviceberry) and *Betula lenta* (sweet birch). The herbaceous layer is very sparse (<10%). Nonvascular species are present in all stands and can cover up to 20% of the ground surface.

Monocacy National Battlefield Vegetation: *Tsuga canadensis* (eastern hemlock) is codominant in the canopy, subcanopy and/or tall-shrub layers. *Quercus montana* (chestnut oak) and/or *Quercus rubra* (northern red oak) are the canopy codominants. The canopy extends from 20-30 m in height with 50-75% cover. The sparse subcanopy (10-25%) is composed of *Tsuga canadensis* (eastern hemlock), *Quercus montana* (chestnut oak), and *Acer rubrum* (red maple) that reach 6-10 m in height. The tall-shrub layer (25-50%) contains *Tsuga canadensis* (eastern hemlock), *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Ostrya virginiana* (hophornbeam), and *Hamamelis virginiana* (American witch-hazel). The herbaceous layer (50-75%) is dominated by the exotic species *Alliaria petiolata* (garlic mustard), *Polygonum cespitosum* (oriental ladysthumb), and *Lonicera japonica* (Japanese honeysuckle). Common native species include *Eurybia divaricata* (white wood aster) and *Impatiens* (touch-me-not) spp. *Parthenocissus quinquefolia* (Virginia creeper) is a common vine in this forest type.

Global Vegetation: This association is a hemlock - mixed oak forest dominated by *Tsuga canadensis* (eastern hemlock) in association with species of *Quercus* (oak) and other deciduous trees indicative of relatively dry, infertile soils. Stands are typically floristically depauperate and generally dominated by variable combinations of *Quercus montana* (chestnut oak) and *Tsuga canadensis* (eastern hemlock). *Betula lenta* (sweet birch) and, less commonly, *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), *Quercus alba* (white oak), and *Quercus rubra* (northern red oak) are major overstory associates, each attaining codominance in a subset of stands. *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Pinus strobus* (eastern white pine), *Sassafras albidum* (sassafras), and *Fagus grandifolia* (American beech) are very minor overstory associates. *Oxydendrum arboreum* (sourwood) and *Acer saccharum* (sugar maple), 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* (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. At some New Jersey sites, a single dense stratum or multiple open strata of ericaceous species can develop, including *Rhododendron maximum* (great laurel), *Kalmia latifolia* (mountain laurel), *Gaylussacia baccata* (black huckleberry), and *Vaccinium pallidum* (Blue Ridge blueberry). 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* (Canada mayflower), *Dennstaedtia punctilobula* (eastern hayscented fern), *Dioscorea quaternata* (fourleaf yam), *Chimaphila maculata* (striped prince's pine), *Deschampsia flexuosa* (wavy hairgrass), *Dryopteris marginalis* (marginal woodfern), *Carex swanii* (Swan's sedge), *Eurybia divaricata* (white wood aster), *Goodyera pubescens*

(downy rattlesnake plantain), *Gaultheria procumbens* (eastern teaberry), *Mitchella repens* (partridgeberry), *Monotropa hypopitys* (pinesap), *Monotropa uniflora* (Indianpipe), *Parthenocissus quinquefolia* (Virginia creeper), and *Aralia nudicaulis* (wild sarsaparilla). In nine West Virginia plots from Bluestone National Scenic River, vascular plant richness ranged from 16 to 43 (mean = 26.5) species per 400-m2 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

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis* (eastern hemlock)
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Quercus montana* (chestnut oak)
Tree subcanopy	Broad-leaved deciduous tree	*Betula lenta* (sweet birch), *Quercus* spp.
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana* (American witch-hazel)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Rhododendron maximum* (great laurel)
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Dryopteris intermedia* (intermediate woodfern), *Hamamelis virginiana* (American witch-hazel), *Monotropa uniflora* (Indianpipe), *Nyssa sylvatica* (blackgum), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Tsuga canadensis* (eastern hemlock)
Chesapeake & Ohio Canal National Historical Park: *Betula lenta* (sweet birch), *Quercus montana* (chestnut oak), *Tsuga canadensis* (eastern hemlock)
Monocacy National Battlefield: *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Tsuga canadensis* (eastern hemlock)
Global: *Chimaphila maculata* (striped prince's pine), *Quercus montana* (chestnut oak), *Tsuga canadensis* (eastern hemlock)

OTHER NOTEWORTHY SPECIES

Monocacy National Battlefield: Vulnerable Plants: *Carex argyrantha* (hay sedge, G5, MD state-vulnerable), *Galium concinnum* (shining bedstraw, G5, MD state-vulnerable); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Polygonum cespitosum* (oriental ladysthumb); **Other Plants**: *Parthenocissus quinquefolia* (Virginia creeper, G5)
Global: Other Plants: *Kalmia latifolia* (mountain laurel, G5), *Maianthemum canadense* (Canada mayflower, G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (04-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

Global Related Concepts:
- *Tsuga canadensis - Quercus prinus / Vaccinium pallidum / Gaultheria procumbens* Forest [Hemlock - Chestnut Oak Forest] (Vanderhorst 2017c) =
- Picatinny Arsenal Hemlock-Mixed Oak-(Heath) Cool Sub-Mesic forest description (TcQf) (Windisch 1993) <

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Catoctin Mountain Park Classification Comments: Central Appalachian Hemlock - Chestnut Oak Forest is also referred to simply as Hemlock - Chestnut Oak Forest.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Central Appalachian Hemlock - Chestnut Oak Forest is also referred to simply as Hemlock - Chestnut Oak Forest.

Monocacy National Battlefield Classification Comments: Central Appalachian Hemlock - Chestnut Oak Forest is also referred to simply as Hemlock - Chestnut Oak Forest.
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 12 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 *~Liriodendron tulipifera - Quercus montana - (Tsuga canadensis) / Kalmia latifolia - (Rhododendron catawbiense)* Forest (CEGL008512)$$ (Fleming and Patterson 2009b).

In West Virginia, this association was first applied to plots at Bluestone National Scenic River (Vanderhorst et al. 2008), then to additional plots from the Ridge and Valley and Western Allegheny Plateau. It is distinguished from other hemlock-hardwood forests in the state by having *Quercus montana* (chestnut oak) codominant in the canopy and its occurrence on dry sites.

ELEMENT DISTRIBUTION

Catoctin Mountain Park Range: This association is confined to the east-central portion of the park, on steep slopes on the Weverton Formation.
Chesapeake & Ohio Canal National Historical Park Range: This community was sampled near Falling Water Road (Canal mile 95-96), Twigg Hollow at Outdoor Club Road (Canal mile 153 and 154), and Town Creek (Canal mile between 162 and 163).
Monocacy National Battlefield Range: This forest occurs in a small patch on a steep mid-lower slope on Brooks Hill at the southwestern edge of the park.
Global Range: This association ranges from the New Jersey Highlands south to the Blue Ridge, Ridge and Valley, Allegheny Mountains, Western Allegheny Plateau, and Piedmont provinces of Pennsylvania and Maryland, and West Virginia.
Nations: US
States/Provinces: MD:SNR, NJ:SNR, NY:SNR, PA:SNR, WV:S3
TNC Ecoregions: 52:C, 59:C, 60:P, 61:C
USFS Ecoregions (2007): 211Fc:PPP, 221Ae:CCC, 221Bd:CCP, 221Eb:CCC, M221Aa: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, Roosevelt-Vanderbilt)

ELEMENT SOURCES

Catoctin Mountain Park Plots: CATO.44, CATO.29, CATO30, CATO.38.
Chesapeake & Ohio Canal National Historical Park Plots: (5 plots): CHOH.065, CHOH.079, CHOH.080, CHOH.619, CHOH.621.
Monocacy National Battlefield Plots: (1 plot): MONO.3.
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Monocacy National Battlefield Description Author(s): S. Perles
Global Description Author(s): A. Windisch, S.C. Gawler, G.P. Fleming, J. Vanderhorst
References: Eastern Ecology Working Group n.d., Edinger et al. 2014a, Fike 1999, Harrison 2004, Harrison 2011, Perez pers. comm., Perles et al. 2006d, Perles et al. 2007, Sechler et al. 2014, Vanderhorst 2017c, Vanderhorst et al. 2008, WVNHP unpubl. data, Windisch 1993, Windisch 1993*

G742. APPALACHIAN-NORTHEAST MESIC FOREST

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* (red maple), *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Quercus rubra* (northern red oak), and *Tilia americana* (American basswood) are characteristic, either forming a deciduous canopy or mixed with *Tsuga canadensis* (eastern hemlock) (or in some cases *Pinus strobus* (eastern white pine)). Other common and sometimes dominant trees include *Quercus* (oak) spp. (most commonly *Quercus rubra* (northern red oak), but also *Quercus alba* (white oak), *Quercus montana* (chestnut

oak)), *Aesculus flava* (yellow buckeye), *Liriodendron tulipifera* (tuliptree), and *Prunus serotina* (black cherry). 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.

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

Canopy dominants of this semi-rich to rich rocky forest are *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), and *Tilia americana* (American basswood). Canopy associates include *Carya ovata* (shagbark hickory), *Juglans cinerea* (butternut), *Ostrya virginiana* (hophornbeam), *Quercus rubra* (northern red oak), and, less commonly, *Betula alleghaniensis* (yellow birch) or *Thuja occidentalis* (arborvitae). The open shrub layer is characterized by *Acer pensylvanicum* (striped maple), *Rubus odoratus* (purpleflowering raspberry), *Sambucus racemosa* (red elderberry), *Staphylea trifolia* (American bladdernut), and, more rarely, *Cornus rugosa* (roundleaf dogwood). This community is characterized by a fairly diverse herbaceous flora. Typical herbs include *Adiantum pedatum* (northern maidenhair), *Allium tricoccum* (ramp), *Anemone quinquefolia* (wood anemone), *Aralia racemosa* (American spikenard), *Asarum canadense* (Canadian wildginger), *Caulophyllum thalictroides* (blue cohosh), *Cystopteris bulbifera* (bulblet bladderfern), *Dicentra cucullaria* (Dutchman's breeches), *Dryopteris goldieana* (Goldie's woodfern), *Sanguinaria canadensis* (bloodroot), and others. Characteristic graminoids include *Carex platyphylla* (broadleaf sedge), *Carex sprengelii* (Sprengel's sedge), *Elymus hystrix* (eastern bottlebrush grass), and *Patis racemosa* (blackseed ricegrass). 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.

[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-Northeast Mesic 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* (American basswood) (mostly *var. americana* but occasionally *var. heterophylla*), *Fraxinus americana* (white ash), and *Acer saccharum* (sugar maple). *Acer nigrum* (black maple) is also codominant in a few localities. Minor overstory associates include *Carya cordiformis* (bitternut hickory), *Ulmus rubra* (slippery elm), *Celtis occidentalis* (common hackberry), *Quercus rubra* (northern red oak), *Liriodendron tulipifera* (tuliptree), *Quercus montana* (chestnut oak), and *Quercus muehlenbergii* (chinquapin oak). 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* (American bladdernut) is constant and abundant in the shrub layer. Other characteristic small

trees, shrubs, and vines that may achieve high cover are *Asimina triloba* (pawpaw), *Ostrya virginiana* (hophornbeam), *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Hydrangea arborescens* (wild hydrangea). Density of herbs varies seasonally, as well as with rock cover and available microhabitats. Spring ephemerals, especially *Cardamine concatenata* (cutleaf toothwort) and *Dicentra canadensis* (squirrel corn), are fairly common in most stands, while dense colonies of *Impatiens pallida* (pale touch-me-not) 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* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), *Polystichum acrostichoides* (Christmas fern), *Solidago flexicaulis* (zigzag goldenrod), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Hydrophyllum virginianum* (eastern waterleaf), and *Actaea racemosa* (black baneberry). Less constant herbs that may be important locally include *Arabis laevigata* (smooth rockcress), *Cystopteris bulbifera* (bulblet bladderfern), *Pilea pumila* (Canadian clearweed), *Polymnia canadensis* (whiteflower leafcup), *Sanguinaria canadensis* (bloodroot), *Symphyotrichum cordifolium* (common blue wood aster), and *Thalictrum dioicum* (early meadowrue).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This sugar maple - basswood forest was sampled at four locations in the park. The sites are steep to extremely steep mid and lower sideslopes with northern and eastern aspects. Soils are rapidly to well-drained silt loam and clay loam. The unvegetated surface is made up of leaf litter (10-60% cover), exposed bedrock (0-50%), large rocks (0-77%), small rocks (0-10%), wood (1-5%), bare soil (3-40%), and mosses and lichens (1-40%). Due to the steep slope and loose soil, erosion of rocks and soil is frequent. Other evidence of disturbance includes some deer grazing/browsing and the presence of exotic species.

George Washington Memorial Parkway Environment: Central Appalachian-Piedmont Rich Boulderfield Forest is restricted to extremely rocky lower slopes subtending the Potomac River floodplain (compare with Quercus montana - Quercus rubra / Hamamelis virginiana Forest (CEGL006057). At typical sites, slopes are steep (mean = 28 degrees) and generally north- to northeast-facing, contributing to sheltered and mesic site conditions. Exposed boulder cover (including boulders covered by mosses and lichens) varies from about 30 to 80% in plot samples, and associated rock outcrops are present (5-50% cover) in half the plots. The size and stability of rock debris vary considerably from site to site. Some sites have relatively stable, large-block boulderfields, with individual boulders ranging up to several meters across. Other sites are characterized by fine, loose fragments all <1 m.

Collectable mineral soil is very sparse at many sites, consisting of interstitial and probably mostly colluvial fine silt and silty loam. Soils extracted from these boulderfields contain by far the highest calcium concentrations of any upland sites in the gorge, which is somewhat puzzling. While some stands of this type occur on or near areas underlain by calcium-bearing mafic rocks, others occur where large blocks of acidic diamictite, schist, or metagraywacke are mapped (Southworth and Denenny 2006). Elevated calcium levels at these sites may be due to bodies of mafic rock that are undetected because of deep weathering, to calcite mineralization along late faults, and/or to concretions of calcium carbonate in the Mather Gorge Formation (Fleming 2007). However, variation in calcium by nearly an order of magnitude among plots is probably an indicator of geological substrate diversity.

Harpers Ferry National Historical Park Environment: Rich Boulderfield Forest is a rich forest of rocky river-fronting slopes on a variety of calcium-bearing sedimentary, metasedimentary and igneous rocks. Slopes are steep (mean = 25°) and generally north- to northeast-facing, contributing to sheltered and mesic site conditions. Exposed boulder cover (including boulders covered by mosses and lichens) varies but can be up to 80%. Collectable mineral soil is sparse at sites, consisting of interstitial and probably mostly colluvial silt and silty loam. Soils from sampling sites have high mean Ca and Mg, along with relatively low Fe and Al.

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

Chesapeake & Ohio Canal National Historical Park Vegetation: The sparse to very dense (20-80+% cover) tree canopy, 20-35 m tall, and very sparse to moderate (10-60%) subcanopy (10-20 m) are codominated by *Acer saccharum var. saccharum* (sugar maple) and *Tilia americana* (American basswood); additional tree species include *Acer nigrum* (black maple), *Fraxinus americana* (white ash), and *Quercus rubra* (northern red oak). The very sparse to moderate (<5-60%) tall-shrub layer (6-10 m) and very sparse to moderate (5-60%) short-shrub layer (1-6 m) are also codominated by *Acer saccharum var. saccharum* (sugar maple) and *Tilia americana* (American basswood) and include other canopy species as well as *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), *Ostrya virginiana* (hophornbeam), and *Staphylea trifolia* (American bladdernut). Common taxa in the herbaceous layer (20-60%) include *Asarum canadense* (Canadian wildginger), *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Pilea pumila* (Canadian clearweed), *Sanguinaria canadensis* (bloodroot), *Solidago flexicaulis* (zigzag goldenrod), and *Toxicodendron radicans* (eastern poison-ivy). Nonvascular species, when present, cover up to 50% of the ground surface. A total of eight exotic species were reported from sampled stands. This community also supports three Maryland state-vulnerable species.

George Washington Memorial Parkway Vegetation: Tree composition of Potomac Gorge stands is somewhat less mixed than in the other two basic upland forests. *Acer saccharum var. saccharum* (sugar maple) and *Tilia americana var. americana* (American basswood) usually share dominance of both overstory and subcanopy tree layers, with *Fraxinus americana* (white ash) and *Carya cordiformis* (bitternut hickory) constant but less abundant associates. *Liriodendron tulipifera* (tuliptree) and *Quercus montana* (chestnut oak) are minor, inconstant overstory species, while *Ulmus rubra* (slippery elm), *Ostrya virginiana* (hophornbeam), and *Celtis occidentalis* (common hackberry) can sometimes be important subcanopy trees. Tree growth is quite open (60% mean canopy cover) and often contains large gaps, owing to frequent blow-downs and the hardships of rooting on unstable talus. Maximum canopy height also varies considerably across plots, from 25 m (82 feet) to 34 m (112 feet) (mean = 30 m [105 fee]). The shrub layer varies from open to dense (50% mean stratum cover), with *Staphylea trifolia* (American bladdernut) particularly abundant and characteristic. *Asimina triloba* (pawpaw) and shrubby vines of *Toxicodendron radicans* (eastern poison-ivy) are also common shrub-layer components.

The herb layer is quite open (30% mean stratum cover), and total species richness in this type quite low due to the very rocky substrate. A few spring ephemerals, especially *Dicentra canadensis* (squirrel corn), occur in the deeper soil pockets, but much of the early-season ground flora is composed of scrambling vines of *Parthenocissus quinquefolia* (Virginia creeper), *Staphylea trifolia* (American bladdernut) sprouts and seedlings, *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Solidago flexicaulis* (zigzag goldenrod), *Arabis laevigata var. laevigata* (smooth rockcress), and other summer-green forbs. The annuals *Impatiens pallida* (pale touch-me-not) and *Pilea pumila* (Canadian clearweed) frequently attain high cover during the late summer, although these species are not present at every site and their abundance often varies dramatically from year to year. Although it is quite scarce, *Scutellaria saxatilis* (smooth rock skullcap) appears to be restricted to this community on the Virginia side of the Potomac Gorge.

Harpers Ferry National Historical Park Vegetation: Tree composition is dominated by *Acer nigrum* (black maple), *Carya cordiformis* (bitternut hickory), and *Celtis occidentalis* (common hackberry). Common associates include *Fraxinus americana* (white ash) and *Acer rubrum* (red maple). *Acer nigrum* (black maple) is also the dominant subcanopy tree, with *Carya cordiformis* (bitternut hickory) a less abundant associate. The shrub layer is quite dense with *Staphylea trifolia* (American bladdernut) particularly abundant and characteristic. *Lindera benzoin* (northern spicebush) and *Carya cordiformis* (bitternut hickory) are also common shrub-layer components. *Sambucus racemosa var. racemosa* (red elderberry) is a noteworthy montane shrub that occurs at exceptionally low elevations in this community. The herb layer is quite dense with a high diversity of species present at low cover (1-2%). Spring ephemerals, especially *Dicentra canadensis* (squirrel corn), occur in the deeper soil pockets. Other common spring ephemerals include *Erythronium albidum* (white fawnlily), *Erigenia bulbosa* (harbinger of spring), *Allium tricoccum* (ramp), *Claytonia virginica* (Virginia springbeauty), and *Cardamine concatenata* (cutleaf toothwort). Summer-green ferns and forbs include *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Solidago flexicaulis* (zigzag goldenrod), *Galium aparine* (stickywilly), and *Actaea racemosa* (black baneberry). The annual *Impatiens pallida* (pale touch-me-not) frequently attains high cover during the late summer. Scrambling vines of *Parthenocissus quinquefolia* (Virginia creeper) and *Toxicodendron radicans* (eastern poison-ivy) are also common in the ground layer.

Global Vegetation: Vegetation of this type is a rich mesophytic forest with the overstory consisting largely of *Tilia americana* (American basswood) (mostly *var. americana* but occasionally *var. heterophylla*), *Fraxinus americana* (white ash), and *Acer saccharum* (sugar maple). *Acer nigrum* (black maple) is also codominant in a few localities. Minor overstory associates include *Carya cordiformis* (bitternut hickory), *Ulmus rubra* (slippery elm), *Celtis*

occidentalis (common hackberry), *Quercus rubra* (northern red oak), *Liriodendron tulipifera* (tuliptree), *Quercus montana* (chestnut oak), and *Quercus muehlenbergii* (chinquapin oak). 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* (American bladdernut) is constant and abundant in the shrub layer. Other characteristic small trees, shrubs, and vines that may achieve high cover are *Asimina triloba* (pawpaw), *Ostrya virginiana* (hophornbeam), *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Hydrangea arborescens* (wild hydrangea). Density of herbs varies seasonally, as well as with rock cover and available microhabitats. Spring ephemerals, especially *Cardamine concatenata* (cutleaf toothwort) and *Dicentra canadensis* (squirrel corn), are fairly common in most stands, while dense colonies of *Impatiens pallida* (pale touch-me-not) 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* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), *Polystichum acrostichoides* (Christmas fern), *Solidago flexicaulis* (zigzag goldenrod), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Hydrophyllum virginianum* (eastern waterleaf), and *Actaea racemosa* (black baneberry). Less constant herbs that may be important more locally include *Arabis laevigata* (smooth rockcress), *Cystopteris bulbifera* (bulblet bladderfern), *Pilea pumila* (Canadian clearweed), *Polymnia canadensis* (whiteflower leafcup), *Sanguinaria canadensis* (bloodroot), *Symphyotrichum cordifolium* (common blue wood aster), and *Thalictrum dioicum* (early meadowrue). Many additional species occur at low constancy and cover. Mean species richness of 16 plot samples was 42 taxa per 400 m2. Despite the very rocky substrate, the exotic weed *Alliaria petiolata* (garlic mustard) 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

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *Tilia americana* (American basswood)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Staphylea trifolia* (American bladdernut)
Herb (field)	Fern (Spore-bearing forb)	*Dryopteris marginalis* (marginal woodfern)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Acer saccharum* var. *saccharum* (sugar maple), *Dryopteris marginalis* (marginal woodfern), *Staphylea trifolia* (American bladdernut), *Tilia americana* (American basswood)
George Washington Memorial Parkway: *Acer saccharum* var. *saccharum* (sugar maple), *Dryopteris marginalis* (marginal woodfern), *Staphylea trifolia* (American bladdernut), *Tilia americana* var. *americana* (American basswood)
Harpers Ferry National Historical Park: *Acer nigrum* (black maple), *Dicentra canadensis* (squirrel corn), *Impatiens pallida* (pale touch-me-not), *Staphylea trifolia* (American bladdernut)
Global: *Acer saccharum* (sugar maple), *Dryopteris marginalis* (marginal woodfern), *Staphylea trifolia* (American bladdernut), *Tilia americana* (American basswood)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Cystopteris bulbifera* (bulblet bladderfern, G5, MD-vulnerable), *Ribes cynosbati* (eastern prickly gooseberry, G5, MD-vulnerable), *Symphyotrichum shortii* (Short's aster, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Prunus avium* (sweet cherry, High/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Stellaria media* (common chickweed, Low), *Veronica hederifolia* (ivyleaf speedwell)
George Washington Memorial Parkway: Vulnerable Plants: *Erigenia bulbosa* (harbinger of spring, G5, VA state-vulnerable), *Scutellaria saxatilis* (smooth rock skullcap, G3G4, globally vulnerable); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium)

Global: Vulnerable Plants: *Scutellaria saxatilis* (smooth rock skullcap, G3G4); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, 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)

Global Related Concepts:

- *Acer (nigrum, saccharum) - Tilia americana / Staphylea trifolia / Thalictrum dioicum* Forest (Lea 2003) <

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Central Appalachian-Piedmont Rich Boulderfield Forest is also referred to simply as Rich Boulderfield Forest.
George Washington Memorial Parkway Classification Comments: Obvious distinguishing features of the Central Appalachian-Piedmont Rich Boulderfield Forest (also referred to as Rich Boulderfield Forest) are the very steep, bouldery, mesic sites; the general abundance of "rich-site" trees (i.e., *Acer saccharum var. saccharum* (sugar maple), *Tilia americana var. americana* (American basswood)) and *Staphylea trifolia* (American bladdernut) in the shrub layer; and the open herb layer of woody vines, *Dryopteris marginalis* (marginal woodfern), summer-green forbs, and often the late-season annuals *Impatiens capensis* (orange jewelweed) and *Pilea pumila* (Canadian clearweed). Conspicuously absent, or much less abundant, are *Caulophyllum thalictroides* (blue cohosh), *Dicentra* (bleedingheart) spp., *Erythronium americanum ssp. americanum* (dogtooth violet), *Podophyllum peltatum* (mayapple), and other early-season forbs that thrive in deep mineral soils. Other forest communities in the area (e.g., Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057)) can sometimes occur on drier and more acidic bouldery sites, but these can be distinguished by the dominance of oaks and the absence of *Tilia americana var. americana* (American basswood) and *Staphylea trifolia* (American bladdernut).
George Washington Memorial Parkway Other Comments: Invasive exotic weeds are not as problematic in this vegetation type (also referred to as Rich Boulderfield Forest) as in other mesic forests of fertile sites, although *Alliaria petiolata* (garlic mustard) occurs in all ten plots at 2-5% cover. Windthrows (prominent in 6 of 10 plots) and slumping of the more unstable, finer-block boulderfields appear to be relatively frequent natural disturbances. Boulderfields appear to be nearly immune to deer grazing and no evidence of herbivory was seen in plots.

It is puzzling why *Betula lenta* (sweet birch) is essentially absent from the Potomac Gorge boulderfield forests as this species is common in adjacent mesophytic forests. This birch is usually an abundant tree on low- to middle-elevation boulderfields in western Virginia and has an uncanny ability to establish itself in deep interstices or directly on large-block boulders of the most rigorous boulderfields (Fleming and Moorhead 2000, Fleming and Coulling 2001).
Harpers Ferry National Historical Park Classification Comments: Obvious distinguishing features of the Central Appalachian-Piedmont Rich Boulderfield Forest (also referred to as Rich Boulderfield Forest) are the steep, bouldery, mesic sites; the general abundance of "rich-site" trees (i.e., *Acer nigrum* (black maple) and *Carya cordiformis* (bitternut hickory)) and *Staphylea trifolia* (American bladdernut) in the shrub layer; and the high cover of early-season forbs such as *Dicentra canadensis* (squirrel corn) and *Erigenia bulbosa* (harbinger of spring). Sweet Birch - Chestnut Oak Talus Woodland (CEGL006565) is another association in the park found on boulderfields, but this type occurs as woodland with a semi-open canopy dominated by *Betula lenta* (sweet birch) and *Quercus montana* (chestnut oak) with a very sparse herb layer (primarily scrambling vines).
Harpers Ferry National Historical Park Other Comments: Boulderfields appear to be nearly immune to deer grazing, and no evidence of herbivory was seen in plots.
Global Classification Comments: The classification is supported by analysis of data from 16 plots during the National Capital Region Parks project.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled at Mountain Lock, Ferry Hill, Roundtop Hill and Chilton Woods. It occurs at Canal mile 37, 63-68, 74-77, 80-81, 84-87, 96-97, and 109.
George Washington Memorial Parkway Range: Central Appalachian-Piedmont Rich Boulderfield Forest is restricted in the Potomac Gorge portion of George Washington Memorial Parkway to extremely rocky lower slopes subtending the Potomac River floodplain in Turkey Run Park. Habitats and vegetation resembling this community are found in piles of rock debris below quarries in several locations on the Arlington bluffs part of the parkway between Spout Run and Chain Bridge. While these are not considered natural occurrences, it seems likely that this community type once occurred in this part of the gorge (or was not detected during this study) since a comparable assemblage of species has readily adapted to artificial "boulderfields" resulting from severe disturbances.
Harpers Ferry National Historical Park Range: Rich Boulderfield Forest is restricted to two rocky lower slopes subtending the Potomac River floodplain on the Virginia side. One site is just before the confluence with the Shenandoah River near the town of Harpers Ferry, and the second site is on the eastern end of Short Hill Mountain. These two areas measure in total about 3.3 hectares.
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:SNR, PA:SNR, VA:S2S3, WV?:SNA
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

Chesapeake & Ohio Canal National Historical Park Plots: (4 plots): CHOH.002, CHOH.011, CHOH.037, CHOH.244.
George Washington Memorial Parkway Plots: TURK_012, TURK_013, TURK_014, TURK_048, TURK_049.
Harpers Ferry National Historical Park Plots: HAFE.104.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Harpers Ferry National Historical Park Description Author(s): G. Fleming and K. Taverna
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 Taverna 2006*, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2003, Southworth and Denenny 2006

A3303 *Quercus rubra - Acer saccharum* Forest Alliance

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* (northern red oak) with a variety of mesic hardwoods, including *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Betula lenta* (sweet birch), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Quercus alba* (white oak), and *Tilia americana* (American basswood). Typical shrubs include *Amelanchier* (serviceberry) spp., *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush), and *Viburnum acerifolium* (mapleleaf viburnum). Herbs include *Polystichum acrostichoides* (Christmas fern), *Medeola virginiana* (Indian cucumber), and *Geranium maculatum* (spotted geranium). These forests typically occur on deep, moist to well-drained loams and silt loams on north and east midslopes and coves.

[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-Northeast Mesic Forest (G742)

Alliance *Quercus rubra - Acer saccharum* 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* (white oak) and *Quercus rubra* (northern red oak), with other hardwoods including *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), and *Liriodendron tulipifera* (tuliptree). *Carya ovata* (shagbark hickory), *Carya tomentosa* (mockernut hickory), *Nyssa sylvatica* (blackgum), and *Quercus velutina* (black oak) are possible associates. *Carya* (hickory) spp. may share dominance in some stands. Dominance by *Acer rubrum* (red maple) or *Liriodendron* (tuliptree) may indicate a past disturbance history. A wide variety of more mesic associates, such as *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), and *Tilia americana* (American basswood) could occur but are negligible in dominance. In addition to *Acer saccharum* (sugar maple) reproduction, some understory species may include *Carpinus caroliniana* (American hornbeam), *Cercis canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), and *Ostrya virginiana* (hophornbeam). Shrub and vine species include *Amelanchier laevis* (Allegheny serviceberry), *Amelanchier arborea* (common serviceberry), *Cornus* (dogwood) spp., *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush), *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum recognitum* (southern arrow-wood), and *Vitis riparia* (riverbank grape). Ericaceous shrubs, such as *Kalmia latifolia* (mountain laurel), *Vaccinium angustifolium* (lowbush blueberry) and *Vaccinium pallidum* (Blue Ridge blueberry), may also be present but are not abundant. The ground layer species are highly variable but include *Caulophyllum thalictroides* (blue cohosh), *Ageratina altissima* (white snakeroot), *Dennstaedtia punctilobula* (eastern hayscented fern), *Podophyllum peltatum* (mayapple), *Maianthemum racemosum* (feathery false lily of the valley), *Medeola virginiana* (Indian cucumber), *Thelypteris noveboracensis* (New York fern), *Dryopteris marginalis* (marginal woodfern), *Dryopteris intermedia* (intermediate woodfern), *Actaea* (baneberry) spp., and *Uvularia sessilifolia* (sessileleaf bellwort). Exotic species, including *Rosa multiflora* (multiflora rose) and *Alliaria petiolata* (garlic mustard), may be present in the shrub and herb layers of disturbed stands.

ENVIRONMENTAL DESCRIPTION

Catoctin Mountain Park Environment: Stands of this type occur in large patches in the north-central portion of the park, and in smaller patches in the western portion, on mesic gentle to moderate low and mid-slopes of the Catoctin Formation. This type sometimes occurs on flats and in ravine bottoms, and where it occurs on slopes, aspect is variable. Soils are sandy loam or silt loam and are often very stony. Surface boulders are common, and surface litter cover ranges from 30-90%. These forests occur in association with Central Appalachian Basic Oak - Hickory Forest (Western Piedmont / Lower Blue Ridge Type) (CEGL008514), Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057), and Ruderal Tuliptree Forest (Rich Type) (CEGL007220). Inclusions of Successional Mixed Deciduous Forest Map Class (COMP_SMDF) are common.
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

Catoctin Mountain Park Vegetation: *Acer saccharum* (sugar maple) is usually the dominant canopy tree, or codominant with *Liriodendron tulipifera* (tuliptree) and *Quercus rubra* (northern red oak). Other frequent canopy associates include *Fagus grandifolia* (American beech), *Acer rubrum* (red maple), *Quercus montana* (chestnut oak), and *Quercus alba* (white oak). Other canopy species may include *Carya ovata* (shagbark hickory), *Fraxinus americana* (white ash), and *Tilia americana* (American basswood). The subcanopy is characterized by *Betula lenta* (sweet birch), *Carpinus caroliniana* (American hornbeam), *Nyssa sylvatica* (blackgum), *Ostrya virginiana* (hophornbeam), as well as species of the canopy, usually including *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), and *Fagus grandifolia* (American beech). Shrub and herbaceous layers are often sparse. *Lindera benzoin* (northern spicebush) is a nearly constant member of the tall-shrub layer, with *Hamamelis virginiana* (American witch-hazel) occurring frequently. When the herbaceous layer is not sparse, it may be fairly diverse, characterized by the nearly constant presence of *Arisaema triphyllum* (Jack in the pulpit).

Other associates may include *Brachyelytrum erectum* (bearded shorthusk), *Dryopteris marginalis* (marginal woodfern), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Oxalis stricta* (common yellow oxalis), *Polystichum acrostichoides* (Christmas fern), *Thalictrum thalictroides* (rue-anemone), *Pilea pumila* (Canadian clearweed), and *Uvularia sessilifolia* (sessileleaf bellwort). Less frequent associates include *Dryopteris intermedia* (intermediate woodfern), *Eurybia divaricata* (white wood aster), *Hepatica nobilis* (hepatica), and several species of *Viola. Toxicodendron radicans* and *Parthenocissus quinquefolia* (Virginia creeper) are common vines that usually occur in the herbaceous layer, but occasionally reach the canopy where they can contribute significant shade. Invasive exotic species are usually present but not often at significant cover. These include *Berberis thunbergii* (Japanese barberry), *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop), and *Polygonum cespitosum* (oriental ladysthumb).

Global Vegetation: Stands of this red oak - sugar maple forest contain a closed-canopy tree layer. *Acer saccharum* (sugar maple), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), and *Quercus rubra* (northern red oak) are the leading dominants. *Acer rubrum* (red maple), *Carya ovata* (shagbark hickory), *Carya tomentosa* (mockernut hickory), *Nyssa sylvatica* (blackgum), and *Quercus velutina* (black oak) are associates on various sites. *Liriodendron tulipifera* (tuliptree) dominance may indicate a past disturbance history, and *Carya* (hickory) spp. may share dominance in some stands. A wide variety of more mesic associates, such as *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Fagus grandifolia* (American beech), and *Fraxinus americana* (white ash), may occur but are negligible in dominance. In addition to *Acer saccharum* (sugar maple) reproduction, understory species may include *Carpinus caroliniana* (American hornbeam), *Cercis canadensis* (eastern redbud), and *Ostrya virginiana* (hophornbeam). Shrub and vine species include *Amelanchier laevis* (Allegheny serviceberry), *Amelanchier arborea* (common serviceberry), *Cornus* (dogwood) spp., *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush), *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum recognitum* (southern arrow-wood), and *Vitis riparia* (riverbank grape). Ericaceous shrubs such as *Kalmia latifolia* (mountain laurel), *Vaccinium angustifolium* (lowbush blueberry) and *Vaccinium pallidum* (Blue Ridge blueberry) may also be present. The ground layer species are highly variable but include *Caulophyllum thalictroides* (blue cohosh), *Dennstaedtia punctilobula* (eastern hayscented fern), *Podophyllum peltatum* (mayapple), *Maianthemum racemosum* (feathery false lily of the valley), *Medeola virginiana* (Indian cucumber), *Thelypteris noveboracensis* (New York fern), and *Uvularia sessilifolia* (sessileleaf bellwort). At the southern end of the type's range in the Catoctin Mountains of Maryland, *Liriodendron tulipifera* (tuliptree) and *Quercus rubra* (northern red oak) are the leading overstory dominants, with *Acer saccharum* (sugar maple) common in both the overstory and understory. Minor tree associates include *Fraxinus americana* (white ash), *Tilia americana* (American basswood), *Quercus alba* (white oak), *Betula lenta* (sweet birch), *Fagus grandifolia* (American beech), and *Acer rubrum* (red maple). *Lindera benzoin* (northern spicebush) and *Hamamelis virginiana* (American witch-hazel) are the most constant and abundant species in a rather open shrub layer. The most constant herbs in eight plot samples are *Arisaema triphyllum* (Jack in the pulpit), *Brachyelytrum erectum* (bearded shorthusk), *Carex digitalis* (slender woodland sedge), *Erythronium americanum* (dogtooth violet), *Eurybia divaricata* (white wood aster), *Galium triflorum* (fragrant bedstraw), *Pilea pumila* (Canadian clearweed), *Polystichum acrostichoides* (Christmas fern), *Thalictrum thalictroides* (rue-anemone), *Uvularia sessilifolia* (sessileleaf bellwort), *Viola pubescens* (downy yellow violet), and *Viola sororia* (common blue violet). 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* (Nepalese browntop) and *Alliaria petiolata* (garlic mustard).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Acer saccharum* (sugar maple)
Tree canopy	Broad-leaved deciduous tree	*Quercus alba* (white oak), *Quercus rubra* (northern red oak)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum acerifolium* (mapleleaf viburnum)
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum* (Blue Ridge blueberry)
Herb (field)	Flowering forb	*Podophyllum peltatum* (mayapple)
Herb (field)	Fern (Spore-bearing forb)	*Dennstaedtia punctilobula* (eastern hayscented fern)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Arisaema triphyllum* (Jack in the pulpit), *Betula lenta* (sweet birch), *Brachyelytrum erectum* (bearded shorthusk), *Carpinus caroliniana* (American hornbeam), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Ostrya virginiana*, *Parthenocissus quinquefolia* (Virginia creeper), *Pilea pumila* (Canadian clearweed), *Polystichum acrostichoides* (Christmas fern), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Thalictrum thalictroides* (rue-anemone), *Toxicodendron radicans* (eastern poison-ivy), *Uvularia sessilifolia* (sessileleaf bellwort)
Global: *Acer saccharum* (sugar maple), *Carex pensylvanica* (Pennsylvania sedge), *Carpinus caroliniana* (American hornbeam), *Caulophyllum thalictroides* (blue cohosh), *Liriodendron tulipifera* (tuliptree), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry)

OTHER NOTEWORTHY SPECIES

Catoctin Mountain Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* (oriental ladysthumb)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (02-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 - Betula lenta - Quercus (alba, rubra) / Carpinus caroliniana* Forest (CEGL006921)
- *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 montana - Acer saccharum / Lindera benzoin* Forest (CEGL002059)
- *Quercus montana - 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)

Global Related Concepts:
- *Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest (Faber-Langendoen 2001) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Catoctin Mountain Park Classification Comments: High Allegheny Rich Red Oak - Sugar Maple Forest is also referred to simply as Rich Red Oak - Sugar Maple Forest.
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 montana - Acer saccharum / Lindera benzoin* Forest (CEGL002059)$$, and the Appalachian oak forest type, ~*Quercus montana - Quercus (alba*, *coccinea) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023)$$, by the substantial presence (over 20% canopy or basal area) of *Liriodendron tulipifera* (tuliptree) and insignificant amounts of *Fagus grandifolia* (American beech) or other mesic tree species. This type concept may overlap considerably with that of the oak-maple type, ~*Quercus alba - Quercus rubra - Quercus montana - 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*

(mapleleaf viburnum) Forest (CEGL006336)$$ by somewhat more mesic conditions, a higher non-oak canopy component, and the absence of *Quercus montana* (chestnut oak).

ELEMENT DISTRIBUTION

Catoctin Mountain Park Range: Stands of this type occur in large patches in the north-central portion of the park, and in smaller patches in the western portion.
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:SNR, MA:S1, MD:SNR, NJ:SNR, NY:SNR, OH:SNR, PA:SNR, WV:S2S3
TNC Ecoregions: 48:C, 49:C, 50:C, 59:C, 60:C, 61:C
USFS Ecoregions (2007): 211Fa:CCP, 211Fc:CCC, 211Fd:CCC, 211Ga:CCC, 211Gb:CCP, 211Ia:CPP, 211Ib:CPP, 221Ae:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCP, 221Bd:CCP, 221Da:CCC, 221Db:CCP, 221Dc:CCC, 221Ea:CCP, 221Ec:CCC, 221Ed:CCC, 221Ee:CCC, 221Ef:CCC, 221Eg:CCC, 221Fa:CCC, 221Fb:CCP, 221He:CC?, M211:C, M221Aa:CCP, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CC?, M221Be:CC?, 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, Roosevelt-Vanderbilt, Upper Delaware); USFS (Wayne); USFWS (Erie)

ELEMENT SOURCES

Catoctin Mountain Park Plots: CATO.19, CATO.31, CATO.32, CATO.33, CATO.48, CATO.54.
Catoctin Mountain Park Description Author(s): L. Sneddon
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. 2014a, Faber-Langendoen 2001, Fike 1999, Fleming 1999, Harrison 2004, Harrison 2011, Lundgren 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, Sechler et al. 2014, Swain and Kearsley 2014, WVNHP unpubl. data

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[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-Northeast Mesic Forest (G742)
Alliance	*Quercus rubra - Acer saccharum* 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* (sugar maple), *Quercus rubra* (northern red oak), and, to a lesser extent, *Carya* (hickory) spp. are the dominant trees in closed-canopy stands. *Carya glabra* (pignut hickory) and *Carya ovata* (shagbark hickory) are the two most frequent hickories, but *Carya cordiformis* (bitternut hickory), *Carya tomentosa* (mockernut hickory), and *Carya ovalis* (red hickory) are also present in some stands. *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus velutina* (black oak), *Fagus grandifolia* (American beech), *Quercus muehlenbergii* (chinquapin oak), and *Tilia americana* (American basswood) each attain importance in a subset of stands. Understory layers contain substantial reproduction of *Acer saccharum* (sugar maple) 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* (hophornbeam) is the most constant and

abundant small tree/shrub, while *Cornus florida* (flowering dogwood), *Cercis canadensis* (eastern redbud), and *Hamamelis virginiana* (American witch-hazel) are more locally important understory species. *Asimina triloba* (pawpaw) is often present and may attain moderate cover. Herbaceous growth is usually not lush and frequently exhibits patch-dominance by one to a few species. Low cover of a mix of acid-tolerant and nutrient-demanding mesophytic herbs is characteristic.

ENVIRONMENTAL DESCRIPTION

Antietam National Battlefield Environment: This maple-oak forest occurs on submesic slopes. Sites range from steep to very steep, northeast- and northwest-facing lower to middle slopes at 106 to 135 m elevation. Soils are well-drained and range from xeric grayish light brown to medium brown sandy loams to grayish brown sandy loam derived from Elbrook and Waynesboro limestone and dolomite and Waynesboro siltstone and shale. The forest floor is made up of leaf litter (33-85% cover) with bedrock (0-20%), large rocks (5%), small rocks (0-10%), wood (1-5%), bare soil (5-35%), and bryophytes and lichens (2-10%). Deer trails and evidence of deer browse is common. Erosion of rocks and soil downslope is common and exposes bare soil. Some stands in the park have experienced fires in the recent past.

Chesapeake & Ohio Canal National Historical Park Environment: This red oak - sugar maple forest was sampled at 21 locations in the park. The sites range from gently sloping to very steep, lower to upper piedmonts, sideslopes, ravines, and interfluves with mostly northern and eastern aspects. Soils are typically well-drained silt loam, sandy loam and clay loam. The unvegetated surface is dominated by leaf litter (60-98% cover) with some exposed bedrock (0-2%), large rocks (0-5%), small rocks (0-2%), wood (1-5%), bare soil (0-36%), and mosses and lichens (1-5%). Evidence of disturbance includes heavy deer grazing/browsing, trails and the presence of exotic species.

George Washington Memorial Parkway Environment: This red oak - sugar maple forest occurs on the MD side of the Potomac from High Island near Brookmont to Sherwin Island near Great Falls. The sites range from gently sloping to very steep, lower to upper piedmonts, sideslopes, ravines, and interfluves.

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

Antietam National Battlefield Vegetation: Characteristic composition includes *Quercus rubra* (northern red oak) dominant in the canopy with *Acer saccharum* (sugar maple) or *Acer nigrum* (black maple) dominant in the subcanopy and tall-shrub layers. Other *Quercus* (oak) spp. or *Carya* (hickory) spp. can be present or common, with *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), and *Tilia americana* (American basswood) as occasional associates. The canopy closure varies (50-100%) and canopy trees are typically 20-35 m tall. The sparse to moderate (10-50%) tree subcanopy (10-20 m) is dominated by *Quercus* (oak) spp., *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), and *Ostrya virginiana* (hophornbeam). *Ostrya virginiana* (hophornbeam) is also characteristic in the tall-shrub layer and subcanopy. *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush), *Staphylea trifolia* (American bladdernut), *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), and *Viburnum prunifolium* (blackhaw) are other common shrub species in the moderately dense to dense (75-100%) tall-shrub layer (1-6 m). The herbaceous layer (<0.5 m) is variable (10-75%), depending on the amount of deer browse. Typically, deer browse has created a depauperate understory dominated by exotic species. However, in areas protected from deer browse, the herbaceous layer is denser and more diverse. Common herbaceous species include *Saxifraga virginiensis* (early saxifrage), *Cardamine concatenata* (cutleaf toothwort), *Carex albursina* (white bear sedge), *Carex communis* (fibrousroot sedge), *Carex platyphylla* (broadleaf sedge), *Claytonia virginica* (Virginia springbeauty), *Dryopteris marginalis* (marginal woodfern), *Polystichum acrostichoides* (Christmas fern), and *Eurybia divaricata* (white wood aster). A total of 98 taxa were recorded from three plots. Nonvascular species make up 2-10% cover.

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderate to very dense (40-80+% cover) tree canopy, 20-35 m tall, is dominated by *Acer saccharum var. saccharum* (sugar maple) and *Quercus rubra* (northern red oak); additional common tree species include *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus velutina* (black oak), and *Tilia americana* (American basswood). A few stands have sparse to very dense (20-80+%) emergent tree layers (>35 m) of *Carya* (hickory) spp., *Fraxinus americana* (white ash), and *Quercus rubra* (northern red oak). The very sparse to very dense (10-80+%) subcanopy (10-20 m) is made up of canopy species, as does the very sparse to moderate (<5-40%) tall-shrub layer (6-10 m) which may also include *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Ostrya virginiana* (hophornbeam), and *Ulmus americana* (American elm). The very sparse to very dense (<5-80+%) short-shrub layer (1-6 m) is dominated by *Acer saccharum var. saccharum* (sugar maple), *Asimina triloba* (pawpaw), *Hamamelis virginiana* (American witch-hazel), *Ostrya virginiana* (hophornbeam), and *Ulmus americana* (American elm). Common and/or dominant species in the herbaceous layer (<5-80+%) include *Ageratina altissima* (white snakeroot), *Alliaria petiolata* (garlic mustard) (exotic), *Arabis laevigata* (smooth rockcress), *Cardamine concatenata* (cutleaf toothwort), *Carex digitalis* (slender woodland sedge), *Claytonia virginica* (Virginia springbeauty), *Eurybia divaricata* (white wood aster), *Festuca subverticillata* (nodding fescue), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Solidago caesia* (wreath goldenrod), and *Viola sororia* (common blue violet). A total of 22 exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Scutellaria nervosa* (veiny skullcap), *Thaspium trifoliatum* (purple meadowparsnip), and *Thuja occidentalis* (arborvitae) and nine state-vulnerable species.

George Washington Memorial Parkway Vegetation: The moderate to very dense tree canopy is characterized by *Acer saccharum var. saccharum* (sugar maple) and *Quercus rubra* (northern red oak); additional common tree species include *Asimina triloba* (pawpaw), *Carya glabra* (pignut hickory), *Cornus florida* (flowering dogwood), *Fraxinus americana* (white ash), *Lindera benzoin* (northern spicebush), *Ostrya virginiana* (hophornbeam), and *Quercus alba.* Common and/or dominant small shrubs, vines and herbaceous species include *Cardamine concatenata*, *Claytonia virginica* (Virginia springbeauty), *Erythronium americanum ssp. americanum* (dogtooth violet), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Parthenocissus quinquefolia* (Virginia creeper), and *Podophyllum peltatum* (mayapple).

Global Vegetation: This forest association occurs in small to large patches. *Acer saccharum* (sugar maple), *Quercus rubra* (northern red oak), and, to a lesser extent, *Carya* (hickory) spp. are the dominant trees in closed-canopy stands. *Carya glabra* (pignut hickory) and *Carya ovata* (shagbark hickory) are the two most frequent hickories, but *Carya cordiformis* (bitternut hickory), *Carya tomentosa* (mockernut hickory), and *Carya ovalis* (red hickory) are also present in some stands. *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus velutina* (black oak), *Fagus grandifolia* (American beech), and *Tilia americana* (American basswood) each attain importance in a subset of stands. Understory layers contain substantial reproduction of *Acer saccharum* (sugar maple) 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* (hophornbeam) is the most constant and abundant small tree/shrub, while *Cornus florida* (flowering dogwood), *Cercis canadensis* (eastern redbud), and *Hamamelis virginiana* (American witch-hazel) 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* (white snakeroot), *Amphicarpaea bracteata* (American hogpeanut), *Arabis laevigata* (smooth rockcress), *Bromus pubescens* (hairy woodland brome), *Cardamine concatenata* (cutleaf toothwort), *Carex digitalis* (slender woodland sedge), *Carex platyphylla* (broadleaf sedge), *Claytonia virginica* (Virginia springbeauty), *Eurybia divaricata* (white wood aster), *Festuca subverticillata* (nodding fescue), *Polystichum acrostichoides* (Christmas fern), and *Solidago caesia* (wreath goldenrod). Species richness in 42 plot-sampled stands ranges from 17 to 84 taxa per 400 m2 (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* (sugar maple).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum* (sugar maple), *Quercus rubra* (northern red oak)

Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple)
Tall shrub/sapling	Broad-leaved deciduous tree	*Ostrya virginiana* (hophornbeam)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Acer saccharum* (sugar maple), *Quercus rubra* (northern red oak)
Chesapeake & Ohio Canal National Historical Park: *Acer saccharum* var. *saccharum* (sugar maple), *Ostrya virginiana*, *Quercus rubra* (northern red oak)
George Washington Memorial Parkway: *Acer saccharum* var. *saccharum* (sugar maple), *Ostrya virginiana* (hophornbeam), *Quercus rubra* (northern red oak)
Global: *Acer saccharum* (sugar maple), *Ageratina altissima* (white snakeroot), *Bromus pubescens* (hairy woodland brome), *Carex digitalis* (slender woodland sedge), *Carex hirtifolia* (pubescent sedge), *Carya ovata* (shagbark hickory), *Muhlenbergia tenuiflora* (slimflower muhly), *Polystichum acrostichoides* (Christmas fern)

OTHER NOTEWORTHY SPECIES

Antietam National Battlefield: Vulnerable Plants: *Asplenium resiliens* (blackstem spleenwort, G5, MD state-critically imperiled), *Carex albursina* (white bear sedge, G5, MD state-vulnerable), *Carex appalachica* (Appalachian sedge, G4, MD state-critically imperiled), *Cystopteris bulbifera* (bulblet bladderfern, G5, MD state-vulnerable), *Galium concinnum* (shining bedstraw, G5, MD state-vulnerable), *Hybanthus concolor* (eastern greenviolet, G5, MD state-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Berberis thunbergii* (Japanese barberry, High/Medium), *Elaeagnus umbellata* var. *parvifolia* (autumn olive), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Prunus avium* (sweet cherry, High/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Stellaria media* (common chickweed, Low), *Veronica hederifolia* (ivyleaf speedwell); **Other Plants**: *Fagus grandifolia* (American beech, G5), *Ostrya virginiana* (G5)
Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Carex albursina* (white bear sedge, G5, MD-vulnerable), *Delphinium tricorne* (dwarf larkspur, G5, MD-vulnerable), *Dodecatheon meadia* (pride of Ohio, G5, MD-vulnerable), *Galium concinnum* (shining bedstraw, G5, MD-vulnerable), *Geum laciniatum* (rough avens, G5, MD-vulnerable), *Hybanthus concolor* (eastern greenviolet, G5, MD-vulnerable), *Juglans cinerea* (butternut, G3, MD-vulnerable), *Ribes cynosbati* (eastern prickly gooseberry, G5, MD-vulnerable), *Scutellaria nervosa* (veiny skullcap, G5, MD-critically imperiled), *Symphyotrichum shortii* (Short's aster, G5, MD-vulnerable), *Thaspium trifoliatum* (purple meadowparsnip, G5, MD-critically imperiled), *Thuja occidentalis* (arborvitae, G5, MD-critically imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Berberis thunbergii* (Japanese barberry, High/Medium), *Cardamine hirsuta* (hairy bittercress), *Glechoma hederacea* (ground ivy, Low), *Lamium purpureum* (purple deadnettle), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Ornithogalum umbellatum* (star of Bethlehem, Medium/Low), *Perilla frutescens* (beefsteakplant, Low), *Poa compressa* (Canada bluegrass, High/Low), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Polygonum persicaria* (spotted ladysthumb), *Prunus avium* (sweet cherry, High/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Silene noctiflora* (nightflowering silene), *Stellaria media* (common chickweed, Low), *Taraxacum officinale* (common dandelion), *Verbascum thapsus* (common mullein, Medium)
George Washington Memorial Parkway: Vulnerable Plants: *Galium concinnum* (shining bedstraw, G5, MD-vulnerable), *Hybanthus concolor* (eastern greenviolet, G5, MD-vulnerable), *Ribes cynosbati* (eastern prickly gooseberry, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Berberis thunbergii* (Japanese barberry, High/Medium), *Cardamine hirsuta* (hairy bittercress), *Glechoma hederacea* (ground ivy, Low), *Lamium purpureum* (purple deadnettle), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Ornithogalum umbellatum* (star of Bethlehem, Medium/Low), *Perilla frutescens* (beefsteakplant, Low), *Poa compressa* (Canada bluegrass, High/Low), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Polygonum persicaria* (spotted ladysthumb), *Prunus avium* (sweet cherry, High/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Silene noctiflora* (nightflowering silene), *Stellaria media* (common chickweed, Low)
Global: Vulnerable Plants: *Lithospermum latifolium* (American stoneseed, G4, VA state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (02-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 montana - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268)
- *Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest (CEGL006125) has a more northern distribution, usually on non-calcareous soils of intermediate fertility.

Global Related Concepts:

- *Acer saccharum - Carya glabra - Ostrya virginiana* Alliance: *Fraxinus americana - Juglans cinerea / Hydrophyllum virginianum* Association (Rawinski et al. 1994) **<**
- *Acer saccharum - Carya ovata / Cercis canadensis / Muhlenbergia tenuiflora* Forest (Fleming and Moorhead 2000) **<**
- *Acer saccharum - Quercus rubra - Carya (glabra, ovata) / Ageratina altissima - Bromus pubescens* Forest (Fleming and Coulling 2001) **=**
- *Acer saccharum - Quercus rubra - Carya glabra / Ageratina altissima* Association (Fleming and Moorhead 1996) **<**
- *Acer saccharum var. saccharum - Quercus rubra - Carya (glabra, ovata) / Ageratina altissima* Forest (Fleming 1999) **=**
- *Quercus rubra - Acer saccharum / Ostrya virginiana / Cardamine concatenata* Forest (Fleming and Taverna 2006) **=**
- *Quercus rubra - Acer saccharum / Ostrya virginiana / Cardamine concatenata* Forest (Fleming and Patterson 2009a) **=**
- *Quercus rubra - Acer saccharum / Ostrya virginiana / Cardamine concatenata* Forest (Fleming et al. 2007b) **=**
- *Quercus rubra - Acer saccharum / Ostrya virginiana / Cardamine concatenata* Forest (Fleming and Patterson 2009b) **=**
- Sugar Maple: 27 (Eyre 1980) **>**
- Yellow-Poplar - White Oak - Northern Red Oak: 59 (Eyre 1980) **>**

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Antietam National Battlefield Classification Comments: Within this park, Central Appalachian Rich Red Oak - Sugar Maple Forest is also referred to as Dry-Mesic Rich Red Oak - Sugar Maple Forest, or simply as Rich Red Oak - Sugar Maple Forest.

Chesapeake & Ohio Canal National Historical Park Classification Comments: Within this park, Central Appalachian Rich Red Oak - Sugar Maple Forest is also referred to as Dry-Mesic Rich Red Oak - Sugar Maple Forest, or simply as Rich Red Oak - Sugar Maple Forest.

George Washington Memorial Parkway Classification Comments: Within this park, Central Appalachian Rich Red Oak - Sugar Maple Forest is also referred to as Dry-Mesic Rich Red Oak - Sugar Maple Forest, or simply as Rich Red Oak - Sugar Maple Forest.

Global Classification Comments: This community type has some affinities to ~*Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest (CEGL006125)$$ that is centered in the high Allegheny Mountains and lower New England regions to the north, but it is typically associated with more calcareous soils and differs considerably in floristic composition. Thus, this association could move to the same alliance as ~*Quercus montana - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268)$$ (i.e., ~*Quercus montana - Quercus rubra* Forest Alliance (A0250)$$), with which it shares both similar floristics and geography.*Liriodendron tulipifera* (tuliptree) 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) (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* (American chestnut).

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* (sugar maple) 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* (sugar maple) (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

Antietam National Battlefield Range: This association occurs near the Pry House and in the Snavely's Woods section of the park.
Chesapeake & Ohio Canal National Historical Park Range: This community was sampled at many locations along the length of the Chesapeake & Ohio Canal, such as near Big Woods, Chilton Woods, Cedar Grove, Kasecamp Neck Road, Little Orleans, Mountain Lock, Roundtop Hill, Tunnel Hill, and elsewhere.
George Washington Memorial Parkway Range: This association occurs on the MD side of the Potomac primarily upstream from C&O Canal Lock 9 and below Mather Gorger. It is found along the C&O Canal and on river islands. One occurrence is mapped downstream from there on High Island near Lock 6. These occurrences are also part of the Chesapeake & Ohio Canal National Historical Park.
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:SNR, VA:S4, WV:S3
TNC Ecoregions: 50:C, 59:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, 221Dd:CCC, M221Aa:CCP, 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

Antietam National Battlefield Plots: (3 plots): ANTI.2, ANTI.3, ANTI.6.
Chesapeake & Ohio Canal National Historical Park Plots: (21 plots): CHOH.019, CHOH.027, CHOH.028, CHOH.029, CHOH.030, CHOH.036, CHOH.051, CHOH.052, CHOH.053, CHOH.059, CHOH.060, CHOH.063, CHOH.239, CHOH.240, CHOH.242, CHOH.243, CHOH.602, CHOH.608, CHOH.609, CHOH.611, CHOH.624.
George Washington Memorial Parkway Plots: POTO_007.01, POTO_020.04, POTO_020.05, POTO_024.03, POTO_025.02, POTO_025.03, POTO_026.01, POTO_027.01, POTO_027.03, POTO_027.05, POTO_027.06, POTO_028.01, POTO_029.01, POTO_029.02, POTO_031.02, POTO_031.06, POTO_031.10,
Antietam National Battlefield Description Author(s): M. Russo and S. Perles
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): J. Teague
Global Description Author(s): G.P. Fleming
References: Andreu and Tukman 1995, Bryant 1981, Eastern Ecology Working Group n.d., 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 Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Rawinski et al. 1994

A3302 *Tsuga canadensis - Betula lenta - Betula alleghaniensis* Forest Alliance

This mixed conifer-hardwood forested alliance is dominated by *Tsuga canadensis* (eastern hemlock), alone or in combination with *Pinus strobus* (eastern white pine), and a variety of mesic hardwoods such as *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), and *Fagus grandifolia* (American beech). Other common and sometimes dominant trees include *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Liriodendron tulipifera*

(tuliptree), *Prunus serotina* (black cherry), and *Quercus* (oak) spp. (most commonly *Quercus rubra* (northern red oak)). 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.

[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-Northeast Mesic 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* (eastern hemlock) 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* (sugar maple) and *Fagus grandifolia* (American beech) (common), *Betula alleghaniensis* (yellow birch) (uncommon), and *Betula lenta* (sweet birch), which may replace *Betula alleghaniensis* (yellow birch) in some areas. *Ostrya virginiana* (hophornbeam) may be present as a small tree. *Quercus* (oak) spp. and *Pinus strobus* (eastern white pine) 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* (mapleleaf viburnum) and *Acer pensylvanicum* (striped maple) in addition to *Tsuga canadensis* (eastern hemlock) regeneration. Herbs may be sparse, particularly in dense shade, but include *Dryopteris intermedia* (intermediate woodfern), *Medeola virginiana* (Indian cucumber), *Oxalis montana* (mountain woodsorrel), *Mitchella repens* (partridgeberry), *Maianthemum canadense* (Canada mayflower), *Uvularia sessilifolia* (sessileleaf bellwort), *Polystichum acrostichoides* (Christmas fern), *Trientalis borealis* (starflower), *Huperzia lucidula* (shining clubmoss), *Eurybia divaricata* (white wood aster), *Oclemena acuminata* (whorled wood aster), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Thelypteris noveboracensis* (New York fern). Nonvascular plants may be well-developed, often characterized by the liverwort *Bazzania trilobata*. Diagnostic characteristics of this forest are the dominance of *Tsuga canadensis* (eastern hemlock), presence of *Acer saccharum* (sugar maple) and *Fagus grandifolia* (American beech), low abundance of either *Betula alleghaniensis* (yellow birch) or *Betula lenta* (sweet birch), and a lack of abundant *Quercus* (oak) spp. or *Pinus strobus* (eastern white pine). In Virginia stands, the most abundant trees are *Tsuga canadensis* (eastern hemlock), *Betula alleghaniensis* (yellow birch), *Acer rubrum* (red maple), and *Quercus rubra* (northern red oak); *Fagus grandifolia* (American beech) and *Acer saccharum* (sugar maple) are both inconstant and only occasionally important.

Environmental Description

Catoctin Mountain Park Environment: This vegetation occurs as small patches at the base of slopes adjacent to watercourses. It is found adjacent to High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125) upslope and Northern Blue Ridge Montane Alluvial Forest (CEGL006255) downslope. The substrate ranges from boulderfield to stony soils, with a high cover of leaf litter. It occurs in Catoctin at elevations ranging from 260-445 m (850-1460 feet).

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

Catoctin Mountain Park Vegetation: The canopy is composed of *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Liriodendron tulipifera* (tuliptree), and *Quercus rubra* (northern red oak). *Tsuga canadensis* (eastern hemlock) can contribute substantial cover, but it is not present in all stands and is heavily affected by woolly adelgid in some areas. Other associated tree species may

include *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Nyssa sylvatica* (blackgum), and *Carya ovata* (shagbark hickory). The shrub layer often includes *Hamamelis virginiana* (American witch-hazel) and *Lindera benzoin* (northern spicebush). The most frequent herbaceous species include *Arisaema triphyllum* (Jack in the pulpit), *Polystichum acrostichoides* (Christmas fern), *Mitchella repens* (partridgeberry), and *Parthenocissus quinquefolia* (Virginia creeper). Other associated species of the herb layer may include *Dennstaedtia punctilobula* (eastern hayscented fern), *Thelypteris noveboracensis* (New York fern), *Erythronium americanum* (dogtooth violet), *Uvularia sessilifolia* (sessileleaf bellwort), and *Toxicodendron radicans* (eastern poison-ivy).

Global Vegetation: *Tsuga canadensis* (eastern hemlock) 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* (American beech) and *Acer saccharum* (sugar maple) are common and sometimes *Betula alleghaniensis* (yellow birch) is uncommon or replaced by *Betula lenta* (sweet birch), and at the southern end of the range (in Virginia and Maryland), *Liriodendron tulipifera* (tuliptree) may be an important overstory associate. The shrub layer may be dense to fairly open and often includes *Viburnum acerifolium* (mapleleaf viburnum) and *Acer pensylvanicum* (striped maple) in addition to *Tsuga canadensis* (eastern hemlock) regeneration. Herbs may be sparse, particularly in dense shade, but often include *Dryopteris intermedia* (intermediate woodfern), *Medeola virginiana* (Indian cucumber), *Oxalis montana* (mountain woodsorrel), *Mitchella repens* (partridgeberry), *Maianthemum canadense* (Canada mayflower), *Trientalis borealis* (starflower), *Huperzia lucidula* (shining clubmoss), *Eurybia divaricata* (white wood aster), and *Thelypteris noveboracensis* (New York fern). Nonvascular plants may be well-developed, often characterized by the liverwort *Bazzania trilobata*. Diagnostic characteristics of this forest are the dominance of *Tsuga canadensis* (eastern hemlock), presence of *Acer saccharum* (sugar maple) and *Fagus grandifolia* (American beech), low abundance of either *Betula alleghaniensis* (yellow birch) or *Betula lenta* (sweet birch) and a lack of abundant *Quercus* (oak) spp. or *Pinus strobus* (eastern white pine). In Virginia stands, the most abundant trees are *Tsuga canadensis* (eastern hemlock), *Betula alleghaniensis* (yellow birch), *Acer rubrum* (red maple), and *Quercus rubra* (northern red oak); *Fagus grandifolia* (American beech) and *Acer saccharum* (sugar maple) 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* (sweet birch) is a common colonizer following the death of hemlocks.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis* (eastern hemlock)
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer pensylvanicum* (striped maple)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum acerifolium* (mapleleaf viburnum)
Herb (field)	Flowering forb	*Maianthemum canadense* (Canada mayflower)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Arisaema triphyllum* (Jack in the pulpit), *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Carpinus caroliniana* (American hornbeam), *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush), *Mitchella repens* (partridgeberry), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Quercus rubra* (northern red oak), *Thelypteris noveboracensis* (New York fern), *Toxicodendron radicans* (eastern poison-ivy), *Tsuga canadensis* (eastern hemlock), *Uvularia sessilifolia* (sessileleaf bellwort)

Global: *Betula alleghaniensis* (yellow birch), *Carex albicans* (whitetinge sedge), *Dryopteris intermedia* (intermediate woodfern), *Huperzia lucidula* (shining clubmoss), *Maianthemum canadense* (Canada mayflower), *Medeola virginiana* (Indian cucumber), *Mitchella repens* (partridgeberry), *Oclemena acuminata* (whorled wood aster), *Thelypteris noveboracensis* (New York fern), *Tsuga canadensis* (eastern hemlock)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (03-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* (eastern hemlock).

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 - Acer saccharum / Dryopteris intermedia* Forest (CEGL006638) is an equivalent from further north.
- *Tsuga canadensis - Betula alleghaniensis / Ilex montana / Rhododendron catawbiense* Forest (CEGL008513)
- *Tsuga canadensis - Fagus grandifolia - Acer saccharum / (Hamamelis virginiana, Kalmia latifolia)* Forest (CEGL005043)
- *Tsuga canadensis - Fagus grandifolia - Quercus (montana, alba)* Forest (CEGL006474)
- *Tsuga canadensis - Fagus grandifolia - Quercus rubra* Forest (CEGL006088)

Global Related Concepts:

- *Betula alleghaniensis - Tsuga canadensis / Dryopteris intermedia - Huperzia lucidula* Forest (Coulling and Rawinski 1999) **<**
- *Tsuga canadensis - Betula (alleghaniensis, lenta) / Dryopteris intermedia* Forest (Fleming and Coulling 2001) **=**
- *Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest (Fleming and Taverna 2006) **=**
- *Tsuga canadensis - Betula lenta - Betula alleghaniensis* Association (Fleming and Moorhead 1996) **<**
- *Tsuga canadensis / Dryopteris intermedia / Bazzania trilobata* Association (Rawinski et al. 1994) **<**
- CNE dry transitional forest on sandy / gravelly soils (Rawinski 1984a) **?**
- CNE mesic conifer [transition] forest on acidic bedrock/till (Rawinski 1984a) **>**
- CNE mesic hardwood forest on acidic bedrock/till (Rawinski 1984a) **>**
- Eastern Hemlock: 23 (Eyre 1980) **>**
- Hemlock - Yellow Birch: 24 (Eyre 1980) **>**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Catoctin Mountain Park Classification Comments: This vegetation occurs only sparingly in the park, and in small patches. It grades into High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125) on the landscape and, as such, shares many of the same species and may be difficult to differentiate between the two, particularly where *Tsuga canadensis* (eastern hemlock) is absent or greatly reduced. Some consideration should be given to re-classifying this association to East-Central Hemlock - Hardwood Forest (~*Tsuga canadensis - Fagus grandifolia - Acer saccharum / (Hamamelis virginiana*, *Kalmia latifolia)* Forest (CEGL005043)$$, which is similar in that it is characterized by the presence of *Liriodendron tulipifera* (tuliptree), *Hamamelis virginiana* (American witch-hazel), *Nyssa sylvatica* (blackgum), *Arisaema triphyllum* (Jack in the pulpit), and others shared with the vegetation at Catoctin. The global concept of the currently mapped type is notably lacking in *Liriodendron tulipifera* (tuliptree), and is characterized by more northern species such as *Maianthemum canadense* (Canada mayflower), *Trientalis borealis* (starflower), *Oxalis montana* (mountain woodsorrel), and *Oclemena acuminata* (whorled wood aster), which are not found in this vegetation at Catoctin.

On the Catoctin Mountain Park vegetation map, this vegetation is labeled Hemlock - Northern Hardwood Forest (CEGL006109), which is what these stands were previously called.

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* (birch) spp. and *Acer pensylvanicum* (striped maple). 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

Catoctin Mountain Park Range: This association occurs in only a few places in the park, and is restricted to the north-central and south-central portions on the Catoctin Formation. It was labeled Hemlock - Northern Hardwood Forest (CEGL006109) in the CATO vegetation map.

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:SNR, MA:SNR, MD:SNR, NJ:S3, NY:SNR, ON:SNR, PA:SNR, RI:SNR, VA:S1, WV:S1
TNC Ecoregions: 48:C, 49:C, 59:C, 60:C, 61:C, 62:?
USFS Ecoregions (2007): 211Fa:CCP, 211Fb:CCC, 211Fc:CCC, 211Fd:CCC, 211Ga:CCC, 211Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ak:CC?, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCP, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Dc:CCP, 232Ad:???, M221Aa:CCP, 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, Roosevelt-Vanderbilt, Saratoga, Shenandoah, Upper Delaware); USFS (Finger Lakes, George Washington); USFWS (Erie, Iroquois)

ELEMENT SOURCES

Catoctin Mountain Park Plots: CATO.008, CATO.015, CATO.020.
Catoctin Mountain Park Description Author(s): L. Sneddon
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. 2014a, Edinger et al. 2014b, Enser and Lundgren 2006, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Metzler and Barrett 2006, NRCS 2004a, Perles et al. 2006e, Perles et al. 2007, Perles et al. 2008, Rawinski 1984a, Rawinski et al. 1994, Sechler et al. 2014, Smith 1983, Swain and Kearsley 2014, WVNHP unpubl. data, Young et al. 2006, Young et al. 2009

M525. North Atlantic Coastal Forest & Woodland

G894. NORTH ATLANTIC COASTAL FOREST

A2054 *Fagus grandifolia - Quercus rubra / Cornus florida* Forest Alliance

Forests in this mid-Atlantic alliance occur in non-montane or low-elevation mesic situations, from Massachusetts, New York, New Jersey and Pennsylvania south to portions of Virginia. The tree canopy is characterized by a mixture of *Fagus grandifolia* (American beech), *Quercus rubra* (northern red oak), *Liriodendron tulipifera* (tuliptree), *Liquidambar styraciflua* (sweetgum), *Quercus alba* (white oak), and *Nyssa sylvatica* (blackgum). *Cornus florida* (flowering dogwood) is a constant understory tree, often associated with *Ostrya virginiana* (hophornbeam) and *Carpinus caroliniana* (American hornbeam). *Viburnum acerifolium* (mapleleaf viburnum) is a common shrub. The herb layer is of variable cover and diversity; it can be relatively lush with such species as *Polystichum acrostichoides* (Christmas fern), *Podophyllum peltatum* (mayapple), *Arisaema triphyllum* (Jack in the pulpit), *Thelypteris noveboracensis* (New York fern), *Mitchella repens* (partridgeberry), *Uvularia perfoliata* (perfoliate bellwort), and others. These forests often occur on concave and sheltered landforms, such as north-facing slopes, low slopes, high terraces along streams, and possibly other situations.

[CEGL006075] *Fagus grandifolia - Quercus (alba, rubra) - Liriodendron tulipifera / (Ilex opaca)* Forest

Translated Name: **American Beech - (White Oak, Northern Red Oak) - Tuliptree / (American Holly) Forest**
Common Name: **Mid-Atlantic Mesic Mixed Hardwood Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	North Atlantic Coastal Forest & Woodland (M525)
Group	North Atlantic Coastal Forest (G894)
Alliance	*Fagus grandifolia - Quercus rubra / Cornus florida* Forest Alliance (A2054)

ELEMENT CONCEPT

Global Summary: This forest of mesic to submesic, well-drained soils occurs in the Piedmont and Coastal Plain of Virginia and Maryland, extending north to Long Island, New York on the Coastal Plain. It also occurs occasionally at low elevations of the Blue Ridge and adjacent Ridge and Valley in Virginia and Maryland. It is characteristically a mixed forest dominated by *Fagus grandifolia* (American beech), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Liriodendron tulipifera* (tuliptree) in various proportions. Overstory associates over the range include *Quercus velutina* (black oak), *Quercus falcata* (southern red oak), *Quercus coccinea* (scarlet oak), *Liquidambar styraciflua* (sweetgum), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), and *Fraxinus americana* (white ash). The subcanopy is characterized by young *Fagus grandifolia* (American beech), *Acer rubrum* (red maple), *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), and *Sassafras albidum* (sassafras). *Ilex opaca* (American holly) is particularly characteristic and abundant on the Coastal Plain. The shrub layer varies from very sparse to well-developed and can include *Asimina triloba* (pawpaw), *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum dentatum* (southern arrow-wood), and *Euonymus americanus* (bursting-heart). Heath shrubs, such as *Vaccinium corymbosum* (highbush blueberry) and *Vaccinium pallidum* (Blue Ridge blueberry), may be common but not abundant. Vines are common, including *Parthenocissus quinquefolia* (Virginia creeper), *Smilax glauca* (cat greenbrier), and *Toxicodendron radicans* (eastern poison-ivy). In the southern part of the range, *Oxydendrum arboreum* (sourwood) and *Vitis rotundifolia* (muscadine) may be conspicuous members of the understory. The herb layer is composed of *Polystichum acrostichoides* (Christmas fern), *Thelypteris noveboracensis* (New York fern), *Uvularia perfoliata* (perfoliate bellwort), *Cypripedium acaule* (moccasin flower), *Mitchella repens* (partridgeberry), *Tipularia discolor* (crippled cranefly), *Goodyera pubescens* (downy rattlesnake plantain), *Eurybia divaricata* (white wood aster), *Chimaphila maculata* (striped prince's pine), *Carex swanii* (Swan's sedge), *Medeola virginiana* (Indian cucumber), *Athyrium filix-femina* (common ladyfern), *Carex digitalis* (slender woodland sedge), *Carex willdenowii* (Willdenow's sedge), *Epifagus virginiana* (beechdrops), *Maianthemum canadense* (Canada mayflower), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Polygonatum biflorum* (smooth Solomon's seal), *Podophyllum peltatum* (mayapple), *Arisaema triphyllum* (Jack in the pulpit), and *Maianthemum racemosum* (feathery false lily of the valley).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This forest association occurs on mesic to submesic slopes and ravines, in the Piedmont area, including the Triassic Basin.

George Washington Memorial Parkway Environment: Mid-Atlantic Mesic Mixed Hardwood Forest is one of the most extensive forest communities in the Potomac Gorge section of the George Washington Memorial Parkway, but is not as prevalent below Chain Bridge. It occupies ravines and slopes with well-drained, infertile soils, mostly weathered from saprolitic residuum of metagraywacke, schist, phyllonite, migmatite, diamictite, and other acidic metasedimentary rocks of the Mather Gorge and Sykesville formations. Most sites were subjectively assessed as mesic but varied to submesic (rarely somewhat xeric). Ravine sideslope habitats may be steep, but, on average, slopes are moderate (mean = 13 degrees). Aspect is quite variable, with northerly aspects prevalent among plots. Soil samples collected from plots were strongly to extremely acidic with low calcium, magnesium, and total base saturation and moderately high aluminum.

Monocacy National Battlefield Environment: This forest association occurs on mesic to submesic, gentle to moderate slopes and ravines.

National Capital Parks-East Environment: See Global Environment.

Prince William Forest Park Environment: Mid-Atlantic Mesic Mixed Hardwood Forest is a mesic to submesic deciduous forest that occurs on deep-soiled uplands throughout Prince William Forest Park. The type is best developed on lower slopes, in ravines, and on concave slopes at higher topographic positions. It is a mixed forest with soils that are typically well-drained, acidic sandy and silt loams derived from parent material of low to moderate fertility.

Rock Creek Park Environment: This mixed hardwood forest is the most common forest community at Rock Creek Park and is found in the widest range of environments--just about everywhere except on high gravel-covered hilltops, steep slopes, or floodplains. Most typically it occurs on middle to lower slopes where the hillsides are gently to moderately sloping, and in shallow ravines, overlying acidic bedrock soils. These slopes typically have fairly deep, well-drained loamy acidic soils, primarily Manor and Glenelg loam (Rossell et al. 2007) formed from Laurel Formation bedrock. Along the western tributaries to Rock Creek (particularly Broad Branch), the slopes occupied by this natural community commonly have soils formed over Kensington tonalite.

Wolf Trap National Park for the Performing Arts Environment: Mid-Atlantic Mesic Mixed Hardwood Forest occupies mesic, sheltered slopes and small ravines along the east and north sides of Wolftrap Creek. Soils in these habitats are deep, moist, and well-drained but relatively low in nutrients.
Global Environment: This forest association occurs on mesic to submesic slopes or gentle gradients. Ravines in dissected topography are particularly typical sites in the Piedmont and parts of the Inner Coastal Plain. The type also occupies rolling uplands with deep soils. Soils are typically well-drained, acidic sandy and silt loams derived from parent material of low to moderate fertility. This association is found throughout the Piedmont from south-central Virginia to New Jersey and Pennsylvania, and on the Mid-Atlantic Coastal Plain from southeastern Virginia northward.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: This forest is dominated by *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and/or *Quercus velutina.* Other common trees include *Carya alba*, *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Nyssa sylvatica* (blackgum), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), and *Sassafras albidum.* Dominant shrubs are *Asimina triloba* (pawpaw), *Cornus florida* (flowering dogwood), *Carpinus caroliniana* (American hornbeam), and *Ilex opaca.* Other common shrubs include *Amelanchier arborea* (common serviceberry), *Cercis canadensis var. canadensis* (eastern redbud), *Euonymus americanus* (bursting-heart), *Lindera benzoin* (northern spicebush), *Morus rubra* (red mulberry), *Rubus phoenicolasius* (exotic), *Viburnum prunifolium* (blackhaw), and *Vaccinium pallidum.* Vines include *Lonicera japonica* (exotic), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), and *Vitis vulpina.* Common herbaceous plants include *Alliaria petiolata* (exotic), *Brachyelytrum erectum*, *Chimaphila maculata* (striped prince's pine), *Polystichum acrostichoides* (Christmas fern), and *Thelypteris noveboracensis.* Other frequent herbaceous plants include *Agrostis perennans* (upland bentgrass), *Arisaema triphyllum* (Jack in the pulpit), *Aristolochia serpentaria* (Virginia snakeroot), *Athyrium filix-femina var. asplenioides*, *Botrychium virginianum* (rattlesnake fern), *Carex albicans* (whitetinge sedge), *Carex digitalis* (slender woodland sedge), *Carex swanii* (Swan's sedge), *Carex willdenowii* (Willdenow's sedge), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Claytonia virginica* (Virginia springbeauty), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Dichanthelium boscii* (Bosc's panicgrass), *Epifagus virginiana* (beechdrops), *Erechtites hieraciifolia var. hieraciifolia*, *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Goodyera pubescens* (downy rattlesnake plantain), *Leersia virginica* (whitegrass), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Mitchella repens* (partridgeberry), *Phytolacca americana* (American pokeweed), *Sanicula canadensis* (Canadian blacksnakeroot), *Verbesina alternifolia* (wingstem), and *Uvularia perfoliata.*
George Washington Memorial Parkway Vegetation: Sampled stands are mature, closed-canopy forests, with the largest trees generally >60 cm (24 inches) dbh and occasionally >80 cm (31 inches) dbh. *Fagus grandifolia* (American beech) is the most characteristic and prevalent woody species. It codominates the overstory of many stands, and also tends to be the most abundant species in each of the lower woody strata, with mean density >300 stems/ha. *Liriodendron tulipifera* (tuliptree) and *Quercus alba* (white oak) are the most constant and important codominants with *Fagus grandifolia* (American beech), but *Quercus rubra* (northern red oak) and *Quercus montana* (chestnut oak) are each important in a significant number of stands. Minor overstory associates include *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Tsuga canadensis* (eastern hemlock), and *Betula lenta* (sweet birch). *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) are characteristic associates of *Fagus grandifolia* (American beech) in the small-tree layers, while *Ilex opaca var. opaca* (American holly) is an infrequent but locally abundant small tree in this type. There is very little oak in the understory, and only minor recruitment of *Liriodendron tulipifera* (tuliptree) in gaps. The shrub layer is open to dense, with *Fagus grandifolia* (American beech) the most abundant species. *Cornus florida* (flowering dogwood), *Viburnum acerifolium* (mapleleaf viburnum), and *Asimina triloba* (pawpaw) are constant and characteristic shrubs, although the latter does not usually occur in dense colonies as it does in the basic upland forests. Heaths such as *Kalmia latifolia* (mountain laurel) and *Vaccinium pallidum* (Blue Ridge blueberry) are often present, but not abundant. The herb layer of this forest is commonly patchy and contains many low-cover woody seedlings. Spring ephemerals are sparse and limited to scattered colonies and individuals of widely distributed species such as *Cardamine concatenata* (cutleaf toothwort), *Stellaria pubera* (star chickweed), and *Claytonia virginica* (Virginia springbeauty). *Polystichum acrostichoides* (Christmas fern), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Polygonatum biflorum var. biflorum* (smooth Solomon's seal), *Medeola virginiana* (Indian cucumber), *Carex digitalis* (slender woodland sedge),

Mitchella repens (partridgeberry), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Dioscorea quaternata* (fourleaf yam), and *Eurybia divaricata* (white wood aster) are the most constant herbs (>70% constancy) in 30 plot samples. *Polystichum acrostichoides* (Christmas fern) and *Thelypteris noveboracensis* (New York fern) are the only herbs that achieve a mean cover >2% across plot samples, occasionally forming sizeable dominance patches. Other herbaceous species that are less constant but still characteristic include *Epifagus virginiana* (beechdrops), *Tipularia discolor* (crippled cranefly), *Conopholis americana* (American cancer-root), *Athyrium filix-femina ssp. asplenioides* (asplenium ladyfern), and *Carex laxiculmis var. laxiculmis* (spreading sedge). Stands that have experienced heavy deer browse often have little to no herb layer.

Monocacy National Battlefield Vegetation: This vegetation is typically dominated by variable combinations of *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus rubra* and *Quercus montana.*

National Capital Parks-East Vegetation: The canopy of stands of this association will typically be dominated by *Quercus alba* (white oak) and other *Quercus* (oak) species with *Fagus grandifolia* (American beech), and may also contain *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Quercus falcata* (southern red oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus stellata* (post oak), *Quercus velutina* (black oak), and the exotic *Paulownia tomentosa* (princesstree). The subcanopy may contain *Acer rubrum* (red maple), *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Ilex opaca var. opaca* (American holly), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Prunus serotina var. serotina* (black cherry), and *Sassafras albidum* (sassafras). Shrubs may include *Asimina triloba* (pawpaw), *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Gaylussacia* (huckleberry) sp., *Ilex opaca var. opaca* (American holly), *Kalmia latifolia* (mountain laurel) (typically at low cover values), *Lindera benzoin* (northern spicebush), *Liquidambar styraciflua* (sweetgum), *Nyssa sylvatica* (blackgum), *Rhododendron periclymenoides* (pink azalea), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), and *Vaccinium pallidum* (Blue Ridge blueberry), as well as juvenile individuals of canopy and subcanopy species and the exotic *Hedera helix* (English ivy). Herbs are limited in the data collected, but may include *Carex albicans* (whitetinge sedge), *Chimaphila maculata* (striped prince's pine), *Dennstaedtia punctilobula* (eastern hayscented fern), *Eurybia divaricata* (white wood aster), *Mitchella repens* (partridgeberry), *Polystichum acrostichoides* (Christmas fern), and *Thelypteris noveboracensis* (New York fern). Some stands have an herb layer heavily dominated by exotic *Microstegium vimineum* (Nepalese browntop).

Prince William Forest Park Vegetation: The canopy is composed of variable combinations of *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), and *Quercus rubra* (northern red oak), but is often dominated by *Fagus grandifolia* (American beech). Stands dominated by species other than *Fagus grandifolia* (American beech) typically have high cover of *Fagus grandifolia* (American beech) in the subcanopy and/or shrub layer. Other species that can be associates in the canopy include *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Carya tomentosa* (mockernut hickory), and *Carya glabra* (pignut hickory). Common subcanopy and tall-shrub species include *Fagus grandifolia* (American beech), *Acer rubrum* (red maple), *Carpinus caroliniana* (American hornbeam), *Ilex opaca var. opaca* (American holly), *Cornus florida* (flowering dogwood), *Nyssa sylvatica* (blackgum), and *Asimina triloba* (pawpaw). Low-shrub species include *Vaccinium pallidum* (Blue Ridge blueberry) and *Viburnum acerifolium* (mapleleaf viburnum). Common woody vines are *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), *Vitis vulpina* (frost grape), and *Lonicera japonica* (Japanese honeysuckle). The herbaceous stratum is often sparse; the most constant and abundant species is *Polystichum acrostichoides* (Christmas fern). *Lycopodium digitatum* (fan clubmoss) can be locally abundant in areas with recent disturbance. Other characteristic species include *Euonymus americanus* (bursting-heart), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Galium circaezans* (licorice bedstraw), *Carex digitalis* (slender woodland sedge), *Carex laxiculmis var. laxiculmis* (spreading sedge), *Chimaphila maculata* (striped prince's pine), *Polygonatum biflorum var. biflorum* (smooth Solomon's seal), and *Thelypteris noveboracensis* (New York fern). A variant of this type that occurs on narrow, sandy, elevated terraces along streams has a shrub layer dominated by *Kalmia latifolia* (mountain laurel) and a well-developed herb layer with abundant ferns and forbs.

Rock Creek Park Vegetation: At Rock Creek Park, this forest generally includes some mix of *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), and sometimes *Quercus rubra* (northern red oak). However, this natural community varies in appearance throughout the park, especially in the abundance and diversity of plants in its shrub layer and ground-flora. The variation is due in part to environmental factors that affect moisture and nutrient availability, and differences in disturbance that each site may have experienced in recent years. *Carya alba*, *Cornus florida* (flowering dogwood), *Acer rubrum* (red maple), *Nyssa*

sylvatica (blackgum), and *Ilex opaca* (American holly) are common in the subcanopy, and *Viburnum acerifolium* (mapleleaf viburnum) in the shrub layer. Occasional understory trees and shrubs may include patches of *Cercis canadensis* (eastern redbud), *Sassafras albidum* (sassafras), *Carpinus caroliniana* (American hornbeam), *Lindera benzoin* (northern spicebush), *Asimina triloba* (pawpaw), and *Amelanchier arborea* (common serviceberry). The single most common understory species is usually *Fagus grandifolia* (American beech) saplings. *Polystichum acrostichoides* (Christmas fern) is patchily common in the field layer that typically has low cover of *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), and *Osmorhiza claytonii* (Clayton's sweetroot). Though more common in Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest (CEGL006055), spring ephemerals such as *Podophyllum peltatum* (mayapple), *Claytonia virginica* (Virginia springbeauty), *Cardamine concatenata* (cutleaf toothwort), *Maianthemum racemosum* (feathery false lily of the valley), and *Medeola virginiana* (Indian cucumber) may also be found here in scattered or patchy numbers.

Wolf Trap National Park for the Performing Arts Vegetation: Vegetation is a medium-aged, mixed hardwood forest dominated by mixtures of *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Carya glabra* (pignut hickory). *Acer rubrum* (red maple), *Prunus serotina* (black cherry), and *Ilex opaca* (American holly) are additional trees present in the canopy or subcanopy. The tall-shrub layer contains *Ilex opaca* (American holly), *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), and saplings of the other canopy species. *Vaccinium pallidum* (Blue Ridge blueberry) and *Viburnum acerifolium* (mapleleaf viburnum) are scattered short shrubs. Scrambling and climbing lianas of *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax rotundifolia* (roundleaf greenbrier) are scattered. The herb layer is patchy, with *Polystichum acrostichoides* (Christmas fern), *Dennstaedtia punctilobula* (eastern hayscented fern), *Amphicarpaea bracteata* (American hogpeanut), and *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley) the most characteristic species.

Global Vegetation: Rangewide, this vegetation type is characteristically a mixed mesophytic forest dominated by *Fagus grandifolia* (American beech), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Liriodendron tulipifera* (tuliptree) in various proportions. Overstory associates over the range include *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Quercus velutina* (black oak), *Quercus falcata* (southern red oak), *Quercus coccinea* (scarlet oak), *Liquidambar styraciflua* (sweetgum), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Fraxinus americana* (white ash). The subcanopy is characterized by young *Fagus grandifolia* (American beech), *Acer rubrum* (red maple), *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), *Ilex opaca* (American holly), and *Sassafras albidum* (sassafras). The shrub layer varies from very sparse to well-developed and can include *Asimina triloba* (pawpaw), *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum dentatum* (southern arrow-wood), and *Euonymus americanus* (bursting-heart). Heath shrubs, such as *Vaccinium corymbosum* (highbush blueberry) and *Vaccinium pallidum* (Blue Ridge blueberry), may be common but not abundant. Vines are common, including *Parthenocissus quinquefolia* (Virginia creeper), *Smilax glauca* (cat greenbrier), and *Toxicodendron radicans* (eastern poison-ivy). The herb layer is composed of *Polystichum acrostichoides* (Christmas fern), *Uvularia perfoliata* (perfoliate bellwort), *Cypripedium acaule* (moccasin flower), *Mitchella repens* (partridgeberry), *Tipularia discolor* (crippled cranefly), *Goodyera pubescens* (downy rattlesnake plantain), *Eurybia divaricata* (white wood aster), *Chimaphila maculata* (striped prince's pine), *Carex swanii* (Swan's sedge), *Medeola virginiana* (Indian cucumber), *Athyrium filix-femina* (common ladyfern), *Carex digitalis* (slender woodland sedge), *Carex willdenowii* (Willdenow's sedge), *Epifagus virginiana* (beechdrops), *Maianthemum canadense* (Canada mayflower), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Polygonatum biflorum* (smooth Solomon's seal). *Podophyllum peltatum* (mayapple), *Arisaema triphyllum* (Jack in the pulpit), and *Maianthemum racemosum* (feathery false lily of the valley).

Several intergrading compositional variants have been noted in regional and local landscape analyses. On more submesic, convex slopes, *Fagus grandifolia* (American beech), *Quercus alba* (white oak), *Cornus florida* (flowering dogwood), and *Vaccinium pallidum* (Blue Ridge blueberry) tend to be prominent, while pronounced mesophytes such as *Carpinus caroliniana* (American hornbeam) and herbaceous species in general are usually sparse. Coastal Plain stands tend to have understories heavily dominated by *Ilex opaca* (American holly), while Piedmont stands generally have only scattered *Ilex opaca* (American holly) as well as slightly higher herbaceous richness.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak)
Tree subcanopy	Broad-leaved deciduous tree	*Cornus florida* (flowering dogwood)
Tree subcanopy	Broad-leaved evergreen tree	*Ilex opaca* (American holly)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum acerifolium* (mapleleaf viburnum)
Shrub/sapling (tall & short)	Liana	*Parthenocissus quinquefolia* (Virginia creeper)
Herb (field)	Flowering forb	*Podophyllum peltatum* (mayapple), *Polygonatum biflorum* (smooth Solomon's seal)
Herb (field)	Fern (Spore-bearing forb)	*Polystichum acrostichoides* (Christmas fern)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Fagus grandifolia* (American beech), *Ilex opaca* (American holly), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak)
George Washington Memorial Parkway: *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Polystichum acrostichoides* (Christmas fern), *Quercus alba* (white oak), *Thelypteris noveboracensis* (New York fern), *Viburnum acerifolium* (mapleleaf viburnum)
Monocacy National Battlefield: *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak)
National Capital Parks-East: *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak)
Prince William Forest Park: *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Polystichum acrostichoides* (Christmas fern)
Rock Creek Park: *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Viburnum acerifolium* (mapleleaf viburnum)
Wolf Trap National Park for the Performing Arts: *Carya glabra* (pignut hickory), *Cornus florida* (flowering dogwood), *Ilex opaca* (American holly), *Liriodendron tulipifera* (tuliptree), *Polystichum acrostichoides* (Christmas fern), *Quercus alba* (white oak), *Quercus rubra* (northern red oak)
Global: *Carex laxiculmis* var. *laxiculmis* (spreading sedge), *Fagus grandifolia* (American beech), *Ilex opaca* (American holly), *Quercus alba* (white oak), *Viburnum acerifolium* (mapleleaf viburnum)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Berberis thunbergii* (Japanese barberry, High/Medium), *Dioscorea polystachya*, *Euonymus fortunei* (winter creeper, High/Medium), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rubus phoenicolasius* (wine raspberry, Medium)
George Washington Memorial Parkway: Vulnerable Plants: *Panax quinquefolius* (American ginseng, G3G4, under collection pressure), *Sanicula trifoliata* (largefruit blacksnakeroot, G4, VA state-vulnerable); **Invasive/Exotic Plants**: *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rubus phoenicolasius* (wine raspberry, Medium)
Prince William Forest Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Rock Creek Park: Invasive/Exotic Plants: *Acer palmatum* (Japanese maple, Low/Insignificant), *Acer platanoides* (Norway maple, High/Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Berberis thunbergii* (Japanese barberry, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Elaeagnus umbellata* (autumn olive, High), *Euonymus alatus* (burningbush, Low), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Viburnum dilatatum* (linden arrow-wood), *Viburnum plicatum* (Japanese snowball)

Global: Vulnerable Plants: *Isotria medeoloides* (small whorled pogonia, G2G3), *Panax quinquefolius* (American ginseng, G3G4, under collection pressure)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (31-Jan-2007). This association is common and widespread on the northeastern Coastal Plain and the Piedmont in Virginia and Maryland.

RELATED CONCEPTS

Global Similar Types:

- *Fagus grandifolia - Betula lenta - Quercus (alba, rubra) / Carpinus caroliniana* Forest (CEGL006921)
- *Fagus grandifolia - Quercus alba - (Acer floridanum)* / Mixed Herbs Forest (CEGL007206)
- *Fagus grandifolia - Quercus alba - Quercus rubra* Forest (CEGL006377)
- *Fagus grandifolia - Quercus rubra / Cornus florida / Polystichum acrostichoides - Hexastylis virginica* Forest (CEGL008465)
- *Quercus alba - Carya glabra* / Mixed Herbs Coastal Plain Forest (CEGL007226)

Global Related Concepts:

- *Fagus grandifolia - Carya alba / Symplocos tinctoria - Cornus florida / Euonymus americana - Botrychium virginianum* Forest (Walton et al. 2001) =
- *Fagus grandifolia - Liriodendron tulipifera - Quercus (alba, rubra) / Polystichum acrostichoides - Aster divaricatus* Forest (Fleming 2001a) **?**
- *Fagus grandifolia - Liriodendron tulipifera - Quercus (alba, rubra) / Polystichum acrostichoides - Aster divaricatus* Forest (Fleming 2002a) =
- *Fagus grandifolia - Liriodendron tulipifera - Quercus rubra / Polystichum acrostichoides - Carex laxiculmis* Forest (Fleming 2002b) =
- *Fagus grandifolia - Liriodendron tulipifera - Quercus rubra / Polystichum acrostichoides* Forest (Fleming and Patterson 2003) =
- *Fagus grandifolia - Liriodendron tulipifera / Asimina triloba / Botrychium virginianum* Forest (McCoy and Fleming 2000) =
- *Fagus grandifolia - Liriodendron tulipifera / Carpinus caroliniana* Forest (McCoy and Fleming 2000) =
- *Fagus grandifolia - Liriodendron tulipifera / Polystichum acrostichoides* Forest (Young et al. 2007a) =
- *Fagus grandifolia - Quercus (alba, rubra) - Liriodendron tulipifera / (Ilex opaca var. opaca) / Polystichum acrostichoides* Forest (Fleming and Taverna 2006) =
- *Fagus grandifolia - Quercus (alba, rubra) - Liriodendron tulipifera / (Ilex opaca var. opaca) / Polystichum acrostichoides* Forest (Fleming et al. 2007b) =
- *Fagus grandifolia - Quercus (alba, rubra) - Liriodendron tulipifera / Ilex opaca var. opaca - (Asimina triloba)* Forest (Fleming 2002a) =
- *Fagus grandifolia - Quercus alba - Liriodendron tulipifera - Carya* spp. Forest (Coulling 1999) =
- *Fagus grandifolia - Quercus alba - Liriodendron tulipifera - Liquidambar styraciflua* Forest (Clancy 1996) =
- *Fagus grandifolia - Quercus alba - Liriodendron tulipifera / Cornus florida* Forest (Fleming and Patterson 2003) =
- *Fagus grandifolia - Quercus alba / Ilex opaca - (Oxydendrum arboreum) / Vitis rotundifolia* Forest (Fleming and Patterson 2003) =
- Mixed oak forest of the south Jersey mesic uplands (Robichaud and Buell 1973) **?**
- Oak - Hardwood Mesic Inner Coastal Plain Forest (OH1) (Windisch 2014a) =
- Southern New England oak / pine forest on sandy / gravelly soils (Rawinski 1984a) **?**

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Chesapeake & Ohio Canal National Historical Park Classification Comments: Mid-Atlantic Mesic Mixed Hardwood Forest is sometimes referred to as Mesic Mixed Hardwood Forest.

George Washington Memorial Parkway Classification Comments: Distinguishing characteristics of Mid-Atlantic Mesic Mixed Hardwood Forest include the prevalence of *Fagus grandifolia* (American beech) in all age classes (or at least in the understory), along with patch-dominance of *Polystichum acrostichoides* (Christmas fern) and/or *Thelypteris noveboracensis* (New York fern) in an open to sparse herb layer. Characteristic site conditions are topographically similar to those of Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest (CEGL006055). Mid-Atlantic Mesic Mixed Hardwood Forest, however, is associated with distinctly infertile soils

and lacks the lush aspect, spring ephemerals, and high shrub cover of *Lindera benzoin* (northern spicebush) and *Asimina triloba* (pawpaw) in CEGL006055. For the most part, these communities occupy discrete niches and may be distinguished by inspection. Nevertheless, stands of intermediate composition sometimes occur. Identification of the two types in the field is most susceptible to confusion during the summer and fall, when spring ephemerals are absent and herbaceous biomass in CEGL006055 is minimal.

Stands of Mid-Atlantic Mesic Mixed Hardwood Forest also grade into Piedmont Dry-Mesic Acidic Oak - Hickory Forest (CEGL008475), which occurs on drier, more solar-exposed sites. Co-occurring stands of these communities often have indistinct boundaries, although *Fagus grandifolia* (American beech) usually decreases and oaks (especially *Quercus alba* (white oak)) increase with higher slope position and lower soil moisture. The relationship between the types is further confounded by the lack of oak recruitment and abundance of young *Fagus grandifolia* (American beech) in the understories of some CEGL008475, suggesting possible future replacement of these stands with Mid-Atlantic Mesic Mixed Hardwood Forest. The expansion of young *Fagus grandifolia* (American beech) into submesic or subxeric, oak-dominated habitats is a widespread phenomenon in the region and may be the result of a prolonged period in which fire and other disturbances that favor oaks have been excluded.

Highly disturbed, older forests with overstories that resemble Mid-Atlantic Mesic Mixed Hardwood Forest but with lower strata that are over-run by invasive exotic vines and herbs are classified as Ruderal Tuliptree Forest (Typic Type) (CEGL007221).

Mid-Atlantic Mesic Mixed Hardwood Forest is sometimes referred to as Mesic Mixed Hardwood Forest.

George Washington Memorial Parkway Other Comments: Herbivory by white-tailed deer in this type is evident, especially in Great Falls Park and uplands above Mount Vernon, where a number of normally robust shrubs and herbs (e.g., *Viburnum acerifolium* (mapleleaf viburnum), *Euonymus americanus* (bursting-heart), *Eurybia divaricata* (white wood aster), *Medeola virginiana* (Indian cucumber), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Polygonatum biflorum var. biflorum* (smooth Solomon's seal)) are dwarfed by repeated top-grazing. The rather sparse herb cover in some of the plots may be the general result of grazing by overpopulous deer over a period of years. The fern patches that characterize the herb layer of some stands are probably favored by selective grazing, since deer apparently find both *Polystichum acrostichoides* (Christmas fern) and *Thelypteris noveboracensis* (New York fern) unpalatable.

National Capital Parks-East Classification Comments: Mid-Atlantic Mesic Mixed Hardwood Forest is sometimes referred to as Mesic Mixed Hardwood Forest.

Prince William Forest Park Classification Comments: Mid-Atlantic Mesic Mixed Hardwood Forest could be confused with Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest (CEGL006919) since both associations typically have a high canopy cover of *Fagus grandifolia* (American beech) and both can be found on lower slopes. Mid-Atlantic Mesic Mixed Hardwood Forest can be distinguished by its location on gentle or steep slopes throughout the park (not necessarily restricted to west- to north-facing, steep ravine slopes and bluffs), and its lack of a dense evergreen shrub layer dominated by *Kalmia latifolia* (mountain laurel). Mid-Atlantic Mesic Mixed Hardwood Forest also intergrades with Piedmont Dry-Mesic Acidic Oak - Hickory Forest (CEGL008475) and can be difficult to distinguish in some areas due to understory invasion of the latter by *Fagus grandifolia* (American beech). As a rule, CEGL008475 occupies somewhat drier sites, lacks *Fagus grandifolia* (American beech) in the canopy, and has only low to moderate cover by *Fagus grandifolia* (American beech) in the understory.

Mid-Atlantic Mesic Mixed Hardwood Forest is sometimes referred to as Mesic Mixed Hardwood Forest.

Rock Creek Park Classification Comments: The Heath Family shrubs (*Kalmia latifolia* (mountain laurel), *Rhododendron periclymenoides* (pink azalea), *Vaccinium pallidum* (Blue Ridge blueberry), and *Gaylussacia baccata* (black huckleberry)) that are so common in Rock Creek's driest natural communities are uncommon or absent in Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075). It generally has a less well-developed and less diverse ground-flora and shrub layer than Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest (CEGL006055); it is especially lacking a high cover of ferns, wildflowers and shrubs that prefer base rich soils, such as *Phegopteris hexagonoptera* (broad beechfern), *Thelypteris noveboracensis* (New York fern), *Erythronium albidum* (white fawnlily), *Podophyllum peltatum* (mayapple), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Maianthemum racemosum* (feathery false lily of the valley), *Hepatica nobilis* (hepatica), *Sanguinaria canadensis* (bloodroot), *Asimina triloba* (pawpaw), and *Lindera benzoin* (northern spicebush). These species make only a scattered appearance in Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075) but are not dominant. The distinction between these communities is clearest when spring wildflowers are evident but can be difficult to tell in the summer and fall and in areas where species richness has been lowered or is being masked by heavy deer browse. The expansion of *Fagus grandifolia* (American beech) into the drier natural communities at Rock Creek Park can make distinguishing them from Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075) also difficult.

Mid-Atlantic Mesic Mixed Hardwood Forest is sometimes referred to as Mesic Mixed Hardwood Forest.

Rock Creek Park Other Comments: The mixed hardwood upland forest described by Jorling (1969, Rock Creek Park) is synonymous with this association. Five forest types described by Anderson et al. (1977, Rock Creek Park) including the oak-beech, tulip tree-beech, tulip tree-oak, tulip tree-locust-pine, and chestnut oak-hickory-beech associations fall within the *Fagus grandifolia - Quercus alba / Podophyllum peltatum* Forest Association. Portions of the dry-mesic inland mixed oak forest of New Jersey (Breden 1989) including sites described by Robichaud and Buell (1973) and Lord and Boerner (1981) are contained in this association. Also included are the mesophytic oak-hickory forest of the western shore of Maryland (Shreve 1910); the *Liriodendron tulipifera - Quercus* spp. - *Fagus grandifolia* (American beech) forest (Clancy 1996, Delaware), in part; Pennsylvania's mesic-central forest (Smith 1983), in part; and Long Island's oak, mixed dicot-dogwood forest and the mixed mesophytic forest (Greller 1977) which is encompassed by Reschke's oak-tulip tree forest (1990, New York).

The term "mixed mesophytic" has been frequently used (e.g., Bromley 1935, Greller 1977, Rawinski 1989) to describe this and other associations in this alliance due to similarities in species composition with the Mixed Mesophytic Forest (see Braun 1950) of the central Appalachian mountains and vicinity. However, the classic Mixed Mesophytic Forest (or *Liriodendron tulipifera - Tilia american var. heterophylla - Aesculus flava - Acer saccharum* Forest Alliance in Grossman et al. 1998) is distinguished by an exceptionally high diversity of canopy and understory species and the presence of basswood (*Tilia americana* (American basswood) var. *heterophylla*) and buckeye (*Aesculus flava* (yellow buckeye)) (Braun 1950). Although there are similarities in canopy and subcanopy associates (e.g., beech, white oak, red oak, tulip poplar, dogwood, maple leaved viburnum and spicebush), the alliance represented at Rock Creek Park and other locations in the northeast (particularly on the coastal plain) lacks both the characteristic indicator tree species (*Tilia* (basswood) spp. and *Aesculus flava* (yellow buckeye)) and is considerably less diverse in species composition than the classic Mixed Mesophytic Forest.

Wolf Trap National Park for the Performing Arts Classification Comments: This community might be confused with Ruderal Tuliptree Forest (Typic Type) (CEGL007221) but has a more mixed canopy with oaks and hickories, as well as tuliptree. Unlike most other examples of this community in the region, stands at Wolf Trap do not have *Fagus grandifolia* (American beech) as a canopy tree or abundant understory species.

Mid-Atlantic Mesic Mixed Hardwood Forest is sometimes referred to as Mesic Mixed Hardwood Forest.

Global Classification Comments: The regional circumscription of this type is very robust and supported by 170 plots from Virginia, Maryland, and the District of Columbia. These were analyzed by VDNH with a 1300-plot regional dataset compiled for the NCR and Mid-Atlantic national parks vegetation mapping projects.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This association is documented from observation points and plots in the Inner Piedmont from Point of Rocks at Catoctin Mountain (Canal mile 49), Marble Quarry (Canal mile 38), to the Outer Piedmont just below Great Falls at Carderock (Canal mile 11). It occurs in extensive upland areas on the Maryland side at Great Falls (Canal mile 13-16). It is also mapped further downstream (Canal mile 5).

George Washington Memorial Parkway Range: Mid-Atlantic Mesic Mixed Hardwood Forest is the matrix forest in Great Falls Park and is common on uplands of Turkey Run Park that are well removed from the river. It is rare below Chain Bridge, where extensive quarrying and other disturbances long ago altered much of the natural vegetation. The largest stands below Chain Bridge occur on the uplands above Mount Vernon. Additional stands are found at Arlington Cemetery and a few small patches are located right off the southern end of the parkway.

Monocacy National Battlefield Range: This community is mapped at three locations in the park. It is easy to observe along the Brooks Hill Loop Trail.

National Capital Parks-East Range: Stands have been documented at Fort Washington, Oxon Hill Farm, Piscataway-Marshall, Baltimore-Washington Parkway/Little Patuxent, and along Interstate Highway 295. Most of the points and mapped locations are south of the Suitland Parkway, but some are known from the northern Baltimore-Washington Parkway (Patuxent North).

Prince William Forest Park Range: Mid-Atlantic Mesic Mixed Hardwood Forest is a matrix forest of Prince William Forest Park, occurring on deep, well-drained soils throughout the park.

Rock Creek Park Range: This community can be found in most places in the park except for the driest gravel-capped ridges and hilltops, or the steepest, most shallow-soiled convex slopes, or the richest mesic bottomlands or floodplains. Most typically, it is found on middle to lower slopes where the hillsides are gently to moderately sloping, and in shallow ravines, overlying acidic bedrock soils. These slopes typically have fairly deep, well-drained loamy acidic soils, primarily Manor and Glenelg loam (Rossell et al. 2007) formed from Laurel Formation bedrock. Along the western tributaries to Rock Creek (particularly Broad Branch), the slopes occupied by

this natural community commonly have soils formed over Kensington tonalite. Some examples also occur on soils underlain by igneous rocks with more available calcium for the plants.
Wolf Trap National Park for the Performing Arts Range: Mid-Atlantic Mesic Mixed Hardwood Forest forms several small stands near the eastern and northern edges of the park.
Global Range: This association is currently described from Virginia northward to Long Island, New York. The type is characteristic of the Coastal Plain throughout its range and of the Piedmont from south-central Virginia through much of Maryland. Small outliers of this vegetation occur at low elevations on both flanks of the Blue Ridge in Virginia and Maryland.
Nations: US
States/Provinces: DC:SNR, DE:S5, MD:SNR, NJ:S3, PA?:SNA, VA:S5
TNC Ecoregions: 52:C, 57:C, 58:C, 59:C, 61:C, 62:C
USFS Ecoregions (2007): 221Db:CCC, 221Dd:CCC, 221De:CCC, 231Af:CC?, 231Ib:CCC, 231Ic:CCC, 231Id:CCP, 231Ie:CCP, 231If:CCC, 232Ac:CCP, 232Ad:CCC, 232Ha:CC?, 232Hb:CCC, 232Hc:CCP, 232Hd:CCP, 232Ib:CCC, 232Je:C??, M221Da:CCC
Federal Lands: DOD (Fort A.P. Hill, Fort Belvoir, Kerr Reservoir, Yorktown); NPS (Appomattox Court House, C&O Canal, Colonial, Fredericksburg-Spotsylvania, George Washington Parkway, Monocacy, National Capital-East, Petersburg, Prince William, Richmond, Rock Creek, Sagamore Hill, Thomas Stone, Wolf Trap); USFWS (James River, Patuxent, Prime Hook)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (25 plots): MDGM_001, MDGM_002, MDGM_007, MDGM_012, MDGM_022, MDGM_023, MDGM_023A, MDGM_025, MDGM_029, MDGM_030, MDGM_032, MDGM_034, MDGM_035, MDGM_043, MDGM_045, MDGM_052, MDGM_065, MDGM_074, MDGM_082, MDGM_085, MDGM_090, MDGM_098, POTO_024.01, POTO_025.01, POTO_027.10.
George Washington Memorial Parkway Plots: GFNP_001, GFNP_0017, GFNP_013, GFNP_017, GFNP_040, GWMP_002, TURK_020, TURK_021, TURK_023, TURK_024, TURK_025, TURK_028, TURK_029, TURK_030.
National Capital Parks-East Plots: (7 plots: NACE.202, NACE.203, NACE.204, NACE.227, NACE.228, NACE.231, NACE.232).
Prince William Forest Park Plots: PRWI.32, PRWI.33, PRWI.39.
Rock Creek Park Plots: 1998 Classification: (Groups refer to notation in TWINSPAN analysis) GROUP 1 - MIXED OAK - BEECH VARIANT (less mesic, more oak) 9, 10, 11 (borderline with group 2), 13, 20, 22, 31, 33, 34, 56, 86. GROUP 2 - Beech-white oak/mayapple forest association (classic type) 15, 16, 17, 18, 19 (around forest opening), 27, 29, 32, 35, 57, 81, 83. GROUP 3 - BEECH - TULIP POPLAR (more mesic variant) 4, 5, 21, 23*, 24, 25* (* related to floodplain forest), 28, 30, 37, 51. (weedy), 52, 53, 61
Wolf Trap National Park for the Performing Arts Plots: None.
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman and G. Fleming
George Washington Memorial Parkway Description Author(s): G.P. Fleming and K. Taverna
Monocacy National Battlefield Description Author(s): J. Teague
National Capital Parks-East Description Author(s): M. Pyne
Prince William Forest Park Description Author(s): K. Taverna
Rock Creek Park Description Author(s): J. Teague
Wolf Trap National Park for the Performing Arts Description Author(s): G. Fleming
Global Description Author(s): S.L. Neid, G. Fleming and L.A. Sneddon
References: Bernard and Bernard 1971, Breden 1989, Breden et al. 2001, Clancy 1996, Coulling 1999, Coxe 2009, Davis et al. 1992, Eastern Ecology Working Group n.d.*, Edinger et al. 2008b, Edinger et al. 2014a, Fleming 2001a, Fleming 2002a, Fleming 2002b, Fleming 2007, Fleming and Coulling 2001, Fleming and Patterson 2003, Fleming and Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Harrison 2004, Harrison 2011, Lea 2003, Lea et al. 2012, McCoy and Fleming 2000, Patterson 2008a, Patterson 2008c, Patterson 2008e, Patterson 2008f, Patterson pers. comm., Rawinski 1984a, Robichaud and Buell 1973, Rossell et al. 2007, Smith 1983, Soil Conservation Service 1987, Taverna and Patterson 2008, Walton et al. 2001, Windisch 2014a, Young et al. 2007a

[CEGL006919] *Fagus grandifolia - Quercus (alba, velutina, montana) / Kalmia latifolia* Forest

Translated Name: **American Beech - (White Oak, Black Oak, Chestnut Oak) / Mountain Laurel Forest**
Common Name: **Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	North Atlantic Coastal Forest & Woodland (M525)
Group	North Atlantic Coastal Forest (G894)
Alliance	*Fagus grandifolia - Quercus rubra / Cornus florida* Forest Alliance (A2054)

Element Concept

Global Summary: This mixed forest of beech and oaks occurs on the Inner Coastal Plain and eastern Piedmont from New Jersey to southern Virginia. It is particularly common on steep ravine slopes and bluffs of dissected terrain with highly acidic soils. It occurs occasionally on short, steep bluffs of the Outer Coastal Plain, and occasionally occurs on elevated swamp islands with sandy, oligotrophic soils. The overstory is composed of *Fagus grandifolia* (American beech) with variable codominance by several oaks, particularly *Quercus montana* (chestnut oak), *Quercus alba* (white oak), and *Quercus velutina* (black oak). Minor associates include *Quercus coccinea* (scarlet oak), *Acer rubrum* (red maple), *Carya* (hickory) spp., and *Liriodendron tulipifera* (tuliptree). Typical subcanopy trees include *Sassafras albidum* (sassafras), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), *Amelanchier arborea* (common serviceberry), and *Ilex opaca* (American holly), the latter frequently dominating in Coastal Plain stands. An evergreen shrub layer with strong dominance by *Kalmia latifolia* (mountain laurel) is characteristic, with low-cover associates of *Rhododendron periclymenoides* (pink azalea), *Vaccinium* (blueberry) spp., and *Gaylussacia baccata* (black huckleberry). Deciduous ericads alone are dominant in rare patches that lack *Kalmia latifolia* (mountain laurel). On northern exposures, *Fagus grandifolia* (American beech) tends to strongly dominate, and *Kalmia latifolia* (mountain laurel) may achieve >75% cover.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: Occurs on dry upland ridges and slopes at elevations of 60-105 m (200-350 feet) in the Outer Piedmont (Triassic Basins).
National Capital Parks-East Environment: See Global Environment.
Prince William Forest Park Environment: Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest occurs in submesic habitats on west- to north-facing, steep ravine slopes and bluffs with acidic, nutrient-poor soils.
Rock Creek Park Environment: This beech-oak forest can be found on Rock Creek Park's steepest slopes or bluffs (commonly northwest-facing valley walls above a creek). Soils are generally thin, acidic, infertile and well-drained; and the underlying bedrock remains very close to the surface. Exposed outcrops of bedrock (typically Laurel Formation or Kensington tonalite) are visible in most stands. Because of a number of geologic faults at Rock Creek, it is not uncommon to see stretched mylonite rock exposed on these bluffs. Angular small boulders or cobbles of white quartz are common at the surface.
Global Environment: This association is characteristic of steep ravine slopes and bluffs in dissected terrain of the Inner Coastal Plain and eastern Piedmont. It also occurs occasionally on short, steep bluffs of the Outer Coastal Plain, as well as on elevated swamp islands with sandy, oligotrophic soils. Sites are mesic to submesic, with extremely acidic, infertile soils. The type occurs on slopes of various aspects but tends to favor northerly ones. Soil samples collected from 24 Virginia and Maryland sites had a mean pH of 4.2 and very low cation and base saturation levels. In the southern part of the range, this association is fairly common in dissected landscapes of the Inner Coastal Plain and fall-line zone of the Piedmont but occurs in progressively smaller and more isolated patches westward in the Piedmont, typically on steep cut-slopes on the outside of meander bends in large creeks and small rivers.

Vegetation Description

Chesapeake & Ohio Canal National Historical Park Vegetation: This forest has a canopy dominated by *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), or *Quercus velutina.* Other common canopy trees include *Liriodendron tulipifera* (tuliptree), *Fagus grandifolia Quercus rubra*, and *Quercus alba.* Subcanopy dominant trees include *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Nyssa sylvatica* and *Quercus montana* (chestnut oak). The dominant shrubs are *Fagus grandifolia* and *Kalmia latifolia.* Other shrubs include *Acer rubrum* (red maple), *Asimina triloba* (pawpaw), *Ilex opaca var. opaca* (American holly), *Nyssa sylvatica* (blackgum), *Quercus montana* and *Vaccinium pallidum.* Herbaceous plants are sparse, including *Agostis perennans*, *Chimaphila maculata* (striped prince's pine), *Dichanthelium dicotomum*, and *Microstegium vimineum* (exotic),
National Capital Parks-East Vegetation: In one observation point of this type at NACE, *Quercus montana* (chestnut oak) dominates the canopy, which also contains *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), and *Quercus rubra* (northern red oak). The subcanopy contains *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), and *Nyssa sylvatica* (blackgum). Shrubs include *Kalmia latifolia* (mountain laurel), as well as

Acer rubrum (red maple), *Ilex opaca var. opaca* (American holly), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Smilax* (greenbrier) sp., and *Vaccinium pallidum* (Blue Ridge blueberry), and smaller individuals of canopy and subcanopy taxa. Herbs are limited but include *Carex albicans* (whitetinge sedge) and *Monotropa uniflora* (Indianpipe).

Prince William Forest Park Vegetation: This deciduous forest is characterized by low species richness and an evergreen shrub layer. The canopy is closed to very open. *Fagus grandifolia* (American beech) is usually the dominant overstory tree, with *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Nyssa sylvatica* (blackgum), *Acer rubrum* (red maple), and *Quercus montana* (chestnut oak) as associates. Typical subcanopy trees include *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), and *Hamamelis virginiana* (American witch-hazel). An evergreen shrub layer with strong dominance (usually > 50% cover) by *Kalmia latifolia* (mountain laurel) is characteristic, with low-cover associates of *Rhododendron periclymenoides* (pink azalea), *Vaccinium* (blueberry) spp., and *Gaylussacia baccata* (black huckleberry). True herbs are sparse but can include *Luzula echinata* (hedgehog woodrush), *Eurybia divaricata* (white wood aster), *Chimaphila maculata* (striped prince's pine), *Carex digitalis* (slender woodland sedge), and *Polystichum acrostichoides* (Christmas fern).

Rock Creek Park Vegetation: The canopy is populated by *Fagus grandifolia* (American beech) and various oaks that are somewhat drought-tolerant, such as *Quercus prinus*, *Quercus alba* (white oak), and *Quercus velutina* (black oak). Dense patches of *Kalmia latifolia* (mountain laurel) characterize the understory. In this natural community, *Fagus grandifolia* (American beech) is present in all its life stages, from seedlings to mature canopy trees. *Kalmia latifolia* (mountain laurel) shares the understory with *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), and *Rhododendron periclymenoides* (pink azalea). Other trees and shrubs can include *Amelanchier arborea* (common serviceberry), *Cornus florida* (flowering dogwood), and *Hamamelis virginiana* (American witch-hazel). The typically sparse field layer may include *Chimaphila maculata* (striped prince's pine) and *Mitchella repens* (partridgeberry). Patches of moss often thrive where duff has eroded to expose mineral soil.

Global Vegetation: The overstory is composed of *Fagus grandifolia* (American beech) with variable codominance by several oaks, particularly *Quercus montana* (chestnut oak), *Quercus alba* (white oak), and *Quercus velutina* (black oak). Minor associates include *Quercus coccinea* (scarlet oak), *Acer rubrum* (red maple), *Carya* (hickory) spp., and *Liriodendron tulipifera* (tuliptree). Typical subcanopy trees include *Sassafras albidum* (sassafras), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), *Amelanchier arborea* (common serviceberry), and *Ilex opaca* (American holly), the latter frequently dominating in Coastal Plain stands. An evergreen shrub layer with strong dominance by *Kalmia latifolia* (mountain laurel) is characteristic, with low-cover associates of *Rhododendron periclymenoides* (pink azalea), *Vaccinium* (blueberry) spp., and *Gaylussacia baccata* (black huckleberry). Deciduous ericads alone are dominant in rare patches that lack *Kalmia latifolia* (mountain laurel). On northern exposures, *Fagus grandifolia* (American beech) tends to strongly dominate, and *Kalmia latifolia* (mountain laurel) may achieve >75% cover.

Global Dynamics: The relatively mesic, sheltered habitats of this association may have protected this vegetation and *Fagus grandifolia* (American beech) (a fire-intolerant species) from fires compared to drier slopes that support oak / heath forests. Beech is thin-barked and highly fire-sensitive, so mature stands of beech-(co)dominated forest indicate a very infrequent to nonexistent fire regime, especially stands of almost pure beech on very mesic to subhydric sites of the Inner Coastal Plain.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus velutina* (black oak)
Tree subcanopy	Broad-leaved deciduous tree	*Cornus florida* (flowering dogwood)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia* (mountain laurel)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Fagus grandifolia* (American beech), *Kalmia latifolia* (mountain laurel), *Quercus montana* (chestnut oak)

National Capital Parks-East: *Fagus grandifolia* (American beech), *Quercus montana* (chestnut oak)

Prince William Forest Park: *Fagus grandifolia* (American beech), *Kalmia latifolia* (mountain laurel)

Rock Creek Park: *Fagus grandifolia* (American beech), *Kalmia latifolia* (mountain laurel), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus velutina* (black oak)

Global: *Kalmia latifolia* (mountain laurel), *Quercus alba* (white oak), *Quercus montana* (chestnut oak)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)
Prince William Forest Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Rock Creek Park: Invasive/Exotic Plants: *Acer platanoides* (Norway maple, High/Medium, invasive non-native), *Celastrus orbiculatus* (oriental bittersweet, High/Medium, invasive non-native), *Hedera helix* (English ivy, High/Medium, invasive non-native), *Microstegium vimineum* (Nepalese browntop, High/Medium, invasive non-native), *Rubus phoenicolasius* (wine raspberry, Medium, invasive non-native), *Viburnum dilatatum* (linden arrow-wood, invasive non-native), mock orange; **Other Plants**: *Amelanchier arborea* (common serviceberry, G5), *Cornus florida* (flowering dogwood, G5), *Eurybia divaricata* (white wood aster, G5), *Hamamelis virginiana* (American witch-hazel, G5), *Pinus rigida* (pitch pine, G5), *Pinus virginiana* (Virginia pine, G5), *Sassafras albidum* (sassafras, G5), *Smilax rotundifolia* (roundleaf greenbrier, G5), *Viburnum acerifolium* (mapleleaf viburnum, G5), blueberries (N/A, common), hickories (N/A), moss (N/A, common)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (22-Sep-2008). This community is fairly common in the Inner Coastal Plain and Piedmont of Virginia and seems to be of a similar status in Maryland. Some occurrences exceed 1700 acres in size.

RELATED CONCEPTS

Global Similar Types:
- *Fagus grandifolia - Quercus alba / Kalmia latifolia - (Rhododendron catawbiense) / Galax urceolata* Forest (CEGL004539)
- *Quercus velutina - Quercus coccinea - Quercus montana / Kalmia latifolia* Forest (CEGL006374)

Global Related Concepts:
- *Quercus alba - Fagus grandifolia / Kalmia latifolia - Rhododendron periclymenoides* Forest (Fleming 2002a) =
- *Quercus montana - Carya alba / Vaccinium pallidum - Castanea pumila - Kalmia latifolia / Epigaea repens* Forest (Walton et al. 2001) =
- *Quercus montana - Fagus grandifolia / Ilex opaca / Kalmia latifolia* Forest (Fleming and Patterson 2003) =
- *Quercus montana / Kalmia latifolia* Forest (McCoy and Fleming 2000) =
- *Quercus prinus - Fagus grandifolia / Ilex opaca / Kalmia latifolia* Forest (Fleming 2002a) =
- Beech - Oak Mesic Inner Coastal Plain Forest (OH2) (Windisch 2014a) =
- Beech - mixed oak forest (Windisch 1995b) =

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Chesapeake & Ohio Canal National Historical Park Classification Comments: Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest is also referred to as Oak - Beech / Heath Forest.
National Capital Parks-East Classification Comments: Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest is also referred to as Oak - Beech / Heath Forest.
Prince William Forest Park Classification Comments: Some examples of Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest (also referred to as Oak - Beech / Heath Forest) may be difficult to distinguish from Low-Elevation Mixed Oak / Heath Forest (CEGL008521) since both can have a mixed oak canopy with patches of high *Kalmia latifolia* (mountain laurel) cover. Oak - Beech / Heath Forest can be distinguished by its location on west- to north-facing, steep ravine slopes and bluffs (rather than upland flats) with high canopy cover of *Fagus grandifolia* (American beech).
Rock Creek Park Classification Comments: Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest (also referred to as Oak - Beech / Heath Forest) has a forest canopy of *Fagus grandifolia* (American beech) along with drought-tolerant *Quercus prinus*, *Quercus velutina* (black oak), and/or *Quercus alba* (white oak). (Little or no *Liriodendron tulipifera* (tuliptree) grows in this community.) *Kalmia latifolia* (mountain laurel) is typical and may be accompanied by some blueberry, huckleberry, and *Rhododendron periclymenoides* (pink azalea) shrubs. Other than moss, there is little in the field layer of these steep, infertile slopes.
Global Classification Comments: A variant of this type was described by A. Windisch (OH1 or DOf1) at Fort Dix. This association is similar to ~*Quercus velutina - Quercus coccinea - Quercus montana / Kalmia latifolia* Forest (CEGL006374)$$, however, it lacks *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), or *Carya* (hickory) spp.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: Occurs in the Pennyfield to Blockhouse Point area (Canal mile 20-21) and at Watts Branch (Canal mile 18) in the Outer Piedmont (Triassic Basins).
National Capital Parks-East Range: There is one observation point of this type at Fort Washington marina.
Prince William Forest Park Range: Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest occurs in Prince William Forest Park as isolated stands on steep west- to north-facing slopes along the major streams in the park.
Rock Creek Park Range: This forest association is typically found on the eastern banks of Rock Creek or Broad Branch, especially south of Military Road. A great example can be seen on the east side of Rock Creek, on the Theodore Roosevelt Trail near the Blagden Avenue entrance. Here the trail cuts across a steep northwest-facing slope with Laurel Formation and mylonite--bedrock that has been stretched into a plated, shale-like quality by fault motion. Another good example of this community on mylonite occurs on the southernmost part of the Western Ridge Trail, on the steep north-facing bluff near Klingle Mansion, overlooking Rock Creek. It can also be found along the steep west-facing slopes over Broad Branch near Picnic Areas 25 and 26, west of the Western Ridge Trail near the Equitation Field. Other good examples occur on the steep, low ridge in the horseshoe curve of Rock Creek at Boulder Bridge, and on a quartz vein in Soapstone Valley.
Global Range: This mixed forest of beech and oaks occurs on the Inner Coastal Plain and eastern Piedmont along the fall zone, from New Jersey to southern Virginia.
Nations: US
States/Provinces: DC:SNR, DE:S1, MD:SNR, NJ:SNR, VA:S3
TNC Ecoregions: 52:C, 57:C, 58:C, 61:C, 62:C
USFS Ecoregions (2007): 221Da:CCC, 221Db:CCC, 221Dc:CCC, 221Dd:CCC, 231Af:CC?, 231Ib:CCC, 231Ic:CCC, 231Id:CCP, 231If:CCC, 232Ab:CCC, 232Ad:CCC, 232Ha:CC?, 232Hb:CCC, 232Ib:CCC, 232Je:C??
Federal Lands: DOD (Fort Belvoir, Fort Dix, Kerr Reservoir); NPS (C&O Canal, Colonial, National Capital-East, Prince William, Rock Creek); USFWS (Great Swamp)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: none
National Capital Parks-East Plots: (1 plot: KH_11JUL08_017).
Prince William Forest Park Plots: PRWI.45.
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
National Capital Parks-East Description Author(s): M. Pyne
Prince William Forest Park Description Author(s): K. Taverna
Rock Creek Park Description Author(s): J. Teague
Global Description Author(s): L.A. Sneddon and G.P. Fleming
References: Coxe 2009, Eastern Ecology Working Group n.d.*, Fleming 2002a, Fleming 2002b, Fleming and Patterson 2003, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, McCoy and Fleming 2000, Patterson 2008c, Walton et al. 2001, Windisch 1995b, Windisch 2014a

A4394 *Quercus muehlenbergii* - Mixed Hardwoods Calcareous Forest

[CEGL006055] *Fagus grandifolia - Liriodendron tulipifera - Carya cordiformis / Lindera benzoin / Podophyllum peltatum* Forest

Translated Name: **American Beech - Tuliptree - Bitternut Hickory / Northern Spicebush / Mayapple Forest**
Common Name: **Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	North Atlantic Coastal Forest & Woodland (M525)
Group	North Atlantic Coastal Forest (G894)
Alliance	*Quercus muehlenbergii* - Mixed Hardwoods Calcareous Forest (A4394)

ELEMENT CONCEPT

Global Summary: This association comprises luxuriant mesophytic forests of sheltered ravines and slopes with base-rich soils in the northern portions of the Coastal Plain and adjacent Piedmont. In the Piedmont, these soils are typically derived from amphibolite and other mafic rocks, or metasedimentary rocks with basic intrusions. Coastal

Plain habitats are in ravines that have downcut into Tertiary shell deposits or limesands. *Fagus grandifolia* (American beech) and *Liriodendron tulipifera* (tuliptree) are the principal canopy dominants, with *Carya cordiformis* (bitternut hickory) and *Quercus rubra* (northern red oak) as constant associates. Additional trees that may be locally important are *Juglans nigra* (black walnut), *Ulmus rubra* (slippery elm), *Quercus alba* (white oak), *Quercus muehlenbergii* (chinquapin oak), and *Fraxinus americana* (white ash). Stands typically have dense understories dominated by *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush). Herb layers are lush but tend to be characterized by patch-dominance of clonal forbs and ferns. *Podophyllum peltatum* (mayapple), *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), and *Polystichum acrostichoides* (Christmas fern) are widespread and abundant herbs. More locally abundant herbs include *Cystopteris protrusa* (lowland bladderfern), *Deparia acrostichoides* (silver false spleenwort), *Diplazium pycnocarpon* (glade fern), *Actaea racemosa* (black baneberry), *Phegopteris hexagonoptera* (broad beechfern), *Nemophila aphylla* (smallflower baby blue eyes), and *Actaea pachypoda* (white baneberry). Many additional low-cover herbaceous species are present in plot-sampled stands.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This forest was sampled at one location in the park. The site is a moderately rolling midslope upland (Piedmont) with a north aspect. The soil is well-drained. The unvegetated surface is dominated by leaf litter (90% cover) with some large rocks (4%), small rocks (3%), wood (1%), bare soil (1%), and mosses and lichens (1%). Evidence of disturbance includes chestnut blight, grazing/browsing, and the presence of exotic species.

George Washington Memorial Parkway Environment: Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest occurs throughout the Potomac Gorge section of the George Washington Memorial Parkway and at one site on Roosevelt Island in the Coastal Plain section of the park. It is associated with mesic, relatively fertile, lower to middle (rarely upper) slopes with predominantly eastern aspects. Slopes have a mean of 17 degrees, and rarely have more than 1 or 2% cover of loose rock. Some stands of this type occur on or near areas underlain by base-rich mafic igneous rocks. In other areas, undetected mafic bodies or colluvial processes may be contributors to enhanced soil fertility.

Monocacy National Battlefield Environment: This association is a terrestrial deciduous forest typically found on mesic, moderately sloping, mid to lower slopes. The soils are well-drained silt loams and silty clay loams that contain abundant small rocks and gravel. Deer browse may have significant impacts on the ground story of this forest type.

National Capital Parks-East Environment: This beech - tuliptree - bitternut hickory forest was sampled at seven locations in the park. This vegetation association represents mesic deciduous forests on base-rich soils of deeply incised ravine systems, sheltered coves, and river-fronting slopes along Piscataway Creek and the Potomac River. These forests are positioned on steep, mid-upper convex slopes with variable aspects that have downcut into calcareous soils of the Aquia Formation. Stands sampled occur on soils classified as Sassafras-Collington-Aura gravelly sandy loams with visible shell fragments observed in profiles. Mean (N=7 plots) soil chemistry values for this association are 5.26 pH, Ca=1812 ppm, Mg=140 ppm, and 48% total base saturation. The unvegetated ground surface is dominated by leaf litter along with some large and small rocks, wood, bare soil and shell fragments. Evidence of disturbance includes past logging, deer grazing/browsing, erosion, trails/roads and the presence of exotic plants.

Rock Creek Park Environment: At Rock Creek Park, this community is mostly found on the lowest mesic, concave slopes, and in moist, cool, shady ravines on fertile, well-drained soils. The fertility of the soils can come from igneous bedrock (tonalite), or from mineralized groundwater. It is often found immediately upslope of the floodplains of streams and their tributaries.

Global Environment: This type occurs on soils derived from amphibolite, other mafic rocks, and metasedimentary rocks with basic intrusions in the Piedmont, and in Coastal Plain ravines that have downcut into Tertiary shell deposits or limesands. Although very high compared to those of most Piedmont and Coastal Plain soils, soil pH and base cation levels at 39 plot sampling sites indicate only moderate fertility (VDNH unpubl. data). Typical soil chemistry values for this type are pH about 5.0, Ca about 1200 to 1500 ppm, Mg about 100 to 200 ppm, and total base saturation about 60%. In Maryland, this type occurs on steep calcareous bluffs along the Potomac River below Washington, DC. Other Maryland examples of this community are called "rich woods pockets" on the eastern shore. They are seemingly limited to ravine slopes (<1 acre) and in some cases sublevel uplands (largest stand about 15 acres) between ravines of the Choptank Formation (interbedded brown to yellow very fine-grained to fine-grained sand and gray to dark bluish-green argillaceous silt; locally indurated to calcareous sandstone; prominent shell beds;

thickness 0-15 m [0-50 feet]). They are most prevalent in Talbot, Queen Annes, Kent, and Dorchester (2 locations) counties on the Outer Coastal Plain.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderate (60% cover) tree canopy, 20-35 m tall, is dominated by *Liriodendron tulipifera* (tuliptree), *Fagus grandifolia* (American beech), *Quercus alba* (white oak) and *Quercus montana* (chestnut oak). Other canopy trees include *Juglans nigra* (black walnut), *Quercus rubra* (northern red oak), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), and *Tilia americana.* The very sparse to moderate (10-60%) subcanopy (10-20 m) can additionally include *Acer rubrum* (red maple), *Acer negundo* (box-elder), *Acer saccharum var. saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), and *Liriodendron tulipifera* (tuliptree). The very sparse (<5%) tall-shrub layer (6-10 m) and moderate (40%) short-shrub layer (1-6 m) are dominated by *Asimina triloba* (pawpaw) and *Fagus grandifolia* (American beech). Other shrubs include *Acer negundo* (box-elder), *Carpinus caroliniana* (American hornbeam), *Cercis canadensis var canadensis*, *Ilex opaca var. opaca* (American holly), *Lindera benzoin* (northern spicebush), and *Fagus grandifolia.* The herbaceous layer (20%) is dominated by *Alliaria petiolata* (garlic mustard) (exotic) along with small amounts of over 30 taxa, such as the native plants, *Arisaema triphyllum* (Jack in the pulpit), *Botrychium virginianum* (rattlesnake fern), *Brachyelytrum erectum* (bearded shorthusk), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Dichanthelium boscii* (Bosc's panicgrass), *Galium circaezans* (licorice bedstraw), *Pilea pumila* (Canadian clearweed), *Polystichum acrostichoides* (Christmas fern), *Sanicula canadensis* (Canadian blacksnakeroot), and *Viola sp.* The exotic herbaceous species *Microstegium vimineum* (Nepalese browntop), *Perilla frutescens* (beefsteakplant), and *Polygonum caespitosum var. longisetum* were reported from sampled stands. This community also supports one Maryland state-vulnerable species.

George Washington Memorial Parkway Vegetation: Sampled stands are mature, closed-canopy forests with the tallest canopy trees about 35 m tall. The overstory is dominated by tall, straight *Liriodendron tulipifera* (tuliptree), which contributes about 33% of the large-tree density. *Fagus grandifolia* (American beech), *Quercus rubra* (northern red oak), *Fraxinus americana* (white ash), and *Quercus alba* (white oak) are characteristic associates, one or more of which attain codominance in most stands. In aggregate, *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), and *Carya cordiformis* (bitternut hickory) are also important overstory associates, although only the latter is constant. Minor, inconstant overstory species include *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Nyssa sylvatica* (blackgum), *Quercus muehlenbergii* (chinquapin oak), and *Quercus montana. Fagus grandifolia* has the highest importance value and highest density of stems in this community due to its strong dominance of all subcanopy layers. Less important species usually present in the subcanopy include *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Ulmus rubra* (slippery elm), and taller stems of *Asimina triloba. Acer saccharum var. saccharum* and *Tilia americana var. americana* (American basswood) are occasional members of the understory, especially where stands occur in close proximity to Central Appalachian-Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type) (CEGL008412). The shrub layer is composed largely of *Asimina triloba* (pawpaw), *Lindera benzoin* (northern spicebush), and young *Fagus grandifolia* (American beech). The herb layer varies in total cover from about 10 to 80% and contains substantial representation of spring ephemerals and other early-flowering species. This layer typically exhibits patch-dominance by one to a few species, the most constant and abundant of which are *Podophyllum peltatum* (mayapple), *Claytonia virginica* (Virginia springbeauty), *Cardamine concatenata* (cutleaf toothwort), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), and *Polystichum acrostichoides* (Christmas fern). Other characteristic herbs are *Stellaria pubera* (star chickweed), *Arisaema triphyllum* (Jack in the pulpit), *Actaea racemosa* (black baneberry), *Adiantum pedatum* (northern maidenhair), *Sanguinaria canadensis* (bloodroot), *Phegopteris hexagonoptera* (broad beechfern), *Hepatica nobilis var. obtusa* (roundlobe hepatica), *Sanicula trifoliata* (largefruit blacksnakeroot), and *Galearis spectabilis* (showy orchid). Many additional herbs occur at low cover and constancy in plots.

Monocacy National Battlefield Vegetation: In the canopy, *Fagus grandifolia* (American beech) and *Liriodendron tulipifera* (tuliptree) are the principal canopy associates, although *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Carya* (hickory) spp. can be present. The closed canopy (70-90% cover) ranges in height from 20-27 m. Common subcanopy trees include *Fagus grandifolia* (American beech), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), *Ulmus americana* (American elm), and *Ostrya virginiana* (hophornbeam). The subcanopy can be sparse to moderately dense (10-40%) and contains trees that are 6-10 m in height. The tall-shrub layer is highly variable. Some areas contain numerous beech sprouts and/or dense *Asimina triloba* (pawpaw) in the tall-shrub layer. In other areas, the tall-shrub layer is sparse and contains scattered saplings of the canopy tree species. The herb layer can be sparse or well-established (30-75%). The most common species are the exotic species *Alliaria petiolata* (garlic mustard), *Polygonum cespitosum* (oriental

ladysthumb), and *Microstegium vimineum* (Nepalese browntop). Common native species include *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Podophyllum peltatum* (mayapple).

National Capital Parks-East Vegetation: This vegetation association is characterized by a closed forest (up to 90% cover) dominated by *Liriodendron tulipifera* (tuliptree), *Carya cordiformis* (bitternut hickory), *Quercus muehlenbergii* (chinquapin oak), and *Fagus grandifolia* (American beech) in the canopy (20-35+ m tall). Other species may include *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus shumardii* (Shumard oak) (stands along the Potomac River), and *Fraxinus americana* (white ash) at slightly lower frequency and cover. The subcanopy (20-40%) typically includes the same species as the canopy as well as a few individuals of *Ulmus rubra* (slippery elm), *Tilia americana* (American basswood), *Ostrya virginiana* (hophornbeam), and *Cercis canadensis* (eastern redbud). The shrub layer may be dense (up to 80%) with *Asimina triloba* (pawpaw) and low-cover associates such as *Lindera benzoin* (northern spicebush), *Cornus florida* (flowering dogwood), and *Carpinus caroliniana* (American hornbeam). The herbaceous layer is very diverse and variable among stands. The most constant species in the herbaceous layer include *Podophyllum peltatum* (mayapple), *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), and *Polystichum acrostichoides* (Christmas fern). Locally abundant species reported from stands may include *Actaea racemosa* (black baneberry), *Galium circaezans* (licorice bedstraw), *Sanguinaria canadensis* (bloodroot), *Cardamine concatenata* (cutleaf toothwort), *Uvularia perfoliata* (perfoliate bellwort), *Diplazium pycnocarpon* (glade fern), *Nemophila aphylla* (smallflower baby blue eyes), *Carex jamesii* (James' sedge), and *Cystopteris protrusa* (lowland bladderfern). These forest stands have been invaded by exotic species; 13 exotic taxa were recorded from seven plots. However, they also support several locally rare species including MD-state critically imperiled *Nemophila aphylla* (smallflower baby blue eyes) and MD-state imperiled *Arisaema dracontium* (green dragon), *Diplazium pycnocarpon* (glade fern), and *Quercus shumardii* (Shumard oak).

Rock Creek Park Vegetation: This forest is the most species-diverse, moist upland natural community in Rock Creek Park. Tall, large-diameter *Liriodendron tulipifera* (tuliptree) and possibly *Fagus grandifolia* (American beech) often clearly dominating the canopy, along with a notable presence of *Quercus rubra* (northern red oak) and possibly *Quercus alba* (white oak). Wildflowers, including *Podophyllum peltatum* (mayapple), *Arisaema triphyllum* (Jack in the pulpit), and *Sanguinaria canadensis* (bloodroot), are a visual treat in spring and early summer. The fertile soil here also supports a wide variety of ferns. This rich forest often has a well-developed and diverse shrub layer. Common shrubs are *Lindera benzoin* (northern spicebush) and *Asimina triloba* (pawpaw). Additional shrubs may include *Euonymus americanus* (bursting-heart), *Viburnum prunifolium* (blackhaw), and *Viburnum dentatum* (southern arrow-wood). Indicator species at Rock Creek Park include *Carya cordiformis* (bitternut hickory) and/or *Fraxinus americana* (white ash) and *Tilia americana* (American basswood) trees growing together with the more common canopy trees. *Ulmus rubra* (slippery elm), another indicator of rich soils, may occur in the subcanopy. *Acer saccharum* (sugar maple) (possibly not native to Rock Creek) may be found here, too, as it also prefers the nutrient-rich, well-drained soils unique to this upland community. The field layer is usually lush, sometimes with invasive plants, but often with *Epifagus virginiana* (beechdrops), *Polystichum acrostichoides* (Christmas fern), *Thelypteris noveboracensis* (New York fern), *Phegopteris hexagonoptera* (broad beechfern), *Osmorhiza claytonii* (Clayton's sweetroot), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Maianthemum racemosum* (feathery false lily of the valley), *Polygonatum biflorum* (smooth Solomon's seal), *Erythronium americanum* (dogtooth violet), *Cardamine concatenata* (cutleaf toothwort), *Claytonia virginica* (Virginia springbeauty), *Polygonum virginianum* (jumpseed), *Eurybia divaricata* (white wood aster), *Dioscorea villosa* (wild yam), and *Stellaria pubera* (star chickweed).

Global Vegetation: In the 40 Virginia and Maryland stands analyzed for the National Capital Parks project, *Fagus grandifolia* (American beech) and *Liriodendron tulipifera* (tuliptree) are the most important canopy dominants, with *Carya cordiformis* (bitternut hickory) and *Quercus rubra* (northern red oak) as constant associates. Additional trees that may be locally important are *Juglans nigra* (black walnut), *Ulmus rubra* (slippery elm), *Quercus alba* (white oak), *Quercus muehlenbergii* (chinquapin oak) (especially important in Coastal Plain shell-marl ravines), *Fraxinus americana* (white ash), and *Tilia americana var. americana* (American basswood). Stands typically have a dense understory dominated by *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush). The herb layer is lush but tends to be characterized by patch-dominance of clonal forbs and ferns. *Podophyllum peltatum* (mayapple), *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), and *Polystichum acrostichoides* (Christmas fern) are widespread and abundant herbs. More locally abundant herbs include *Cystopteris protrusa* (lowland bladderfern), *Deparia acrostichoides* (silver false spleenwort), *Diplazium pycnocarpon* (glade fern),

Actaea racemosa (black baneberry), *Phegopteris hexagonoptera* (broad beechfern), *Nemophila aphylla* (smallflower baby blue eyes), and *Actaea pachypoda* (white baneberry). Many additional low-cover herbaceous species are present in plot-sampled stands. Mean species richness is 54 taxa per 400 m2. In eastern Maryland, *Liriodendron tulipifera* (tuliptree) is dominant with *Fagus grandifolia* (American beech), *Quercus alba* (white oak), and *Quercus rubra* (northern red oak) usually present. Hickories are variable, with *Carya cordiformis* (bitternut hickory), *Carya glabra* (pignut hickory), and sometimes *Carya tomentosa* (mockernut hickory) usually present at low cover. Diagnostic shrubs include *Viburnum prunifolium* (blackhaw) and *Lindera benzoin* (northern spicebush). The herb layers in this community are quite lush compared to most surrounding drier mixed oak-heath forests. Dominant and most frequent herbs include *Podophyllum peltatum* (mayapple), *Botrychium oneidense* (bluntlobe grapefern), *Polystichum acrostichoides* (Christmas fern), *Sanguinaria canadensis* (bloodroot), *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Actaea racemosa* (black baneberry), *Galium circaezans* (licorice bedstraw), *Cardamine concatenata* (cutleaf toothwort), and *Uvularia perfoliata* (perfoliate bellwort). Herbs mentioned in the description that have not been reported on the eastern shore of Maryland include *Diplazium pycnocarpon* (glade fern), *Nemophila aphylla* (smallflower baby blue eyes), and *Cystopteris protrusa* (lowland bladderfern). However, there is documentation that these species occur in such habitats on the Inner Coastal Plain and Piedmont.

Global Dynamics: Mature examples of this association appear to be naturally mixed forests, with variable overstory composition maintained by natural disturbances and gap dynamics. Over long periods of time, *Fagus grandifolia* (American beech) is most likely to exert dominance in a stand because of its superior shade-tolerance and longevity compared to other canopy associates. On Piedmont sites where *Acer saccharum* (sugar maple) is important in adjacent communities, recruitment of this shade-tolerant species occurs in some stands of this association. Examples of this community that have been heavily disturbed by cutting usually have overstories dominated by *Liriodendron tulipifera* (tuliptree), *Liquidambar styraciflua* (sweetgum), and other fast-growing, shade-intolerant species, and may have significant component of invasive exotics in the herb layer. Shade-tolerant exotics such as *Alliaria petiolata* (garlic mustard) and *Microstegium vimineum* (Nepalese browntop) are serious threats to even undisturbed stands of this vegetation type.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Asimina triloba* (pawpaw), *Lindera benzoin* (northern spicebush)
Herb (field)	Flowering forb	*Podophyllum peltatum* (mayapple)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Fagus grandifolia* (American beech)
George Washington Memorial Parkway: *Asimina triloba* (pawpaw), *Fagus grandifolia* (American beech), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Podophyllum peltatum* (mayapple), *Polystichum acrostichoides* (Christmas fern)
Monocacy National Battlefield: *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Podophyllum peltatum* (mayapple)
National Capital Parks-East: *Arisaema triphyllum* (Jack in the pulpit), *Carya cordiformis* (bitternut hickory), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Podophyllum peltatum* (mayapple), *Quercus muehlenbergii* (chinquapin oak)
Rock Creek Park: *Asimina triloba* (pawpaw), *Carya cordiformis* (bitternut hickory), *Fagus grandifolia* (American beech), *Lindera benzoin* (northern spicebush), *Podophyllum peltatum* (mayapple), *Quercus rubra* (northern red oak)
Global: *Carya cordiformis* (bitternut hickory), *Fagus grandifolia* (American beech), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Podophyllum peltatum* (mayapple), *Quercus rubra* (northern red oak)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Galium concinnum* (shining bedstraw, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens*

(beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rubus phoenicolasius* (wine raspberry, Medium)
George Washington Memorial Parkway: Vulnerable Plants: *Carex careyana* (Carey's sedge, G4G5, VA state-vulnerable), *Panax quinquefolius* (American ginseng, G3G4, under collection pressure), *Phacelia covillei* (Coville's phacelia, G3, VA state-critically imperiled), *Sanicula trifoliata* (largefruit blacksnakeroot, G4, VA state-vulnerable); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Euonymus alatus* (burningbush, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Prunus subhirtella* (winter-flowering cherry), *Rubus phoenicolasius* (wine raspberry, Medium), *Veronica hederifolia* (ivyleaf speedwell)
Monocacy National Battlefield: Vulnerable Plants: *Asplenium resiliens* (blackstem spleenwort, G5, MD state-critically imperiled), *Galium concinnum* (shining bedstraw, G5, MD state-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Berberis thunbergii* (Japanese barberry, High/Medium), *Chenopodium album* (lambsquarters), *Dactylis glomerata* (orchardgrass, Medium/Insignificant), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* (oriental ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low), *Stellaria media* (common chickweed, Low), *Veronica hederifolia* (ivyleaf speedwell)
National Capital Parks-East: Vulnerable Plants: *Carex albursina* (white bear sedge, G5, MD-vulnerable), *Diplazium pycnocarpon* (glade fern, G5, MD-imperiled), *Myosotis macrosperma* (largeseed forget-me-not, G5, MD-vulnerable), *Nemophila aphylla* (smallflower baby blue eyes, G5, MD-critically imperiled), *Quercus shumardii* (Shumard oak, G5, MD-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Clematis terniflora* (sweet autumn virginsbower), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Prunus avium* (sweet cherry, High/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Stellaria media* (common chickweed, Low), *Veronica hederifolia* (ivyleaf speedwell)
Rock Creek Park: Invasive/Exotic Plants: *Acer palmatum* (Japanese maple, Low/Insignificant), *Acer platanoides* (Norway maple, High/Medium), *Akebia quinata* (chocolate vine, Medium/Low), *Alliaria petiolata* (garlic mustard, High/Medium), *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Berberis thunbergii* (Japanese barberry, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Euonymus alatus* (burningbush, Low), *Euonymus fortunei* (winter creeper, High/Medium), *Hedera helix* (English ivy, High/Medium), *Humulus japonicus* (Japanese hop, Medium/Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Philadelphus coronarius* (sweet mock orange), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Viburnum dilatatum* (linden arrow-wood), *Viburnum plicatum* (Japanese snowball), *Wisteria sinensis* (Chinese wisteria, Medium)
Global: Vulnerable Plants: *Panax quinquefolius* (American ginseng, G3G4, under collection pressure), *Phacelia covillei* (Coville's phacelia, G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (09-May-2002).

RELATED CONCEPTS

Global Similar Types:
- *Fagus grandifolia - Acer floridanum - Quercus muehlenbergii / Sanguinaria canadensis* Forest (CEGL007181)
- *Liriodendron tulipifera - Quercus rubra - Fraxinus americana / Asimina triloba / Actaea racemosa* Forest (CEGL006186) a similar community distributed primarily in rocky, clay-rich soils weathered from mafic rocks of the western Piedmont and Blue Ridge foothills; its distribution slightly overlaps that of CEGL006055 in gorges of the northern Piedmont. Compared to CEGL006055, *Fagus grandifolia* (American beech), *Carya cordiformis* (bitternut hickory), *Quercus muehlenbergii* (chinquapin oak), and *Podophyllum peltatum* (mayapple) are much less important; *Quercus rubra* (northern red oak), *Fraxinus americana* (white ash), and *Actaea racemosa* (black baneberry) are much more important.

Global Related Concepts:

- *Fagus grandifolia - Liriodendron tulipifera - Carya cordiformis / Asimina triloba / Podophyllum peltatum* Forest (Young et al. 2007a) =
- *Fagus grandifolia - Liriodendron tulipifera - Carya cordiformis / Lindera benzoin / Podophyllum peltatum* Forest (Fleming et al. 2007b) =
- *Juglans nigra - Liriodendron tulipifera - Fagus grandifolia / Asimina triloba - Lindera benzoin / Actaea pachypoda* Forest (Walton et al. 2001) =
- *Liriodendron tulipifera - Fagus grandifolia - Carya cordiformis / Asimina triloba / Circaea lutetiana ssp. canadensis* Forest (Fleming and Patterson 2003) =
- Tuliptree Rich Wood (coastal plain variant) (Coxe 2006) ><

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest is also referred to as Basic Mesic Hardwood Forest.
George Washington Memorial Parkway Classification Comments: Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest (also referred to as Basic Mesic Hardwood Forest) is similar to, and co-occurs on the landscape with, both Central Appalachian-Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type) (CEGL008412) and Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075). In Turkey Run Park, where this type co-occurs with CEGL008412, it occupies higher slope positions and soils that are demonstrably less fertile. Floristically, it can be distinguished by its less lush herb layer, which often exhibits monospecific dominance by large clones of *Podophyllum peltatum* (mayapple) or *Claytonia virginica. Acer saccharum var. saccharum* and *Tilia americana var. americana* (American basswood) occasionally occur as understory trees but are not important overstory dominants as they are in CEGL008412. Additionally, a suite of herbs characteristic of the latter, including *Caulophyllum thalictroides* (blue cohosh), *Trillium sessile* (toadshade), *Dicentra cucullaria* (Dutchman's breeches), *Dicentra canadensis* (squirrel corn), *Hydrophyllum canadense* (bluntleaf waterleaf), *Erigenia bulbosa* (harbinger of spring), *Deparia acrostichoides* (silver false spleenwort), *Cystopteris protrusa* (lowland bladderfern), *Allium tricoccum* (ramp), *Jeffersonia diphylla* (twinleaf), *Diplazium pycnocarpon* (glade fern), and *Carex albursina* (white bear sedge), are absent or very infrequent.

Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest differs from Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075) by its association with soils of higher base status, the greater abundance of *Fraxinus americana* (white ash) and *Carya* (hickory) spp. in the tree layers, the much greater importance of *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush) in the shrub layer, and its higher cover of spring ephemerals and other nutrient-demanding herbs. The two are most likely to be confused in late summer and fall, when spring ephemerals are absent and overall herbaceous biomass is reduced.

Heavily disturbed or early-successional forests similar to Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest are strongly dominated by tall, even-aged *Liriodendron tulipifera* (tuliptree) and are classified as Ruderal Tuliptree Forest (Rich Type) (CEGL007220). These stands will likely succeed to Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest as the stand recovers from past disturbance.
George Washington Memorial Parkway Other Comments: This community apparently does not occur, or at least has not been clearly documented, on the Maryland / District of Columbia side of the gorge. Some slopes in C&O Canal National Historical Park now occupied by disturbed, successional forests may have once supported this type.
Monocacy National Battlefield Classification Comments: Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest is also referred to as Basic Mesic Hardwood Forest.
National Capital Parks-East Classification Comments: Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest is also referred to as Basic Mesic Hardwood Forest.
Rock Creek Park Classification Comments: Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest (also referred to as Basic Mesic Hardwood Forest) is easily identified early in the growing season when the spring ephemeral wildflowers are blooming. Other times of year, it can be easily confused with the surrounding Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075). When rich herbs are absent, diagnostic trees, such as *Carya cordiformis* (bitternut hickory), *Fraxinus americana* (white ash), and *Tilia americana* (American basswood), and a dense and diverse shrub layer can help distinguish this community from CEGL006075. In addition, this community typically lacks *Ilex opaca* (American holly).
Rock Creek Park Other Comments: Many areas of Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest (CEGL006055) at the park have been invaded by a variety of non-native plants which respond to the rich

soils with vigorous growth. Invasion of non-native plants and over-browsing by deer are the major threats to this community at the park, and each can impact the community so dramatically as to make it almost unrecognizable.
Global Classification Comments: Classification of this association is supported by the analysis of plot data from 40 stands in the Piedmont and Inner Coastal Plain regions of Virginia and Maryland, plus additional quantitative and qualitative data from Maryland, Delaware, and New Jersey. Several variants, including a calcareous ravine variant in which *Quercus muehlenbergii* (chinquapin oak) is important, are evident, but the type is too variable to segregate into formal subtypes. This community type occurs in small to large patches and is somewhat locally but widely distributed in the eastern half of the Piedmont in Virginia and Maryland. Coastal Plain occurrences are probably more local. The scarcity of oaks and the abundance of *Fagus* (beech) and *Liriodendron* (tuliptree) in documented stands may be artifacts of past logging. An outstanding occurrence of this association, containing scattered residual trees 1.0-1.5 m dbh, has been documented at Crow's Nest, Stafford County, VA. Similar vegetation is reported from calcareous ravines in southern Maryland by Rod Simmons. Comparable stands also occur in Rock Creek Park, Washington, DC (G. Fleming pers. obs.).

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled above the towpath northeast of Fort Duncan.
George Washington Memorial Parkway Range: Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest occurs throughout the Potomac Gorge section of George Washington Memorial Parkway, but it is rare below Chain Bridge, where it only occurs at one site on the upland slopes of Roosevelt Island. Quarrying and other disturbances long ago destroyed much of the natural vegetation below Chain Bridge. The type is most widespread in Turkey Run Park, between the parkway and the river, and south of the parkway along Turkey and Dead runs. In Great Falls and Riverbend parks, it tends to be restricted to deep ravines and lower slopes subtending the river floodplain.
Monocacy National Battlefield Range: This association occurs primarily on gently rolling lower slopes in the Brooks Hill section of the park.
National Capital Parks-East Range: This forest association was sampled at seven locations in Prince Georges County, Maryland, including Fort Washington, Fort Foote, Johnson's Gully, Hard Bargain Farm, and Piscataway Park. There were also observations at Shepherd Parkway. All of these locations and all of the mapped polygons are south of the Suitland Parkway.
Rock Creek Park Range: Good examples of this community occur in ravines and concave slopes near the base of hills in the main part of the park, Melvin Hazen Park, Whitehaven Parkway, and southern Battery Kemble Park.
Global Range: This association occurs in the eastern Piedmont and Inner Coastal Plain from Virginia to New Jersey.
Nations: US
States/Provinces: DC:SNR, DE:S2, MD:SNR, NJ:SNR, VA:S3
TNC Ecoregions: 52:C, 57:C, 58:C, 59:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, 221Dd:CCC, 231Af:CC?, 231Ib:CCC, 231Ic:CCC, 231Id:CCP, 231If:CCC, 232Ac:CCP, 232Ad:CCC, 232Ha:CC?, 232Hb:CCC, 232Ib:CCC, 232Je:C??, M221Da:CCC
Federal Lands: NPS (C&O Canal, George Washington Parkway, Monocacy, National Capital-East, Rock Creek, Thomas Stone); USFWS (Chesapeake Marshlands, Eastern Neck, Prime Hook)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (1 plot): CHOH.306.
George Washington Memorial Parkway Plots: GFNP_027, GFNP_034, GFNP_035, GFNP_036, GWMP_005, GWMP.12, GWMP.18, TURK_015, TURK_016, TURK_027, TURK_039, TURK_040, TURK_041, TURK_043, TURK_044, TURK_047.
Monocacy National Battlefield Plots: (3 plots): MONO.1, MONO.7, MONO.548.
National Capital Parks-East Plots: (7 plots: NACE.202, NACE.203, NACE.204, NACE.227, NACE.228, NACE.231, NACE.232).
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming and K. Taverna
Monocacy National Battlefield Description Author(s): S. Perles and M. Russo
National Capital Parks-East Description Author(s): J.W. Harrison, mod. M.J. Russo
Rock Creek Park Description Author(s): J. Teague
Global Description Author(s): J. Harrison and G.P. Fleming

References: Coxe 2006, Coxe 2009, Eastern Ecology Working Group n.d.*, Fleming 2002b, Fleming 2007, Fleming and Patterson 2003, Fleming and Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Fleming unpubl. data, Harrison 2004, Harrison 2011, Lea et al. 2012, Walton et al. 2001, Young et al. 2007a

[CEGL007748] *Quercus muehlenbergii / Cercis canadensis / Bromus pubescens - Erigeron pulchellus var. pulchellus - Aquilegia canadensis* Forest

Translated Name: **Chinquapin Oak / Eastern Redbud / Hairy Woodland Brome - Robin's-plantain - Red Columbine Forest**

Common Name: **North Atlantic Coastal Plain Dry Calcareous Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	North Atlantic Coastal Forest & Woodland (M525)
Group	North Atlantic Coastal Forest (G894)
Alliance	*Quercus muehlenbergii* - Mixed Hardwoods Calcareous Forest (A4394)

Element Concept

Global Summary: This dry, open, calcareous forest of the Coastal Plain of Virginia and Maryland is restricted to subxeric to xeric, fertile habitats over unconsolidated, calcareous deposits. These localized habitats are found on southeast- to southwest-facing, usually convex slopes of deep ravines or stream-fronting bluffs that have downcut into Tertiary shell deposits or limesands. Occurrences are small (typically <1 acre) and highly localized in dissected portions of the Virginia Inner Coastal Plain and Maryland Outer Coastal Plain. *Quercus muehlenbergii* (chinquapin oak) is a constant, codominant or dominant canopy tree and is the most characteristic tree of this type. Some stands tend toward a woodland physiognomy, with low-statured, gnarled trees and a very open canopy. The understory includes *Juniperus virginiana var. virginiana* (eastern red-cedar) and *Cercis canadensis var. canadensis* (eastern redbud). The herb layer is usually patchy but contains a diversity of species, including several long-range mountain disjuncts. Particularly abundant or noteworthy herbaceous species include *Erigeron pulchellus var. pulchellus* (robin's plantain), *Dichanthelium boscii* (Bosc's panicgrass), *Bromus pubescens* (hairy woodland brome), and *Aquilegia canadensis* (red columbine). Other locally important species are *Carex albicans* (whitetinge sedge), *Matelea carolinensis* (maroon Carolina milkvine), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Elymus villosus* (hairy wildrye), *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod), *Symphyotrichum patens* (late purple aster), *Arabis laevigata* (smooth rockcress), *Verbesina virginica var. virginica* (white crownbeard), *Campanulastrum americanum* (American bellflower), *Smallanthus uvedalius* (hairy leafcup), *Silphium trifoliatum var. trifoliatum* (whorled rosinweed), *Desmodium pauciflorum* (fewflower ticktrefoil), *Hexalectris spicata* (spiked crested coralroot), and *Piptochaetium avenaceum* (blackseed speargrass).

Environmental Description

National Capital Parks-East Environment: This rare calcareous oak-hickory forest is restricted to subxeric, convex slopes bordering the Potomac River (west-facing slopes) and Piscataway Creek (south-facing slopes). Habitats are highly localized and positioned over unconsolidated slopes of calcareous soils derived from the Upper Paleocene Aquia Formation. Some of the mapped polygons of this type extend onto the adjacent Cretaceous Potomac and Severn formations below. Stands are less than 5 acres in size and occupy mid to upper slopes with soils classified as Sassafras-Collington-Aura gravelly sandy loam. Mean soil chemistry values from one plot at Fort Washington (NACE.201) indicate high soil fertility; pH = 6.9, Ca = 6083 ppm, Mg = 198 ppm, total base saturation = 100%. The unvegetated ground surface is dominated by leaf litter with small amounts of small rocks, wood, and bare soil. Evidence of disturbance includes trails/roads and the presence of exotic plants.

Global Environment: This forest occurs on subxeric to xeric, fertile habitats over unconsolidated, calcareous deposits in dissected portions of the Inner Coastal Plain from southeastern Virginia north to Kent County, Maryland. The majority of documented stands are in the central Virginia Coastal Plain near Williamsburg (James City, Surry, and York counties). Habitats are developed on the steep, convex, south-facing slopes of deep ravines and stream-fronting bluffs that have downcut into Tertiary shell deposits or limesands. Soils are slightly acidic to circumneutral, with high calcium levels. Mean soil chemistry values from plots of this type are comparable to those from limestone soils in the mountains (G. Fleming unpubl. data): pH = 6.5, Ca = 4707 (ppm), Mg = 116, Fe = 158, Mn = 67, Al = 403, P = 40, K = 113, cation exchange capacity = 27.4, total base saturation = 86.3%.

VEGETATION DESCRIPTION

National Capital Parks-East Vegetation: This association is dominated (60% cover) by *Quercus muehlenbergii* (chinquapin oak) and *Fraxinus americana* (white ash) in the overstory (20-35 m tall). Less constant are species such as *Quercus shumardii* (Shumard oak), *Quercus rubra* (northern red oak), *Carya ovalis* (red hickory), *Carya cordiformis* (bitternut hickory), and *Celtis occidentalis* (common hackberry). Subcanopy species are variable but commonly include *Ulmus rubra* (slippery elm), *Cercis canadensis* (eastern redbud), *Ostrya virginiana* (hophornbeam), *Cornus florida* (flowering dogwood), and *Juniperus virginiana* (eastern red-cedar). The shrub layer varies from dense (up to 80%) (stands with *Asimina triloba* (pawpaw)) to open but generally include *Viburnum prunifolium* (blackhaw), *Lindera benzoin* (northern spicebush), *Cercis canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Acer negundo* (box-elder) (atypical), and *Asimina triloba* (pawpaw) (atypical). Vines are unimportant in this type but are found to include *Toxicodendron radicans* (eastern poison-ivy), *Smilax rotundifolia* (roundleaf greenbrier), *Parthenocissus quinquefolia* (Virginia creeper), *Campsis radicans* (trumpet creeper), and the non-native invasives *Clematis terniflora* (sweet autumn virginsbower) and *Lonicera japonica* (Japanese honeysuckle). The herbaceous layer is diverse with species such as *Bromus pubescens* (hairy woodland brome), *Bromus nottowayanus* (Nottoway Valley brome), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Arabis laevigata* (smooth rockcress), *Sanguinaria canadensis* (bloodroot), *Dichanthelium boscii* (Bosc's panicgrass), *Polygonatum biflorum* (smooth Solomon's seal), *Carex blanda* (eastern woodland sedge), *Solidago caesia* (wreath goldenrod), *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod), and *Phryma leptostachya* (American lopseed). In addition, this forest supports MD-state critically imperiled *Matelea carolinensis* (maroon Carolina milkvine) and MD-state imperiled *Myosotis macrosperma* (largeseed forget-me-not).

Global Vegetation: *Quercus muehlenbergii* (chinquapin oak) is a constant, codominant or dominant canopy tree and is the most characteristic tree of this type, occurring with a variety of mostly inconstant associates, including *Acer floridanum* (southern sugar maple), *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus montana* (chestnut oak), *Tilia americana* (American basswood), and *Ulmus rubra* (slippery elm). Small tree and shrub associates include *Cercis canadensis var. canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Dirca palustris* (eastern leatherwood), *Ilex opaca var. opaca* (American holly), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Ostrya virginiana* (hophornbeam), *Sideroxylon lycioides* (buckthorn bully), and *Viburnum rufidulum* (rusty blackhaw). The most characteristic or locally abundant herbs include *Agrimonia rostellata* (beaked agrimony), *Aquilegia canadensis* (red columbine), *Arabis laevigata var. laevigata* (smooth rockcress), *Aristolochia serpentaria* (Virginia snakeroot), *Bromus pubescens* (hairy woodland brome), *Carex albicans var. australis* (stellate sedge), *Carex laxiflora var. laxiflora* (broad looseflower sedge), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Elymus villosus* (hairy wildrye), *Erigeron pulchellus var. pulchellus* (robin's plantain), *Phryma leptostachya* (American lopseed), *Solidago caesia* (wreath goldenrod), and *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod). Herbs that are important in specific geographic parts of the range include *Arnoglossum atriplicifolium* (pale Indian plantain), *Asclepias verticillata* (whorled milkweed), *Chasmanthium sessiliflorum* (longleaf woodoats), *Desmodium pauciflorum* (fewflower ticktrefoil), *Eupatorium sessilifolium* (upland boneset), *Fleischmannia incarnata* (pink thoroughwort), *Heuchera americana* (American alumroot), *Matelea carolinensis* (maroon Carolina milkvine), *Piptochaetium avenaceum* (blackseed speargrass), *Scleria oligantha* (littlehead nutrush), *Silphium trifoliatum* (whorled rosinweed), *Smallanthus uvedalius* (hairy leafcup), *Sorghastrum elliottii* (slender Indiangrass), and *Symphyotrichum patens var. patens* (late purple aster). Stands of this community type also contain a number of species that are more-or-less strongly disjunct from primary ranges in the mountains and Piedmont, including *Hexalectris spicata* (spiked crested coralroot), *Corallorhiza wisteriana* (spring coralroot), *Campanulastrum americanum* (American bellflower), *Celastrus scandens* (American bittersweet), *Muhlenbergia sobolifera* (rock muhly), *Muhlenbergia tenuiflora* (slimflower muhly), *Sanicula marilandica* (Maryland sanicle), *Arabis lyrata* (lyrate rockcress), *Packera obovata* (roundleaf ragwort), *Symphyotrichum laeve var. laeve* (smooth blue aster), and *Thalictrum revolutum* (waxyleaf meadowrue). Mean species richness of 24 plot samples analyzed by VDNH was 67 taxa per 400 m2.

Global Dynamics: Warm aspects and dry, highly calcareous soils appear to be the principal environmental factors in the occurrence and composition of this type. Owing to the scarcity of calcareous soils in the Coastal Plain, the combination of requisite site conditions for this type is very rare, accounting for the small and widely dispersed patches. The short, steep slopes incised into unconsolidated sediments provide a somewhat tenuous foothold for trees and are subject to windthrows during hurricanes and other high-wind conditions. For instance, all patches of this association at Chippokes State Park in Surry County, Virginia, were severely damaged by Hurricane Isabel in 2003 to the extent that the overstory was nearly removed, and the habitats cannot now be traversed because of the

fallen trees. Increased light from the canopy removal has fostered massive invasions of *Lonicera japonica* (Japanese honeysuckle) and *Microstegium vimineum* (Nepalese browntop) at this site.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus muehlenbergii* (chinquapin oak)

CHARACTERISTIC SPECIES

National Capital Parks-East: *Arabis laevigata* (smooth rockcress), *Bromus nottowayanus* (Nottoway Valley brome), *Bromus pubescens* (hairy woodland brome), *Celtis occidentalis* (common hackberry), *Cercis canadensis* (eastern redbud), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix* var. *hystrix* (eastern bottlebrush grass), *Elymus villosus* (hairy wildrye), *Fraxinus americana* (white ash), *Juniperus virginiana* (eastern red-cedar), *Phryma leptostachya* (American lopseed), *Quercus muehlenbergii* (chinquapin oak), *Solidago caesia* (wreath goldenrod), *Solidago ulmifolia* (elmleaf goldenrod), *Ulmus rubra* (slippery elm)
Global: *Agrimonia rostellata* (beaked agrimony), *Aquilegia canadensis* (red columbine), *Arabis laevigata* (smooth rockcress), *Aristolochia serpentaria* (Virginia snakeroot), *Bromus pubescens* (hairy woodland brome), *Carex albicans* var. *australis* (stellate sedge), *Carex laxiflora* (broad looseflower sedge), *Cercis canadensis* (eastern redbud), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix* (eastern bottlebrush grass), *Elymus villosus* (hairy wildrye), *Erigeron pulchellus* (robin's plantain), *Juniperus virginiana* (eastern red-cedar), *Phryma leptostachya* (American lopseed), *Quercus muehlenbergii* (chinquapin oak), *Solidago caesia* (wreath goldenrod), *Solidago ulmifolia* (elmleaf goldenrod)

OTHER NOTEWORTHY SPECIES

National Capital Parks-East: Vulnerable Plants: *Matelea carolinensis* (maroon Carolina milkvine, G4, MD-critically imperiled), *Myosotis macrosperma* (largeseed forget-me-not, G5, MD-vulnerable), *Quercus shumardii* (Shumard oak, G5, MD-imperiled); **Invasive/Exotic Plants**: *Clematis terniflora* (sweet autumn virginsbower), *Ligustrum sinense* (Chinese privet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Verbascum blattaria* (moth mullein), *Veronica hederifolia* (ivyleaf speedwell)
Global: Invasive/Exotic Plants: *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (15-Feb-2007). This community is restricted to dry, calcium-rich, shell-containing soils of the eastern Virginia and Maryland Coastal Plain. This community is naturally rare and restricted to a specialized edaphic situation that is regionally restricted and extremely rare within this region. Despite relatively intensive inventory, fewer than 30 scattered occurrences totaling less than 20 hectares are known. About 25% of the known patches are located on public lands, but many of these occur in a poor landscape context and are subject to encroachment by invasive weeds.

RELATED CONCEPTS

Global Similar Types:
- *Fagus grandifolia - Acer floridanum - Quercus muehlenbergii / Sanguinaria canadensis* Forest (CEGL007181) is a mesic forest occurring on cooler, more sheltered slopes of calcareous ravines; contains substantial *Fagus grandifolia* (American beech), *Acer floridanum* (southern sugar maple), and mesophytic understory species such as *Asimina triloba* (pawpaw).

Global Related Concepts:
- *Quercus muehlenbergii / Cercis canadensis / Dichanthelium boscii - Bromus pubescens - Erigeron pulchellus var. pulchellus - Aquilegia canadensis* Forest (Fleming et al. 2007b) =
- *Quercus muhlenbergii - Carya cordiformis / Dichanthelium boscii - Erigeron pulchellus - (Desmodium pauciflorum)* Forest (Fleming and Patterson 2003) =
- *Quercus muhlenbergii - Celtis (occidentalis, laevigata) / Elymus villosus* Forest (Fleming and Patterson 2003) =
- *Quercus muhlenbergii / Erigeron pulchellus - Dichanthelium boscii - (Verbesina virginica)* Forest (Fleming 2002a) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

National Capital Parks-East Classification Comments: North Atlantic Coastal Plain Dry Calcareous Forest is sometimes referred to as Dry Calcareous Forest.
Global Classification Comments: Classification of this type is supported by analysis of a 1250-plot regional dataset for the NCR and Mid-Atlantic national parks vegetation mapping projects. In that analysis, this association was represented by 22 plots from James City, Stafford, Surry, Westmoreland, and York counties, Virginia, and two plots from Kent County, Maryland. According to Rod Simmons, vegetation similar to the stands of this type at Crow's Nest, Stafford County, Virginia, occurs across the Potomac River at Chapman's Landing, Maryland. It is likely that this community type is endemic to a narrow region of the Coastal Plain stretching from Charles County, Maryland, south to Surry County, Virginia. Further inventory is required to determine whether it is present in Isle of Wight County and City of Suffolk, Virginia. This is a small-patch community type, usually occurring in patches of <1 acre or 0.4 ha. The total acreage of all known occurrences is <20 hectares.

ELEMENT DISTRIBUTION

National Capital Parks-East Range: This forest association was sampled at Fort Washington in Prince Georges County, Maryland. The only observation points of this type, as well as the only mapped polygons, are in the vicinity of Fort Washington.
Global Range: This dry, open, calcareous forest is widely scattered in the Coastal Plain of Virginia and Maryland. Occurrences in Virginia are in highly dissected portions of the Inner Coastal Plain in James City, Stafford, Surry, Westmoreland, and York counties. Occurrences in Maryland are in the Outer Coastal Plain in Kent County.
Nations: US
States/Provinces: DC:SNR, MD:S1, VA:S1
TNC Ecoregions: 57:C, 58:C
USFS Ecoregions (2007): 232Ad:CCC, 232Ha:CC?, 232Hb:CCC, 232Ib:CCC, 232Je:C??
Federal Lands: DOD (Yorktown); NPS (Colonial, George Washington Birthplace, National Capital-East)

ELEMENT SOURCES

National Capital Parks-East Plots: (2 plots: NACE.201, FOWA.001).
National Capital Parks-East Description Author(s): J.W. Harrison, mod. M.J. Russo
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d.*, Fleming 2001a, Fleming 2002a, Fleming 2002b, Fleming and Patterson 2003, Fleming et al. 2007b, Fleming et al. 2017, Fleming unpubl. data, Harrison 2004, Harrison 2011, McAvoy and Harrison 2012, Patterson 2008c, Patterson 2008d, Patterson pers. comm., Ware and Ware 1992

A4209 *Quercus velutina - Quercus falcata - Pinus rigida* Coastal Plain Forest Alliance

This alliance includes coastal forests of the glaciated Northeast, ranging south to the coastal plain of Virginia. It ranges from forest to woodland in physiognomy and is generally deciduous. *Quercus velutina* (black oak) and *Quercus alba* (white oak) dominate in the north, with *Quercus falcata* (southern red oak) codominant in the south. A dwarf-shrub heath layer is characteristic, and includes *Gaylussacia baccata* (black huckleberry), *Gaylussacia frondosa* (blue huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), and in the north, *Vaccinium angustifolium* (lowbush blueberry). The herbaceous layer is sparsely to moderately developed and includes *Aralia nudicaulis* (wild sarsaparilla), *Carex pensylvanica* (Pennsylvania sedge), *Maianthemum canadense* (Canada mayflower), *Maianthemum stellatum* (starry false lily of the valley), and *Panicum virgatum* (switchgrass).

[CEGL006329] *Pinus rigida - Quercus coccinea - Quercus falcata / (Quercus marilandica) / Gaylussacia frondosa* Woodland

Translated Name: **Pitch Pine - Scarlet Oak - Southern Red Oak / (Blackjack Oak) / Blue Huckleberry Woodland**
Common Name: **North Atlantic Coastal Plain Oak - Pine Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	North Atlantic Coastal Forest & Woodland (M525)
Group	North Atlantic Coastal Forest (G894)

Alliance *Quercus velutina - Quercus falcata - Pinus rigida* Coastal Plain Forest Alliance (A4209)

ELEMENT CONCEPT

Global Summary: This pitch pine - oak woodland of dry sandy soils occurs in portions of the New Jersey Pine Barrens and the Cape May peninsula, with outliers occurring south of the Delaware Bay on the Maryland Inner Coastal Plain. Dominant trees include *Pinus rigida* (pitch pine) mixed with tree oaks, most frequently *Quercus falcata* (southern red oak) and *Quercus coccinea* (scarlet oak). Other associated oaks include *Quercus velutina* (black oak) and *Quercus alba* (white oak). *Pinus virginiana* (Virginia pine) sometimes occurs, and in New Jersey, *Pinus echinata* (shortleaf pine) may be an associate. Maryland occurrences may also include *Nyssa sylvatica* (blackgum) and *Liquidambar styraciflua* (sweetgum) in the canopy. The tall-shrub layer is characterized by *Quercus marilandica* (blackjack oak), *Quercus prinoides* (dwarf chinquapin oak), *Ilex opaca* (American holly), *Sassafras albidum* (sassafras), and occasionally *Kalmia latifolia* (mountain laurel). Maryland occurrences also support *Castanea pumila* (chinquapin), *Lyonia mariana* (piedmont staggerbush), and *Vaccinium fuscatum* (black highbush blueberry) in this layer. A short-shrub layer is dominated by *Gaylussacia frondosa* (blue huckleberry), *Gaylussacia baccata* (black huckleberry), and *Vaccinium pallidum* (Blue Ridge blueberry). The herbaceous or field layer is usually sparse and may include *Smilax glauca* (cat greenbrier), *Chimaphila maculata* (striped prince's pine), *Gaultheria procumbens* (eastern teaberry), *Carex pensylvanica* (Pennsylvania sedge), and *Cypripedium acaule* (moccasin flower).

ENVIRONMENTAL DESCRIPTION

National Capital Parks-East Environment: This pitch pine - scarlet oak woodland was sample at once in the park. The site is a somewhat xeric crest with well-drained sandy clay soil with occasional pea gravel and some peat in upper horizon. The unvegetated ground surface is dominated by leaf litter with some wood. No evidence of disturbance was reported. The points and mapped polygons are on the sand-dominated facies of the Lower Cretaceous Potomac Formation.

Global Environment: This community is associated with xeric, sublevel, sandy uplands. In Maryland, soils are unconsolidated sands of the Patuxent Formation and are extremely acidic with exceedingly low base cation and base saturation levels, indicating extreme infertility.

VEGETATION DESCRIPTION

National Capital Parks-East Vegetation: The dense (up to 80% cover) canopy tall (20-35 m tall) and sparse (20%) subcanopy (10-20 m) are dominated by *Pinus rigida* (pitch pine) and *Quercus coccinea* (scarlet oak); additional tree species include lesser amounts of *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Pinus virginiana* (Virginia pine), and *Quercus alba* (white oak). The sparse (10%) shrub layers (0.5-10 m) include canopy species as well as trace amounts of *Kalmia latifolia* (mountain laurel) and *Rhododendron periclymenoides* (pink azalea). The herbaceous layer is dominated by ericaceous dwarf-shrubs including dominants *Gaylussacia baccata* (black huckleberry) and *Gaylussacia frondosa* (blue huckleberry), along with lesser amounts of *Eubotrys racemosa* (swamp doghobble), *Lyonia mariana* (piedmont staggerbush), *Rhododendron periclymenoides* (pink azalea), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium stamineum* (deerberry).

Global Vegetation: Current examples of this community vary from woodlands to open forests. The overstory consists of *Pinus rigida* (pitch pine) mixed with tree oaks, most frequently *Quercus falcata* (southern red oak) and *Quercus coccinea* (scarlet oak). Other associated oaks include *Quercus velutina* (black oak) and *Quercus alba* (white oak). *Pinus virginiana* (Virginia pine) sometimes occurs, and in New Jersey, *Pinus echinata* (shortleaf pine) may be an associate. Maryland occurrences may also include *Nyssa sylvatica* (blackgum) and *Liquidambar styraciflua* (sweetgum) in the canopy. The tall-shrub layer is characterized by *Quercus marilandica* (blackjack oak), *Quercus prinoides* (dwarf chinquapin oak), *Ilex opaca* (American holly), *Sassafras albidum* (sassafras), *Castanea pumila* (chinquapin), and occasionally *Kalmia latifolia* (mountain laurel). Maryland occurrences also support *Castanea pumila* (chinquapin), *Lyonia mariana* (piedmont staggerbush), and *Vaccinium fuscatum* (black highbush blueberry) in this layer. A short-shrub layer is dominated by *Gaylussacia frondosa* (blue huckleberry), *Gaylussacia baccata* (black huckleberry), and *Vaccinium pallidum* (Blue Ridge blueberry). The herbaceous or field layer is usually sparse and may include *Smilax glauca* (cat greenbrier), *Chimaphila maculata* (striped prince's pine), *Gaultheria procumbens* (eastern teaberry), *Carex pensylvanica* (Pennsylvania sedge), and *Cypripedium acaule* (moccasin flower).

Global Dynamics: Edaphic conditions (xeric, rapidly drained soils) are undoubtedly an important influence on vegetation composition. In New Jersey, and likely in Maryland, periodic fires once contributed to the woodland physiognomy and ensured long-term recruitment of the strongly fire-adapted *Pinus rigida* (pitch pine). Exclusion of

fires for many decades (especially in Maryland) may have contributed to the closure of some stands and the presence of fire-intolerant species such as *Pinus virginiana* (Virginia pine) and *Acer rubrum* (red maple).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus rigida* (pitch pine)
Tree canopy	Broad-leaved deciduous tree	*Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak)
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia frondosa* (blue huckleberry)

CHARACTERISTIC SPECIES

National Capital Parks-East: *Gaylussacia frondosa* (blue huckleberry), *Pinus rigida* (pitch pine), *Quercus coccinea* (scarlet oak)
Global: *Gaylussacia frondosa* (blue huckleberry), *Pinus rigida* (pitch pine), *Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak), *Quercus marilandica* (blackjack oak)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (18-Jan-2006).

RELATED CONCEPTS

Global Similar Types:

- *Quercus alba - Quercus falcata - (Carya pallida) / Gaylussacia frondosa* Forest (CEGL006269) dry oak / heath forest of the northeastern Coastal Plain from NJ to VA; occupies somewhat less xeric sites and is a true forest, lacking *Pinus rigida* (pitch pine) and *Quercus prinoides* (dwarf chinquapin oak).
- *Quercus falcata - Pinus rigida - Pinus echinata / Ilex opaca* Woodland (CEGL006929)

Global Related Concepts:

- *Pinus rigida - Pinus virginiana / Vaccinium fuscatum / Epigaea repens* Forest (NatureServe 2005a) **<**
- *Pinus rigida - Quercus coccinea / Gaylussacia baccata - Vaccinium pallidum - Castanea pumila* Forest (NatureServe 2005a) **<**
- *Pinus rigida / Sassafras albidum - Quercus prinoides / Gaylussacia baccata - Vaccinium pallidum* Forest (NatureServe 2005a) **<**
- Mixed Pine - Oak Mid-Successional Forest (PO3, variant of PO1, PO2) (Windisch 2014a) **<**
- Pine - Oak Forest (PO1) (Windisch 2014a) **<**
- Pine - Oak Successional Woodland (SPO) (Windisch 2014a) **<**
- Pine - Oak Upland (POU; variant of PO2 and others) (Windisch 2014a) **<**
- Pine Oak Woodland (POW9) (Windisch 1995b) **?**
- Pitch Pine - Oak Forest (P02; variant of Pine - Oak Forest) (Windisch 2014a) **<**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
National Capital Parks-East Classification Comments: Pine Barrens Pine - Oak Woodland is also referred to simply as Pine - Oak Woodland.
Global Classification Comments: Classification of this association at the southern end of its range is supported by analysis of plot data for the NCR vegetation mapping project. In that analysis, a group of six Maryland plots sampled from areas of the Patuxent Formation proved distinct from related oak/heath vegetation and matched this type closely.

ELEMENT DISTRIBUTION

National Capital Parks-East Range: This woodland association was sampled along the west side of the northern Baltimore-Washington Parkway at Powder Mill Road. There are also mapped polygons at Patuxent North, in Anne Arundel County, Maryland.
Global Range: This association occurs on the Coastal Plain of New Jersey and Maryland.
Nations: US
States/Provinces: DC:SNR, MD:S3, NJ:SNR
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions (2007): 232Ab:CCC, 232Ad:CCC

Federal Lands: DOD (Fort Meade); NPS (National Capital-East); USFWS (Cape May, Patuxent, Beltsville Agricultural, Goddard)

ELEMENT SOURCES

National Capital Parks-East Plots: (1 plot: NACE.017).
National Capital Parks-East Description Author(s): M.J. Russo
Global Description Author(s): L.A. Sneddon, J. Teague, G.P. Fleming
References: Eastern Ecology Working Group n.d.*, Harrison 2004, Harrison 2011, NatureServe 2005a, Windisch 1995b, Windisch 2014a

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[CEGL006390] *Quercus falcata - Quercus michauxii / Ilex opaca* Forest

Translated Name: **Southern Red Oak - Swamp Chestnut Oak / American Holly Forest**
Common Name: **Mesic Coastal Plain Oak Forest**

USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	North Atlantic Coastal Forest & Woodland (M525)
Group	North Atlantic Coastal Forest (G894)
Alliance	*Quercus velutina - Quercus falcata - Pinus rigida* Coastal Plain Forest Alliance (A4209)

ELEMENT CONCEPT

Global Summary: This community is a mesic oak forest of the central Atlantic Coastal Plain. In general, this vegetation borders wetlands and occurs in areas with a high water table or soils with high clay content. Canopy dominants include *Quercus falcata* (southern red oak), *Quercus phellos* (willow oak), *Quercus alba* (white oak), *Quercus michauxii* (swamp chestnut oak), with *Liquidambar styraciflua* (sweetgum) and *Acer rubrum* (red maple) common associates. Pines may be present, including *Pinus rigida* (pitch pine) or *Pinus echinata* (shortleaf pine) in New Jersey, or *Pinus taeda* (loblolly pine) in Delaware and Maryland. *Pinus serotina* (pond pine) is reported in some Delaware examples of this community. A subcanopy is often present with *Ilex opaca* (American holly), *Vaccinium corymbosum* (highbush blueberry), and *Amelanchier canadensis* (Canadian serviceberry). *Gaylussacia frondosa* (blue huckleberry) forms a patchy shrub layer draped with *Smilax rotundifolia* (roundleaf greenbrier), and the herb layer is sparse with species such as *Chasmanthium laxum* (slender woodoats), *Osmunda regalis* (royal fern), and *Mitchella repens* (partridgeberry).

In New Jersey, this forest occupies peripheral parts of the Pinelands in the coastal oak-pine-holly subregion and extends inland along the edges of major river estuaries. These forests are codominated by tree-oaks such as *Quercus falcata* (southern red oak), *Quercus phellos* (willow oak), *Quercus michauxii* (swamp chestnut oak), *Quercus coccinea* (scarlet oak), and *Quercus alba* (white oak), smaller amounts of *Liquidambar styraciflua* (sweetgum), *Acer rubrum* (red maple), *Pinus rigida* (pitch pine), *Pinus echinata* (shortleaf pine), and rarely in New Jersey *Pinus taeda* (loblolly pine), as well as local areas with codominance by *Fagus grandifolia* (American beech), *Carya* (hickory) spp., *Liriodendron tulipifera* (tuliptree), or other hardwoods. The multi-layered understory is often dense and evergreen, including *Ilex opaca* (American holly), *Cornus florida* (flowering dogwood), *Kalmia latifolia* (mountain laurel), *Vaccinium corymbosum* (highbush blueberry), and other heaths. This community can also be associated with oak-pine-holly forest (OPH) near the coast with similar understory structure and species diversity.

Oak-hardwood-holly mesic forests are concentrated in the coastal subregion of the Pinelands, typically on "perihydric" sites (i.e., adjacent to wetlands), and/or mesic to semi-hydric upland soils with a higher clay content relative to most Pinelands soils. Fire-return intervals of 150-200 years are suggested by its species composition which contains thin-barked, fire-sensitive hardwoods and holly and little or no pine, as well as its peripheral distribution in the Pinelands landscape. The interval between fires in this community has been great due to its location near both the coast and major wetlands, where the regional edge effect and fire shadow effect combine. The coastal influence on climate which moderates temperatures and expands growing season also enhances the abundance of southern-affinity holly, southern red oak, willow oak and swamp chestnut oak.

ENVIRONMENTAL DESCRIPTION

National Capital Parks-East Environment: This southern red oak - willow oak forest was sampled at two locations in the park. The sites are rolling mid and upper slopes with clay loam soils and bog iron present. The unvegetated ground surface is dominated by leaf litter along with a fair amount of wood. Evidence of disturbance

includes past logging, wind damage, erosion/flood scouring, trails/roads, human trash, and the presence of exotic plants.

Rock Creek Park Environment: This community occurs on flat or rolling areas in the Coastal Plain section of the park.

Global Environment: These forests occur on somewhat poorly drained sands or on soils with high clay content, where the water table is close to the soil surface; they often border wetlands. In Prince Georges County, Maryland, it occupies sublevel uplands and ravines in estuarine terrace deposits. Here, the type is often sympatrically associated with gravel terraces dominated by xeric stands of *Quercus montana* (chestnut oak) and *Quercus alba* (white oak). It is hypothesized that shallow clay lenses may cause seasonally poor drainage (as with hardpan soils), even on upland slopes, and may allow for the dominance of swamp species on sloping uplands. Soil samples collected from two Maryland plots were extremely acidic with low base cation and base saturation levels.

VEGETATION DESCRIPTION

National Capital Parks-East Vegetation: The dense (up to 90% cover) canopy (20-35 m tall) is codominated by *Quercus falcata* (southern red oak) and *Quercus phellos* (willow oak); additional species generally found in lesser amounts include *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Liquidambar styraciflua* (sweetgum), *Nyssa sylvatica* (blackgum), and *Pinus virginiana* (Virginia pine); most of which make up the moderate (40%) subcanopy (10-20 m), as well as the moderate (up to 40%) shrub layers (0.5-10 m). Additional shrubs include *Ilex opaca var. opaca* (American holly), *Liriodendron tulipifera* (tuliptree), and *Vaccinium fuscatum* (black highbush blueberry). The herbaceous layer is dominated by tree and shrub seedlings but may also include small amounts of herbs such as *Carex swanii* (Swan's sedge), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Mitchella repens* (partridgeberry), and the exotic *Polygonum cespitosum var. longisetum* (oriental ladysthumb). Vines of *Parthenocissus quinquefolia* (Virginia creeper), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), and *Toxicodendron radicans* (eastern poison-ivy) may be found trailing along the ground or climbing into the shrub canopy.

Rock Creek Park Vegetation: The tree canopy includes a mix of oak species, often including *Quercus falcata* (southern red oak), *Quercus phellos* (willow oak), and *Quercus alba* (white oak). The understory is characterized by *Acer rubrum* (red maple) (red maple), *Ilex opaca* (American holly) (American holly), and *Nyssa sylvatica* (blackgum) (blackgum) and a tangle of vines both native and non-native.

Global Vegetation: Canopy dominants include *Quercus falcata* (southern red oak), *Quercus phellos* (willow oak), *Quercus alba* (white oak), *Quercus michauxii* (swamp chestnut oak), and *Quercus palustris* (pin oak), with *Liquidambar styraciflua* (sweetgum) and *Acer rubrum* (red maple) common associates, especially in disturbed stands. Pines may be present, including *Pinus rigida* (pitch pine) or *Pinus echinata* (shortleaf pine) in New Jersey, or *Pinus taeda* (loblolly pine) in Delaware and Maryland. *Pinus serotina* (pond pine) is reported in some Delaware examples of this community. *Quercus coccinea* (scarlet oak) occurs in some New Jersey examples. A subcanopy is often present with *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Ilex opaca* (American holly), and *Sassafras albidum* (sassafras). Tall shrubs can include *Vaccinium corymbosum* (highbush blueberry), *Viburnum dentatum* (southern arrow-wood), *Eubotrys racemosa* (swamp doghobble), *Clethra alnifolia* (coastal sweet-pepperbush), *Lyonia ligustrina* (maleberry), *Ilex verticillata* (common winterberry), and *Amelanchier canadensis* (Canadian serviceberry). *Gaylussacia frondosa* (blue huckleberry) forms a patchy shrub layer draped with *Smilax rotundifolia* (roundleaf greenbrier), and the herb layer is sparse with species such as *Chasmanthium laxum* (slender woodoats), *Osmunda regalis* (royal fern), *Mitchella repens* (partridgeberry), *Carex swanii* (Swan's sedge), *Carex debilis* (white edge sedge), *Bartonia paniculata* (twining screwstem), *Cypripedium acaule* (moccasin flower), and *Lilium superbum* (turk's-cap lily). Successional stands on formerly cleared or disturbed land may have extensive colonies of *Lycopodium digitatum* (fan clubmoss) and *Lycopodium obscurum* (rare clubmoss) in the herb layer.

Global Dynamics: This association grades into upland oak forests. These forests are concentrated in the coastal subregion of the New Jersey Pinelands, typically on "perihydric" sites (i.e., adjacent to wetlands), and/or mesic to semi-hydric upland soils with a higher clay content relative to most Pinelands soils. Fire-return intervals of 150-200 years are suggested by its species composition which contains thin-barked, fire-sensitive hardwoods and holly and little or no pine, as well as its peripheral distribution in the Pinelands landscape. The interval between fires in this community has been great due to its location near both the coast and major wetlands, where the regional edge effect and fire shadow effect combine. The coastal influence on climate which moderates temperatures and expands growing season also enhances the abundance of southern-affinity holly, southern red oak, willow oak and swamp chestnut oak.

MOST ABUNDANT SPECIES

CHARACTERISTIC SPECIES

National Capital Parks-East: *Ilex opaca* var. *opaca* (American holly), *Quercus falcata* (southern red oak), *Quercus phellos* (willow oak)
Rock Creek Park: *Acer rubrum* (red maple), *Ilex opaca* (American holly), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak), *Quercus falcata* (southern red oak), *Quercus phellos* (willow oak)

OTHER NOTEWORTHY SPECIES

National Capital Parks-East: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Polygonum perfoliatum* (Asiatic tearthumb, Medium)
Rock Creek Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR. Oak-hardwood-holly mesic forest is ranked S2S3 in New Jersey and is not yet globally ranked (Breden et al. 2001, p. 39). The range of this association includes the southern parts of New Jersey near Delaware Bay and the Atlantic Coast in peripheral parts of the Pinelands, and possibly in Delaware and Maryland. Total statewide acreage is estimated to be between 1000 and 5000 acres. The number of occurrences is unknown. This forest is declining and vulnerable to loss of critical habitats. Threats include type conversion or degradation from forest management practices (e.g., silvicultural practices which convert to pine-dominated forest, excessive prescribed burning which impacts understory strata), as well as fragmentation and habitat destruction by development.

RELATED CONCEPTS

Global Related Concepts:
- Oak - Hardwood - Holly Subhydric Coastal Plain Forest (OHH) (Windisch 2014a) **<**
- Oak - southern hardwood "peri-hydric" forest (Windisch pers. comm.) **?**
- Pine - Oak- Holly Forest (POH: variant of OHH) (Windisch 2014a) **<**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
National Capital Parks-East Classification Comments: Some of the points attributed to this type are of questionable confidence, and there is some uncertainty about its identity and origin. Within this park, this community is also referred to as Coastal Plain Oak Forest.
Rock Creek Park Classification Comments: Within this park, the Mesic Coastal Plain Oak Forest is also referred to as Coastal Plain Oak Forest.

ELEMENT DISTRIBUTION

National Capital Parks-East Range: This forest association was sampled at Greenbelt Park in Prince Georges County, Maryland.
Rock Creek Park Range: This community occurs in the Fort Circle parks in the Coastal Plain.
Global Range: This type is currently described from New Jersey to Maryland. In New Jersey, this forest occupies peripheral parts of the Pinelands in the coastal oak-pine-holly subregion and extends inland along the edges of major river estuaries (Windisch 1999).
Nations: US
States/Provinces: DC:SNR, DE:S5, MD:SNR, NJ:S2S3
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions (2007): 232Ab:CCC, 232Ac:CCP, 232Ad:CCC, 232Hb:CCC, 232Hc:CC?, 232Hd:CCP
Federal Lands: NPS (National Capital-East, Rock Creek); USFWS (Cape May, Chesapeake Marshlands, E.B. Forsythe, Prime Hook, Supawna Meadows)

ELEMENT SOURCES

National Capital Parks-East Plots: (2 plots: NACE.004, NACE.005).
Rock Creek Park Plots: none
National Capital Parks-East Description Author(s): M.J. Russo

Rock Creek Park Description Author(s): J. Teague
Global Description Author(s): S.L. Neid, G.P. Fleming and L.A. Sneddon
References: Breden 1989, Breden et al. 2001, Coxe 2009, Eastern Ecology Working Group n.d.*, Harrison 2004, Harrison 2011, Leck 1979, NatureServe 2009, Windisch 1999, Windisch 2014a, Windisch pers. comm.

[CEGL006490] *Quercus montana / Deschampsia flexuosa - Solidago bicolor* Forest

Translated Name: **Chestnut Oak / Wavy Hairgrass - White Goldenrod Forest**
Common Name: **Chesapeake Bay River Bluff Chestnut Oak Forest**

USNVC Classification

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	North Atlantic Coastal Forest & Woodland (M525)
Group	North Atlantic Coastal Forest (G894)
Alliance	*Quercus velutina - Quercus falcata - Pinus rigida* Coastal Plain Forest Alliance (A4209)

Element Concept

Global Summary: This association occurs on river-fronting slopes composed of unconsolidated sediments on the Inner Coastal Plain of Virginia, Maryland, and Delaware. Sites include both very steep, erosive, bluff-like slopes and more stable, gently convex upper slopes and bluff-tops underlain by coarse gravel deposits. In either case, the ground surface typically has a substantial amount of exposed mineral substrate, and soils are sandy, extremely acidic, and infertile. This vegetation is an open, somewhat stunted forest with strong overstory dominance by *Quercus montana* (chestnut oak). *Quercus rubra* (northern red oak), *Quercus alba* (white oak), *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), and *Quercus stellata* (post oak) are variably present, minor associates. *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), *Amelanchier arborea* (common serviceberry), and *Fagus grandifolia* (American beech) are characteristic understory species. Isolated, individual shrubs of *Kalmia latifolia* (mountain laurel) often occur, but this species does not form dense stands. Patches of *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and *Gaylussacia baccata* (black huckleberry) are typical in the open shrub layer, along with *Viburnum acerifolium* (mapleleaf viburnum), scrambling vines of *Smilax rotundifolia* (roundleaf greenbrier) and young recruitment of *Quercus montana* (chestnut oak). The herb layer is species-poor, with *Deschampsia flexuosa* (wavy hairgrass) common and *Solidago bicolor* (white goldenrod) frequent at low cover. Additional herbs may include *Danthonia spicata* (poverty oatgrass), *Polygonatum biflorum* (smooth Solomon's seal), *Carex tonsa* (shaved sedge), *Carex pensylvanica* (Pennsylvania sedge), *Hieracium venosum* (rattlesnakeweed), *Viola pedata* (birdfoot violet), and *Carex virescens* (ribbed sedge).

Environmental Description

National Capital Parks-East Environment: This chestnut oak forest was sample at two locations in the park. It occurs on very steep (>70% slope) bluffs and bluff-crests bordering the Potomac River and Piscataway Creek. These are at Fort Foote. There are also points at Fort Washington. Stands are small-patched, linear in configuration and typically extend less than 1 km in length. Substrates are comprised of unconsolidated sand and gravels underlain by deeper strata of coarse gravels or ancient marine deposits (i.e., shell marl). Mineral soils are classified as Aura gravel loams and are extremely acidic, infertile, and commonly exposed on steeper slopes. Constant colluvial movement from shoreline and toeslope erosion maintain soil exposure and open forest physiognomy. Aspects vary from west (stand at Forte Foote along the Potomac River) to south (stand at Fort Washington along Piscataway Creek). The unvegetated ground surface is dominated by leaf litter with trace amounts of small rocks, wood, and bare soil. Evidence of disturbance includes past logging, recent fire at one site, erosion, trails/roads and the presence of exotic plants.
Global Environment: This association occurs on river-fronting slopes on Coastal Plain estuarine deposits of Cretaceous, Tertiary, or Quaternary age. Some stands, such as those described by Lea (2004), occur on very steep (up to 60%), bluff-like slopes where toeslope erosion maintains constant colluvial movement. More typically, the type occurs on stable, gently convex upper slopes and bluff-tops underlain by coarse gravel deposits. In either case, the ground surface typically has a substantial amount of exposed mineral substrate, and soils are sandy, extremely acidic, and infertile.

Vegetation Description

National Capital Parks-East Vegetation: Stands are characterized by an open (up to 60% cover) canopy (20-35 m tall) dominated by *Quercus montana* (chestnut oak). Other canopy species that are typically associated but at low

cover include *Quercus rubra* (northern red oak), *Quercus falcata* (southern red oak), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Fagus grandifolia* (American beech). The sparse (20-40%) subcanopy (10-20 m) includes *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Prunus serotina* (black cherry), *Sassafras albidum* (sassafras), and *Nyssa sylvatica* (blackgum). The tall-shrub layer (2-6 m) is open (up to 20%) and dominated by *Amelanchier arborea* (common serviceberry) and *Acer rubrum* (red maple). Also frequent in the shrub layer are *Vaccinium pallidum* (Blue Ridge blueberry), *Juniperus virginiana* (eastern red-cedar), *Cornus florida* (flowering dogwood), and *Kalmia latifolia* (mountain laurel). Vines are never abundant but may include species such as *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax glauca* (cat greenbrier). The unstable substrate and acidic soil support a species-poor herbaceous layer dominated by *Deschampsia flexuosa* (wavy hairgrass). Other taxa reported at low cover include *Solidago bicolor* (white goldenrod), *Solidago caesia* (wreath goldenrod), *Danthonia spicata* (poverty oatgrass), *Hieracium venosum* (rattlesnakeweed), and *Antennaria plantaginifolia* (woman's tobacco).

Global Vegetation: This is usually an open, somewhat stunted forest with strong overstory dominance by *Quercus montana* (chestnut oak). *Quercus rubra* (northern red oak), *Quercus alba* (white oak), *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), and *Quercus stellata* (post oak) are variably present, minor associates. *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), *Amelanchier arborea* (common serviceberry), and *Fagus grandifolia* (American beech) are characteristic understory species. Isolated, individual shrubs of *Kalmia latifolia* (mountain laurel) often occur, but this species does not form dense stands. Patches of *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and *Gaylussacia baccata* (black huckleberry) are typical in the open shrub layer, along with *Viburnum acerifolium* (mapleleaf viburnum), scrambling vines of *Smilax rotundifolia* (roundleaf greenbrier) and young recruitment of *Quercus montana* (chestnut oak). The herb layer is species-poor, with *Deschampsia flexuosa* (wavy hairgrass) common and *Solidago bicolor* (white goldenrod) frequent at low cover. Additional herbs may include *Danthonia spicata* (poverty oatgrass), *Polygonatum biflorum* (smooth Solomon's seal), *Carex tonsa* (shaved sedge), *Carex pensylvanica* (Pennsylvania sedge), *Hieracium venosum* (rattlesnakeweed), *Viola pedata* (birdfoot violet), and *Carex virescens* (ribbed sedge). In Virginia, some occurrences of this vegetation can be substantial (>20 ha in aggregate).

Most Abundant Species

Characteristic Species

National Capital Parks-East: *Deschampsia flexuosa* (wavy hairgrass), *Quercus montana* (chestnut oak)

Conservation Status Rank

Global Rank & Reasons: G3 (14-Jul-2016). More information is needed to rank this association.

Related Concepts

Global Related Concepts:

- *Quercus prinus / Deschampsia flexuosa - Solidago bicolor* Forest (Lea 2004) =

Classification

Status: Standard

Classification Confidence: 3 - Weak

National Capital Parks-East Classification Comments: Chesapeake Bay River Bluff Chestnut Oak Forest is sometimes referred to as River-Bluff Chestnut Oak Forest.

Global Classification Comments: This vegetation type has been observed frequently by ecologists in both the Maryland and Virginia Natural Heritage Programs, but very little quantitative documentation exists. Nevertheless, the type is immediately and unambiguously recognizable in the field, and the three available plots performed as a tight, discrete group in quantitative analysis of more than 200 Virginia, Maryland, and West Virginia oak / heath forest plots conducted for the NCR vegetation mapping project.

Element Distribution

National Capital Parks-East Range: This forest association was sampled at Fort Foote and Fort Washington in Prince Georges County, Maryland. These areas are found bordering the Potomac River and Piscataway Creek, and are all south of the Suitland Parkway.

Global Range: Small to medium-sized patches of this vegetation occur on bluffs bordering rivers and estuarine tidal wetlands throughout the inner northern Coastal Plain of Virginia, and Maryland. This vegetation has also been observed in Delaware (P. Bowman, DNHP, pers. comm.). In Virginia, stands are known from the Potomac, Rappahannock, Pamunkey, and James rivers.

Nations: US
States/Provinces: DC:SNR, DE:S2, MD:S3, VA:S1
TNC Ecoregions: 58:C
USFS Ecoregions (2007): 232Ad:CCC, 232Ha:CC?, 232Ib:CCC, 232Je:C??
Federal Lands: NPS (National Capital-East)

ELEMENT SOURCES

National Capital Parks-East Plots: (2 plots: NACE.213, NACE.214).
National Capital Parks-East Description Author(s): J.W. Harrison, mod. M.J. Russo
Global Description Author(s): G. P. Fleming
References: Coxe 2009, Eastern Ecology Working Group n.d., Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2004, Lea 2004*

M013. Eastern North American Ruderal Forest

This ruderal forest macrogroup is found in eastern temperate North America, and shows evidence of former and heavy human disturbance, such as through plowing, grading, skidding, etc., followed by plantings, but has been allowed to succeed more-or-less spontaneously. The tree layer is dominated (>80% cover) by "weedy" or generalist native tree species, or exotic invasive tree species. The list of ruderal tree species are as follows: Conifers: *Juniperus ashei* (Ashe's juniper), *Juniperus virginiana* (eastern red-cedar), *Pinus rigida* (pitch pine), *Pinus strobus* (eastern white pine), *Pinus virginiana* (Virginia pine). Hardwoods: *Acer negundo* (box-elder), *Acer rubrum* (red maple), *Amelanchier* (serviceberry) spp., *Betula populifolia* (gray birch), *Crataegus* (hawthorn) spp., *Crataegus crus-galli* (cockspur hawthorn), *Crataegus mollis* (downy hawthorn), *Diospyros virginiana* (common persimmon), *Fraxinus americana* (white ash), *Gleditsia triacanthos* (honeylocust), *Gymnocladus dioicus* (Kentucky coffeetree), *Juglans nigra* (black walnut), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Malus fusca* (Oregon crabapple), *Morus rubra* (red mulberry), *Populus tremuloides* (quaking aspen), *Prunus pensylvanica* (pin cherry), and *Prunus serotina* (black cherry). Naturalized exotics include the conifer *Pinus thunbergii* (Japanese black pine) and hardwoods *Acer platanoides* (Norway maple), *Ailanthus altissima* (tree of heaven), *Catalpa bignonioides* (southern catalpa), *Malus* (apple) spp., *Morus alba* (white mulberry), *Paulownia tomentosa* (princesstree), and *Robinia pseudoacacia* (black locust) (although a native in the central hardwoods region, it is so widely planted outside of its range that it is essentially exotic in character). Common conifer planted tree species in old or abandoned plantations include *Larix decidua* (European larch), *Picea abies* (Norway spruce), *Picea glauca* (white spruce), *Pinus banksiana* (jack pine), *Pinus resinosa* (red pine), *Pinus strobus* (eastern white pine), *Pinus sylvestris* (Scotch pine), and *Pinus virginiana* (Virginia pine). In these stands, trees may still show evidence of being planted in rows and be of uniform age. Regeneration of tree species in abandoned plantations rarely consists of the current overstory. Understory shrub and herb species can be sparse in old conifer plantations, and typically are native generalists or exotics. Understory shrub and herb species in all stands vary from exotic invasives to native generalists. Invasive shrub species include a variety of honeysuckles (*Lonicera japonica* (Japanese honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), *Lonicera tatarica* (Tatarian honeysuckle), *Lonicera x bella* (Bell's honeysuckle)), *Rhamnus cathartica* (common buckthorn), and others.

G030. EASTERN NORTH AMERICAN NATIVE RUDERAL FOREST

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* (eastern red-cedar), *Pinus rigida* (pitch pine), *Pinus strobus* (eastern white pine), *Pinus virginiana* (Virginia pine). Hardwoods: *Acer negundo* (box-elder), *Acer rubrum* (red maple), *Amelanchier* (serviceberry) spp., *Betula populifolia* (gray birch), *Crataegus* (hawthorn) spp., *Crataegus crus-galli* (cockspur hawthorn), *Crataegus mollis* (downy hawthorn), *Diospyros virginiana* (common persimmon), *Fraxinus americana* (white ash), *Gleditsia triacanthos* (honeylocust), *Gymnocladus dioicus* (Kentucky coffeetree), *Juglans nigra* (black walnut), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Morus* (mulberry) spp., *Malus fusca* (Oregon crabapple), *Morus rubra* (red mulberry), *Populus tremuloides* (quaking aspen), *Prunus pensylvanica* (pin cherry), *Prunus serotina* (black cherry), *Prunus americana* (American plum), and *Robinia pseudoacacia* (black

locust). Naturalized exotics include the conifer *Pinus thunbergii* (Japanese black pine) and hardwoods *Acer platanoides* (Norway maple) and *Ailanthus altissima* (tree of heaven). *Robinia pseudoacacia* (black locust), 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* (Japanese honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), *Lonicera tatarica* (Tatarian honeysuckle), *Lonicera x bella)*, *Rhamnus cathartica* (common buckthorn), 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

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* (red maple), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Pinus strobus* (eastern white pine), and *Prunus serotina* (black cherry). Other associates can include *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Ailanthus altissima* (tree of heaven), *Amelanchier* (serviceberry) spp., *Betula lenta* (sweet birch), *Betula populifolia* (gray birch), *Juglans nigra* (black walnut), *Juniperus virginiana* (eastern red-cedar), *Pinus strobus* (eastern white pine), *Populus grandidentata* (bigtooth aspen), *Quercus* (oak) spp., *Robinia pseudoacacia* (black locust), *Sassafras albidum* (sassafras), and *Ulmus americana* (American elm). The low-shrub layer, if present, is usually characterized by the presence of *Rubus* (blackberry) spp. such as *Rubus allegheniensis* (Allegheny blackberry), *Rubus flagellaris* (northern dewberry), *Rubus hispidus* (bristly dewberry), or *Rubus phoenicolasius* (wine raspberry). This layer is often dominated by exotic species such as *Berberis thunbergii* (Japanese barberry), *Crataegus* (hawthorn) spp., *Lonicera morrowii* (Morrow's honeysuckle), *Lonicera tatarica* (Tatarian honeysuckle), *Rhamnus cathartica* (common buckthorn), and *Rosa multiflora* (multiflora rose). The herbaceous layer is variable, often containing grasses and forbs of both native and exotic origin. The invasive species *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop), and *Polygonum cespitosum* (oriental ladysthumb) 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.

[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* (black locust) 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* (black cherry), *Liriodendron tulipifera* (tuliptree), *Fraxinus*

americana (white ash), *Robinia pseudoacacia* (black locust), and *Acer rubrum* (red maple). Other associates can include *Juglans nigra* (black walnut), *Sassafras albidum* (sassafras), *Betula populifolia* (gray birch), *Juniperus virginiana* (eastern red-cedar), *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Ailanthus altissima* (tree of heaven), *Ulmus americana* (American elm), *Quercus* (oak) spp., *Betula lenta* (sweet birch), *Amelanchier* (serviceberry) spp., *Pinus strobus* (eastern white pine), and *Populus grandidentata* (bigtooth aspen). Other woody species may contribute to the canopy or form a tall-shrub layer, including *Lindera benzoin* (northern spicebush) and *Carpinus caroliniana* (American hornbeam). The low-shrub layer, if present, is usually characterized by the presence of *Rubus* (blackberry) spp. such as *Rubus flagellaris* (northern dewberry), *Rubus allegheniensis* (Allegheny blackberry), *Rubus phoenicolasius* (wine raspberry), or *Rubus hispidus* (bristly dewberry). This layer is often dominated by exotic species such as *Lonicera tatarica* (Tatarian honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), *Rhamnus cathartica* (common buckthorn), *Crataegus* (hawthorn) spp., *Rosa multiflora* (multiflora rose), and *Berberis thunbergii* (Japanese barberry). The herbaceous layer is variable, often containing grasses and forbs of both native and exotic origin. Common species include *Ageratina altissima var. altissima* (white snakeroot), *Polygonum persicaria* (spotted ladysthumb), *Impatiens capensis* (orange jewelweed), *Glechoma hederacea* (ground ivy), *Polystichum acrostichoides* (Christmas fern), *Calystegia sepium ssp. sepium* (hedge false bindweed), *Galium aparine* (stickywilly), *Oxalis stricta* (common yellow oxalis), *Polygonum virginianum* (jumpseed), *Dennstaedtia punctilobula* (eastern hayscented fern), *Arisaema triphyllum* (Jack in the pulpit), *Allium vineale* (wild garlic), and *Veronica officinalis* (common gypsyweed), among many others. The invasive species *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop), and *Polygonum cespitosum* (oriental ladysthumb) 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* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), *Vitis labrusca* (fox grape), and the invasive vines *Celastrus orbiculatus* (oriental bittersweet) and *Lonicera japonica* (Japanese honeysuckle). 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

Catoctin Mountain Park Environment: This forest type occurs most frequently on soils derived from the Catoctin Formation, in the northwestern and central portions of the park. It occurs in scattered small patches on soils of the Weverton Formation in the southeast. It occurs on a variety of aspects, on gentle slopes and often in close association with Ruderal Tuliptree Forest (Rich Type) (CEGL007220). There may be ephemeral seepage areas included.

Chesapeake & Ohio Canal National Historical Park Environment: This successional forest represents regeneration on disturbed sites.

George Washington Memorial Parkway Environment: This successional forest represents regeneration on heavily disturbed sites, including old quarries, clearings, former building sites, roadsides, banks, and artificial fill along the parkway.

Harpers Ferry National Historical Park Environment: Northeastern Ruderal Hardwood Forest represents regeneration on heavily disturbed sites, including old quarries, clearings, former building sites, roadsides, and banks throughout the park.

Manassas National Battlefield Park Environment: Young mixed forests of disturbed, abandoned fields and homesites are scattered throughout the park. Northeastern Ruderal Hardwood Forests are typically even-aged stands dominated by shade-intolerant hardwoods. Stands occur on a range of soil types and are located on upland sites in the park.

Monocacy National Battlefield Environment: This successional forest represents regeneration on disturbed sites.

National Capital Parks-East Environment: This post-disturbance association may be found anywhere that land has been heavily impacted by agriculture or other severe disturbances and is recovering. Examples of this situation include abandoned agricultural fields and areas adjacent to former habitations, as well as along roadsides.

Rock Creek Park Environment: This successional forest represents regeneration on disturbed sites.

Wolf Trap National Park for the Performing Arts Environment: This successional forest represents regeneration on disturbed sites.

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

Catoctin Mountain Park Vegetation: The disturbance history of this vegetation is often immediately apparent - the canopy is usually somewhat to very open, with frequent canopy gaps, downed trees, and a profusion of vines often completely covering shrubs. Exotic species are frequent and often dominant. The tree canopy is usually codominated by a number of tree species, including *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Nyssa sylvatica* (blackgum), *Liriodendron tulipifera* (tuliptree), with other associates including *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust), *Juglans nigra* (black walnut), *Carya ovata* (shagbark hickory), *Acer saccharum* (sugar maple), *Quercus alba* (white oak), and *Sassafras albidum* (sassafras). Vegetation strata are not well-developed. with no clear emergent, tree canopy, tree subcanopy, and shrub layers. *Berberis thunbergii* (Japanese barberry) often forms large patches. Vines are notable, growing on the ground surface, over shrubs, and into the tree canopy. The most common and often dominant herb is *Microstegium vimineum* (Nepalese browntop). Other herbs that may occur are *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana* (broadleaf enchanter's nightshade), *Impatiens capensis* (orange jewelweed), *Dichanthelium clandestinum* (deertongue), *Geum canadense* (white avens), *Brachyelytrum erectum* (bearded shorthusk), and others.

Chesapeake & Ohio Canal National Historical Park Vegetation: The type is characterized by stands of weedy, early-successional trees, any one or two of which may assume dominance. Tree species often include some combination of *Prunus serotina* (black cherry) (black cherry), *Liriodendron tulipifera* (tuliptree) (tuliptree), *Fraxinus americana* (white ash) (white ash), *Robinia pseudoacacia* (black locust) (black locust), and *Acer rubrum* (red maple) (red maple).

George Washington Memorial Parkway Vegetation: The type is characterized by mixed, even-aged stands of weedy, early-successional trees, any one or two of which may assume dominance in a given stand. *Robinia pseudoacacia* (black locust) is characteristic but varies from widely scattered to dominant. Other typical canopy trees include *Acer rubrum* (red maple), *Acer platanoides* (Norway maple), *Ailanthus altissima* (tree of heaven), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tuliptree), *Morus alba* (white mulberry), *Paulownia tomentosa* (princesstree), *Prunus avium* (sweet cherry), *Prunus serotina* (black cherry), and *Prunus subhirtella* (winter-flowering cherry). Canopy composition is highly variable and may include the alluvial floodplain trees *Acer negundo* (box-elder), *Platanus occidentalis* (American sycamore), and *Ulmus americana* (American elm) growing on uplands or artificial fill. Stands may also occasionally include a few later-successional trees such as *Quercus* (oak) spp. or *Carya* (hickory) spp. The understory is often choked with exotic shrubs, including (but not limited to) *Elaeagnus umbellata* (autumn olive), *Euonymus alatus* (burningbush), *Ligustrum obtusifolium* (border privet), *Ligustrum sinense* (Chinese privet), *Lonicera maackii* (Amur honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), *Rosa multiflora* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), and *Viburnum dilatatum* (linden arrow-wood). Both native and exotic vines, including *Ampelopsis brevipedunculata* (Amur peppervine), *Campsis radicans* (trumpet creeper), *Celastrus orbiculatus* (oriental bittersweet), *Clematis terniflora* (sweet autumn virginsbower), *Euonymus fortunei* (winter creeper), *Hedera helix* (English ivy), *Lonicera japonica* (Japanese honeysuckle), *Parthenocissus quinquefolia* (Virginia creeper), *Polygonum perfoliatum* (Asiatic tearthumb), *Pueraria montana var. lobata* (kudzu), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), *Smilax tamnoides* (bristly greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Vinca minor* (common periwinkle), *Vitis aestivalis* (summer grape), *Vitis riparia* (riverbank grape), *Vitis vulpina* (frost grape), *Wisteria floribunda* (Japanese wisteria), and *Wisteria sinensis* (Chinese wisteria), tend to be rampant and frequently climb into the canopy. The herbaceous flora is highly variable from site to site and may include both native and exotic species.

Harpers Ferry National Historical Park Vegetation: Stands are highly variable in structure and composition and have developed from a variety of land-use practices. Some examples are mixed, even-aged stands of weedy, early-successional trees, any one or two of which may assume dominance in a given stand. Others may contain older open grown individuals of a particular group of species with a younger cohort of others below. *Robinia pseudoacacia* (black locust) is characteristic but varies from widely scattered to dominant. Other typical canopy trees include *Acer rubrum* (red maple), *Acer platanoides* (Norway maple), *Ailanthus altissima* (tree of heaven), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tuliptree), *Morus alba* (white mulberry), *Paulownia tomentosa* (princesstree), *Prunus avium* (sweet cherry), *Prunus serotina* (black cherry), and *Prunus subhirtella* (winter-flowering cherry). Canopy composition is highly variable and may include the alluvial floodplain trees *Acer negundo* (box-elder), *Platanus occidentalis* (American sycamore), and *Ulmus americana* (American elm) growing on uplands or artificial fill. Stands may also occasionally include a few later-successional trees such as *Quercus* (oak) spp. or *Carya* (hickory) spp. The understory is often choked with exotic shrubs, including (but not limited to) *Elaeagnus umbellata* (autumn olive), *Euonymus alatus* (burningbush), *Ligustrum obtusifolium* (border privet), *Ligustrum sinense* (Chinese privet),

Lonicera maackii (Amur honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), *Rosa multiflora* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), and *Viburnum dilatatum* (linden arrow-wood). Both native and exotic vines, including *Ampelopsis brevipedunculata* (Amur peppervine), *Campsis radicans* (trumpet creeper), *Celastrus orbiculatus* (oriental bittersweet), *Clematis terniflora* (sweet autumn virginsbower), *Euonymus fortunei* (winter creeper), *Hedera helix* (English ivy), *Lonicera japonica* (Japanese honeysuckle), *Parthenocissus quinquefolia* (Virginia creeper), *Polygonum perfoliatum* (Asiatic tearthumb), *Pueraria montana var. lobata* (kudzu), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), *Smilax tamnoides* (bristly greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Vinca minor* (common periwinkle), *Vitis aestivalis* (summer grape), *Vitis riparia* (riverbank grape), *Vitis vulpina* (frost grape), *Wisteria floribunda* (Japanese wisteria), and *Wisteria sinensis* (Chinese wisteria), tend to be rampant and frequently climb into the canopy. The herbaceous flora is highly variable from site to site and may include both native and exotic species. The invasive species *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop), and *Polygonum cespitosum* (oriental ladysthumb) can be abundant in this disturbed forest type.

Manassas National Battlefield Park Vegetation: Northeastern Ruderal Hardwood Forest has a mixed, deciduous overstory, and stands are usually even-aged. The overstory is a variable combination of early-successional and shade-intolerant hardwoods. Common canopy and subcanopy species include *Fraxinus americana* (white ash), *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Prunus serotina* (black cherry), and *Robinia pseudoacacia* (black locust). Some *Pinus virginiana* (Virginia pine) and/or *Juniperus virginiana* (eastern red-cedar) is also often present scattered throughout stands. *Toxicodendron radicans* (eastern poison-ivy), *Smilax* (greenbrier) spp., and other lianas are commonly found in the shrub layer and/or climbing canopy trees. The herb layer can be quite dense and is usually dominated by *Microstegium vimineum* (Nepalese browntop) and other exotics.

Monocacy National Battlefield Vegetation: The type is characterized by stands of weedy, early-successional trees, any one or two of which may assume dominance. Tree species often include some combination of *Prunus serotina* (black cherry) (black cherry), *Liriodendron tulipifera* (tuliptree) (tuliptree), *Fraxinus americana* (white ash) (white ash), *Robinia pseudoacacia* (black locust) (black locust), and *Acer rubrum* (red maple) (red maple).

National Capital Parks-East Vegetation: There are no plots or observation points related to this type at NACE. In general, the tree species often include some combination of *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Robinia pseudoacacia* (black locust), and *Acer rubrum* (red maple). Other associates can include *Juglans nigra* (black walnut), *Sassafras albidum* (sassafras), *Betula populifolia* (gray birch), *Juniperus virginiana* (eastern red-cedar), *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Ailanthus altissima* (tree of heaven), *Ulmus americana* (American elm), *Quercus* (oak) spp., *Betula lenta* (sweet birch), *Amelanchier* (serviceberry) spp., and *Pinus strobus* (eastern white pine).

Rock Creek Park Vegetation: The type is characterized by stands of weedy, early-successional trees, any one or two of which may assume dominance. Tree species often include some combination of *Prunus serotina* (black cherry) (black cherry), *Liriodendron tulipifera* (tuliptree) (tuliptree), *Fraxinus americana* (white ash) (white ash), *Robinia pseudoacacia* (black locust) (black locust), *Juglans nigra* (black walnut) (black walnut), and *Acer rubrum* (red maple) (red maple), and any number of non-native early-successional trees such as *Ailanthus altissima* (tree of heaven) (tree of heaven), *Acer platanoides* (Norway maple) (Norway Maple), or non-native cherries (*Prunus* (plum) spp.).

Wolf Trap National Park for the Performing Arts Vegetation: The type is characterized by stands of weedy, early-successional trees, any one or two of which may assume dominance. Tree species often include some combination of *Prunus serotina* (black cherry) (black cherry), *Liriodendron tulipifera* (tuliptree) (tuliptree), *Fraxinus americana* (white ash) (white ash), *Robinia pseudoacacia* (black locust) (black locust), and *Acer rubrum* (red maple) (red maple).

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* (black locust) 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* (black cherry), *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Robinia pseudoacacia* (black locust), and *Acer rubrum* (red maple). Other associates can include *Juglans nigra* (black walnut), *Sassafras albidum* (sassafras), *Betula populifolia* (gray birch), *Juniperus virginiana* (eastern red-cedar), *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Ailanthus altissima* (tree of heaven), *Ulmus americana* (American elm), *Quercus* (oak) spp., *Betula lenta* (sweet birch), *Amelanchier* (serviceberry) spp., *Pinus strobus* (eastern white pine), and *Populus grandidentata* (bigtooth aspen). Other woody species may contribute to the canopy or form a tall-shrub layer, including *Lindera benzoin* (northern spicebush) and *Carpinus caroliniana*

(American hornbeam). The low-shrub layer, if present, is usually characterized by the presence of *Rubus* (blackberry) spp. such as *Rubus flagellaris* (northern dewberry), *Rubus allegheniensis* (Allegheny blackberry), *Rubus phoenicolasius* (wine raspberry), or *Rubus hispidus* (bristly dewberry). This layer is often dominated by exotic species such as *Lonicera tatarica* (Tatarian honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), *Rhamnus cathartica* (common buckthorn), *Crataegus* (hawthorn) spp., *Rosa multiflora* (multiflora rose), and *Berberis thunbergii* (Japanese barberry). The herbaceous layer is variable, often containing grasses and forbs of both native and exotic origin. Common species include *Ageratina altissima var. altissima* (white snakeroot), *Polygonum persicaria* (spotted ladysthumb), *Impatiens capensis* (orange jewelweed), *Glechoma hederacea* (ground ivy), *Polystichum acrostichoides* (Christmas fern), *Calystegia sepium ssp. sepium* (hedge false bindweed), *Galium aparine* (stickywilly), *Oxalis stricta* (common yellow oxalis), *Polygonum virginianum* (jumpseed), *Dennstaedtia punctilobula* (eastern hayscented fern), *Arisaema triphyllum* (Jack in the pulpit), *Allium vineale* (wild garlic), and *Veronica officinalis* (common gypsyweed), among many others. The invasive species *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop), and *Polygonum cespitosum* (oriental ladysthumb) 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* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), *Vitis labrusca* (fox grape), and the invasive vines *Celastrus orbiculatus* (oriental bittersweet) and *Lonicera japonica* (Japanese honeysuckle).

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

Global Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum* (red maple)
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin* (northern spicebush), *Rosa multiflora* (multiflora rose)
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus* spp.
Herb (field)	Flowering forb	*Alliaria petiolata* (garlic mustard), *Polygonum persicaria* (spotted ladysthumb)
Herb (field)	Graminoid	*Microstegium vimineum* (Nepalese browntop)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Acer rubrum* (red maple), *Arisaema triphyllum* (Jack in the pulpit), *Berberis thunbergii* (Japanese barberry), *Fraxinus americana* (white ash), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Vitis aestivalis* (summer grape)

Chesapeake & Ohio Canal National Historical Park: *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust)

George Washington Memorial Parkway: *Acer rubrum* (red maple), *Ailanthus altissima* (tree of heaven), *Ampelopsis brevipedunculata* (Amur peppervine), *Celastrus orbiculatus* (oriental bittersweet), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Hedera helix* (English ivy), *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tuliptree), *Lonicera japonica* (Japanese honeysuckle), *Lonicera maackii* (Amur honeysuckle), *Parthenocissus quinquefolia* (Virginia creeper), *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust), *Rosa multiflora* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Vitis vulpina* (frost grape), *Wisteria sinensis* (Chinese wisteria)

Harpers Ferry National Historical Park: *Acer rubrum* (red maple), *Ailanthus altissima* (tree of heaven), *Alliaria petiolata* (garlic mustard), *Ampelopsis brevipedunculata* (Amur peppervine), *Celastrus orbiculatus* (oriental bittersweet), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Glechoma hederacea* (ground ivy), *Hedera helix* (English ivy), *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tuliptree), *Lonicera japonica* (Japanese honeysuckle), *Lonicera maackii* (Amur honeysuckle), *Parthenocissus quinquefolia* (Virginia creeper), *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust), *Rosa multiflora* (multiflora rose),

Rubus phoenicolasius (wine raspberry), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Vitis vulpina* (frost grape), *Wisteria sinensis* (Chinese wisteria)
Manassas National Battlefield Park: *Acer rubrum* (red maple), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Microstegium vimineum* (Nepalese browntop), *Pinus virginiana* (Virginia pine)
Monocacy National Battlefield: *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust)
National Capital Parks-East: *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust)
Rock Creek Park: *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust)
Wolf Trap National Park for the Performing Arts: *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust)
Global: *Acer rubrum* (red maple), *Alliaria petiolata* (garlic mustard), *Berberis thunbergii* (Japanese barberry), *Elaeagnus umbellata* (autumn olive), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tuliptree), *Microstegium vimineum* (Nepalese browntop), *Polygonum persicaria* (spotted ladysthumb), *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust), *Rosa multiflora* (multiflora rose), *Rubus allegheniensis* (Allegheny blackberry), *Rubus* spp.

OTHER NOTEWORTHY SPECIES

Catoctin Mountain Park: Invasive/Exotic Plants: *Berberis thunbergii* (Japanese barberry, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
George Washington Memorial Parkway: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera maackii* (Amur honeysuckle, High), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Wisteria sinensis* (Chinese wisteria, Medium)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera maackii* (Amur honeysuckle, High), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Wisteria sinensis* (Chinese wisteria, Medium)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Monocacy National Battlefield: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
National Capital Parks-East: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Wolf Trap National Park for the Performing Arts: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Global: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Elaeagnus umbellata* (autumn olive, High), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Lonicera tatarica* (Tatarian honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* (oriental ladysthumb), *Polygonum persicaria* (spotted ladysthumb), *Rhamnus cathartica* (common buckthorn, High/Medium), *Rosa multiflora* (multiflora rose, 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* (tuliptree) 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)

Global Related Concepts:
- Successional communities (Ehrenfeld 1977) >

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Catoctin Mountain Park Classification Comments: Northeastern Ruderal Hardwood Forest (sometimes referred to as Northeastern Modified Successional Forest) is widely variable in composition and structure. It can be differentiated from Ruderal Tuliptree Forest (Rich Type) (CEGL007220) and Ruderal Black Locust Forest (CEGL007279) by the relatively greater diversity of tree species. *Liriodendron tulipifera* (tuliptree) and *Robinia pseudoacacia* (black locust) are components of this forest type but are not dominant. This association is sometimes mapped individually but is usually mapped as part of the Successional Mixed Deciduous Forest Map Class (COMP_SDMF), which at this park includes two associations, Northeastern Ruderal Hardwood Forest (CEGL006599) and Ruderal Black Locust Forest (CEGL007279), in addition to undescribed ruderal vegetation.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Northeastern Ruderal Hardwood Forest (sometimes referred to as Northeastern Modified Successional Forest) is sometimes mapped individually but is usually mapped as part of the Successional Mixed Deciduous Forest Map Class (COMP_SDMF). At this park, this map class includes four associations, Northeastern Ruderal Hardwood Forest (CEGL006599), Ruderal Tree-of-Heaven Forest (CEGL007191), Ruderal Black Locust Forest (CEGL007279), and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to undescribed ruderal vegetation.
George Washington Memorial Parkway Classification Comments: Northeastern Ruderal Hardwood Forest (sometimes referred to as Northeastern Modified Successional Forest) can be distinguished from other successional forest types in the park by its mixed canopy lacking a strong dominant species, and its usually dense cover of exotic shrubs and vines. The understory with its rampant vines and weedy shrubs can be similar to Successional Vine-Shrubland (COMP_VISH), but Northeastern Ruderal Hardwood Forest always has some cover of canopy trees. It is mapped as part of the Successional Mixed Deciduous Forest Map Class (COMP_SDMF), which at this park includes only this association, Northeastern Ruderal Hardwood Forest (CEGL006599), in addition to undescribed ruderal vegetation.
Harpers Ferry National Historical Park Classification Comments: Northeastern Ruderal Hardwood Forest (sometimes referred to as Northeastern Modified Successional Forest) is mapped as Successional Mixed Deciduous Forest Map Class (COMP_SDMF) at this park, together with undescribed ruderal vegetation.
Manassas National Battlefield Park Classification Comments: Northeastern Ruderal Hardwood Forest (sometimes referred to as Northeastern Modified Successional Forest) is distinguished by its mixed deciduous canopy of even-aged, early-successional and shade-intolerant hardwoods and herb layer dominated by exotics, predominantly *Microstegium vimineum* (Nepalese browntop). This association together with undescribed ruderal vegetation make up the Successional Mixed Deciduous Forest Map Class (COMP_SDMF) at this park.
Monocacy National Battlefield Classification Comments: Northeastern Ruderal Hardwood Forest (also referred to as Northeastern Modified Successional Forest) is sometimes mapped individually but is usually mapped as part of the Successional Mixed Deciduous Forest Map Class (COMP_SDMF). At this park, this map class includes two associations, Northeastern Ruderal Hardwood Forest (CEGL006599) and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to undescribed ruderal vegetation.
National Capital Parks-East Classification Comments: Northeastern Ruderal Hardwood Forest (sometimes referred to as Northeastern Modified Successional Forest) is mapped as the Successional Mixed Deciduous Forest Map Class (COMP_SDMF). At this park, this map class includes two associations, Northeastern Ruderal Hardwood Forest (CEGL006599) and Ruderal Black Locust Forest (CEGL007279), in addition to undescribed ruderal vegetation.

Rock Creek Park Classification Comments: At this park, Northeastern Ruderal Hardwood Forest (sometimes referred to as Northeastern Modified Successional Forest) is mapped as the Successional Mixed Deciduous Forest Map Class (COMP_SDMF), which includes undescribed ruderal vegetation as well as this association.
Wolf Trap National Park for the Performing Arts Classification Comments: This association is sometimes mapped individually but is usually mapped, together with undescribed ruderal vegetation, as part of the Successional Mixed Deciduous Forest Map Class (COMP_SDMF). Northeastern Ruderal Hardwood Forest is sometimes referred to as Northeastern Modified Successional Forest.
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* (tuliptree) drops out.

ELEMENT DISTRIBUTION

Catoctin Mountain Park Range: This forest type occurs in the northwestern and central portions of the park, and in some scattered locations in the southeast.
Chesapeake & Ohio Canal National Historical Park Range: This association has been observed at the park. It is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF) which is mapped at many locations in the park. Some of these locations may represent this community.
George Washington Memorial Parkway Range: This association is most extensive on old quarry sites that cover a large portion of the Arlington section of the parkway below Chain Bridge. It is scattered elsewhere along the parkway on uplands and low slopes adjacent to floodplains of the Potomac River, as well as on areas of extensive fill in former floodplain areas (e.g., Daingerfield Island). It also occurs in both Turkey Run Park and Great Falls Park.
Harpers Ferry National Historical Park Range: This association is scattered throughout the park on uplands and low slopes adjacent to floodplains. It is most common around developed areas such as the town of Harpers Ferry and Bolivar.
Manassas National Battlefield Park Range: This association occurs in scattered upland stands throughout the park, in old homesites and abandoned fields, as well as along disturbed creek drainages.
Monocacy National Battlefield Range: This association has been observed at Monocacy National Battlefield. It is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF) which is mapped at several locations in the park. Some of these locations may represent this community.
National Capital Parks-East Range: This association has been observed in the National Capital Parks East. It is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF) which is mapped at several locations in the park. Some of these locations may represent this community.
Rock Creek Park Range: This association has been observed in the Fort Circle Parks. It is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF) which is mapped at several locations in the park. Some of these locations may represent this community.
Wolf Trap National Park for the Performing Arts Range: This association has been observed at the park. It is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF) which is mapped at several locations in the park. Some of these locations may represent this community.
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:SNA, DE:SNA, IN:SNA, MA:SNA, MD:SNA, NJ:SNA, NY:SNA, PA:SNA, VA:SNA, WV:SNA
TNC Ecoregions: 48:C, 49:C, 52:?, 58:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (2007): 211Fc:CCC, 211G:C?, 211I:C?, 221Aa:CC?, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Am:CCC, 221An:CC?, 221Ba:CCC, 221Bb:CCC, 221Bc:CCP, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Dc:CCC, 221Fa:CCC, 222Ic:CCC, 222Ja:CCC, 231A:??, 232Ab:CCC, 232Ac:CCP, 232Ad:CCC, 232B:C?, 232C:C?, M211Bc:CCC, M211Bd:CCC, M211Cb:CCC, M221Aa:CCP, 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, Monocacy, Morristown, National Capital-East, Rock Creek, Roosevelt-Vanderbilt, 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

Catoctin Mountain Park Plots: None.
Chesapeake & Ohio Canal National Historical Park Plots: None.
George Washington Memorial Parkway Plots: None.
Harpers Ferry National Historical Park Plots: None.
Manassas National Battlefield Park Plots: None.
Monocacy National Battlefield Plots: None.
National Capital Parks-East Plots: None.
Rock Creek Park Plots: None.
Wolf Trap National Park for the Performing Arts Plots: None.
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
George Washington Memorial Parkway Description Author(s): G.P. Fleming and K. Taverna
Harpers Ferry National Historical Park Description Author(s): G. Fleming and K. Taverna
Manassas National Battlefield Park Description Author(s): K. Taverna
Monocacy National Battlefield Description Author(s): J. Teague
National Capital Parks-East Description Author(s): M. Pyne
Rock Creek Park Description Author(s): E. Jones and J. Teague
Wolf Trap National Park for the Performing Arts Description Author(s): J. Teague
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. 2008a, Edinger et al. 2008b, Edinger et al. 2014a, Edinger et al. 2014b, Ehrenfeld 1977, Fike 1999, Hop et al. 2009, Largay and Sneddon 2008, Largay and Sneddon 2017, 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, Sechler et al. 2014, Sneddon et al. 2008, Soil Conservation Service 1987, Walz et al. 2008, Young et al. 2009

A3227 *Juniperus virginiana - Pinus virginiana - Pinus echinata* Ruderal Forest Alliance

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* (eastern red-cedar) 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* (red maple), *Carya tomentosa* (mockernut hickory), *Carya ovata* (shagbark hickory), *Cercis canadensis* (eastern redbud), *Fraxinus americana* (white ash), and *Pinus virginiana* (Virginia pine). The midstory is typically sparse, with canopy species, as well as *Cornus florida* (flowering dogwood), *Ilex opaca* (American holly), *Liquidambar styraciflua* (sweetgum), and *Prunus serotina var. serotina* (black cherry). 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* (scarlet oak), *Quercus phellos* (willow oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak)) are present. (3) *Pinus* (pine) spp. (especially *Pinus echinata* (shortleaf pine), *Pinus strobus* (eastern white pine), and *Pinus virginiana* (Virginia pine)) 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* (Virginia pine) and little understory vegetation. The dense canopy may also include admixtures of other *Pinus* (pine) species (e.g., *Pinus taeda* (loblolly pine), *Pinus echinata* (shortleaf pine), *Pinus rigida* (pitch pine), *Pinus strobus* (eastern white pine)) or other early-successional deciduous trees (e.g., *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Nyssa sylvatica* (blackgum)). 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* (Japanese honeysuckle) and *Rosa multiflora* (multiflora rose) are common. The herb layer is characterized by weedy natives and exotics such as *Lycopodium digitatum* (fan clubmoss), *Achillea millefolium var. occidentalis* (western yarrow), *Hieracium caespitosum* (meadow hawkweed), and *Lespedeza cuneata* (sericea lespedeza).

[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* (eastern red-cedar) dominates the canopy layer. Common associates, typically occurring as scattered individuals, may include *Pinus strobus* (eastern white pine), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Quercus* (oak) spp., and *Prunus serotina* (black cherry). Shrub cover varies, with the most forested stands having little or no shrub cover. Exotic shrubs such as *Elaeagnus umbellata* (autumn olive), *Lonicera morrowii* (Morrow's honeysuckle), *Ligustrum vulgare* (European privet), and *Rosa multiflora* (multiflora rose) are characteristic, along with *Rubus* (blackberry) spp. Herbaceous cover likewise varies. Common species in the more open-canopy stands include old-field denizens such as *Schizachyrium scoparium* (little bluestem), *Festuca rubra* (red fescue), *Anthoxanthum odoratum* (sweet vernalgrass), *Agrostis gigantea* (redtop), *Andropogon virginicus* (broomsedge bluestem), *Elymus repens* (quackgrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago gigantea* (giant goldenrod), *Euthamia graminifolia* (flat-top goldentop), *Monarda fistulosa* (wild bergamot), *Toxicodendron radicans* (eastern poison-ivy), *Achillea millefolium* (common yarrow), and *Daucus carota* (Queen Anne's lace). In dense forest stands, herbs may be absent or limited to scattered shade-tolerant species such as *Alliaria petiolata* (garlic mustard) and *Allium vineale* (wild garlic), and *Dennstaedtia punctilobula* (eastern hayscented fern). These forests are often young and result from the colonization of old agricultural fields by *Juniperus virginiana* (eastern red-cedar) 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* (juniper).

Environmental Description

Antietam National Battlefield Environment: This association commonly occurs in old fields and other abandoned agricultural settings.
Chesapeake & Ohio Canal National Historical Park Environment: Occurs on a variety of mostly dry to dry-mesic old field sites, which may have been farmed or grazed in the past.
Harpers Ferry National Historical Park Environment: Northeastern Ruderal Red-cedar Forest occurs on former fields and clearings that were abandoned within the past 80 years. Stands occupy submesic to subxeric sites on low ridges and rolling to flat uplands, especially over limestone or dolomite bedrock. Surface substrate typically consists of dense needle litter and decaying wood. Soils are often rocky or stony, predominantly clay loams with moderately low to high base status.
Manassas National Battlefield Park Environment: This vegetation type is widespread in the park on former fields and clearings that were abandoned within the past 80 years. Stands occupy submesic to xeric sites on low ridges and rolling to flat uplands. Surface substrate typically consists of dense needle litter and decaying wood. Analyzed soils are clay loams with low to very low base status.
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

Antietam National Battlefield Vegetation: Open to closed canopy of *Juniperus virginiana var. virginiana* (eastern red-cedar) is typical of this type. Herbaceous species tend to be typical of old fields.
Chesapeake & Ohio Canal National Historical Park Vegetation: *Juniperus virginiana* (eastern red-cedar) dominates the canopy layer in stands of this successional vegetation. Other canopy and subcanopy trees include *Acer negundo* (box-elder), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Prunus serotina var. serotina* and *Robinia pseudoacacia.* Additionally, shrubs include *Asimina triloba* (pawpaw), *Lindera benzoin* (northern spicebush), *Lonicera morrowii* (Morrow's honeysuckle), *Rubus phoenicolasius* (wine raspberry), *Rosa multiflora*

(multiflora rose), and *Viburnum prunifolium.* Herbaceous plants include *Ageratina altissima* (white snakeroot), *Andropogon virginicus* (broomsedge bluestem), *Asplenium platyneuron* (ebony spleenwort), *Carex amphibola* (eastern narrowleaf sedge), *Carex blanda* (eastern woodland sedge), *Lespedeza procumbens* (trailing lespedeza), *Oxalis stricta* (common yellow oxalis), *Phytolacca americana* (American pokeweed), *Poa compressa* (Canada bluegrass), *Ranunculus bulbosus* (exotic), *Sorghastrum nutans* (Indiangrass), and *Viola sororia* (common blue violet).

Harpers Ferry National Historical Park Vegetation: This forest community represents temporary, early-successional vegetation of abandoned fields. Although relatively short-persistent, this forest assemblage repeatedly develops on suitable habitats of the region. Composition varies from nearly monospecific stands of *Juniperus virginiana var. virginiana* (eastern red-cedar), to stands with *Pinus virginiana* (Virginia pine) and/or hardwoods as minor canopy associates. Hardwood regeneration, particularly of *Fraxinus americana* (white ash), *Celtis occidentalis* (common hackberry), *Quercus* (oak) spp., and *Cercis canadensis* (eastern redbud) is often abundant in the understory. The herb layer varies from about 10% total cover to nearly absent on sites densely shaded by overstocked cedars.

Manassas National Battlefield Park Vegetation: This forest community represents temporary, early-successional vegetation of abandoned fields, particularly those that suffered extensive sheet erosion. Although relatively short-persistent, this forest assemblage repeatedly develops on suitable habitats of the region. Because it recurs over the landscape in predictable association with specific environmental conditions, classification at an association level is warranted. Composition varies from nearly monospecific stands of *Juniperus virginiana var. virginiana* (eastern red-cedar), to stands with *Pinus virginiana* (Virginia pine) as a less abundant, usually supracanopy associate. *Cornus florida* (flowering dogwood) and hardwood regeneration, particularly of *Fraxinus americana* (white ash), *Carya* (hickory) spp., and *Quercus* (oak) spp., are often abundant in the understory. The herb layer varies from about 10% total cover to nearly absent on sites densely shaded by overstocked red-cedars. In some stands, the ground is abundantly covered by *Cladonia* (cup lichen) spp. and other bryophytes.

Global Vegetation: *Juniperus virginiana* (eastern red-cedar) 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* (eastern white pine), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Quercus* (oak) spp., and *Prunus serotina* (black cherry). Shrub cover varies according to canopy closure, with the most forested stands having little or no shrub cover. Exotic shrubs such as *Elaeagnus umbellata* (autumn olive), *Lonicera morrowii* (Morrow's honeysuckle), *Ligustrum vulgare* (European privet), and *Rosa multiflora* (multiflora rose) are most characteristic, along with *Rubus* (blackberry) spp. Herbaceous cover likewise varies. Common species in the more open-canopy stands include old-field denizens such as *Schizachyrium scoparium* (little bluestem), *Andropogon virginicus* (broomsedge bluestem), *Festuca rubra* (red fescue), *Anthoxanthum odoratum* (sweet vernalgrass), *Agrostis gigantea* (redtop), *Elymus repens* (quackgrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago gigantea* (giant goldenrod), *Euthamia graminifolia* (flat-top goldentop), *Monarda fistulosa* (wild bergamot), *Toxicodendron radicans* (eastern poison-ivy), *Achillea millefolium* (common yarrow), and *Daucus carota* (Queen Anne's lace). In dense forest stands, herbs may be absent or limited to scattered shade-tolerant species such as *Alliaria petiolata* (garlic mustard), *Allium vineale* (wild garlic), and *Dennstaedtia punctilobula* (eastern hayscented fern).

Global Dynamics: These forests are often young and result from the colonization of old agricultural fields by *Juniperus virginiana* (eastern red-cedar) 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* (juniper).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana* (eastern red-cedar)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lonicera morrowii* (Morrow's honeysuckle)
Tall shrub/sapling	Needle-leaved tree	*Juniperus virginiana* (eastern red-cedar)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Elaeagnus umbellata* (autumn olive)
Short shrub/sapling	Broad-leaved deciduous shrub	*Rosa multiflora* (multiflora rose)
Short shrub/sapling	Liana	*Toxicodendron radicans* (eastern poison-ivy)
Herb (field)	Flowering forb	*Solidago rugosa* (wrinkleleaf goldenrod)
Herb (field)	Graminoid	*Schizachyrium scoparium* (little bluestem)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Juniperus virginiana* (eastern red-cedar)
Chesapeake & Ohio Canal National Historical Park: *Juniperus virginiana* (eastern red-cedar), *Lonicera morrowii* (Morrow's honeysuckle), *Rosa multiflora* (multiflora rose)
Harpers Ferry National Historical Park: *Juniperus virginiana* var. *virginiana* (eastern red-cedar)
Manassas National Battlefield Park: *Juniperus virginiana* var. *virginiana* (eastern red-cedar)
Global: *Elaeagnus umbellata* (autumn olive), *Juniperus virginiana* (eastern red-cedar), *Lonicera morrowii* (Morrow's honeysuckle), *Rosa multiflora* (multiflora rose), *Schizachyrium scoparium* (little bluestem), *Solidago rugosa* (wrinkleleaf goldenrod), *Toxicodendron radicans* (eastern poison-ivy)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Poa compressa* (Canada bluegrass, High/Low), *Ranunculus bulbosus* (St. Anthony's turnip), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Poa compressa* (Canada bluegrass, High/Low), *Rosa multiflora* (multiflora rose, Medium/Low)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Global: Invasive/Exotic Plants: *Agrostis gigantea* (redtop, Medium/Low), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Anthoxanthum odoratum* (sweet vernalgrass), *Daucus carota* (Queen Anne's lace, Low), *Elaeagnus umbellata* (autumn olive, High), *Elymus repens* (quackgrass, High/Medium), *Ligustrum vulgare* (European privet, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low); **Other Plants**: *Andropogon virginicus* (broomsedge bluestem, 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

Global Related Concepts:
- Red-cedar - Grass (Clark 1986a) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Antietam National Battlefield Classification Comments: Northeastern Ruderal Red-cedar Forest is also referred to as Successional Red-cedar Forest or Successional Old-field Eastern Red-cedar Forest.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Northeastern Ruderal Red-cedar Forest is also referred to as Successional Red-cedar Forest or Successional Old-field Eastern Red-cedar Forest.
Harpers Ferry National Historical Park Classification Comments: This community is instantly recognizable by its monospecific dominance of eastern red-cedar. Northeastern Ruderal Red-cedar Forest is also referred to as Successional Red-cedar Forest or Successional Old-field Eastern Red-cedar Forest.
Manassas National Battlefield Park Classification Comments: This community is instantly recognizable by its monospecific dominance of eastern red-cedar. Northeastern Ruderal Red-cedar Forest is also referred to as Successional Red-cedar Forest or Successional Old-field Eastern Red-cedar Forest.
Manassas National Battlefield Park Other Comments: This is one of the most abundant forest communities in the park, and is also characteristic of ruderal habitats throughout the northern Virginia Culpeper Basin. Northeastern Ruderal Red-cedar Forest is also referred to as Successional Red-cedar Forest or Successional Old-field Eastern Red-cedar Forest.
Global Classification Comments: This association is currently very generally defined.

ELEMENT DISTRIBUTION

Antietam National Battlefield Range: This association commonly occurs in old fields and other abandoned agricultural settings throughout Antietam National Battlefield.
Chesapeake & Ohio Canal National Historical Park Range: This successional forest occurs on a variety of old field sites, which may have been farmed or grazed in the past. It includes some dry thin soil areas which have become dominated by *Juniperus virginiana.*
Harpers Ferry National Historical Park Range: Northeastern Ruderal Red-cedar Forest occurs in scattered patches in the western end of the park on former fields and clearings that were abandoned within the past 80 years. It is primarily found near more developed areas of the park, such as near the park Visitor Center and the town of Millville. Most of the soils in this area are weathered from limestone or dolomite bedrock.
Manassas National Battlefield Park Range: This vegetation type is widespread in the park on former fields and clearings that were abandoned within the past 80 years. It is also common along park road corridors and wind-breaks in fields.
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:SNA, DC:SNA, DE:SNA, MA:SNA, MD?:SNA, NJ:SNA, NY:SNA, PA:SNA, VA:SNA, WV:SNA
TNC Ecoregions: 52:C, 58:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (2007): 211Fc:CCC, 221Ab:CCC, 221An:CC?, 221Bd:CPP, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ab:CCC, 232Ac:CCP, 232Ha:CC?, 232Je:C??, 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

Antietam National Battlefield Plots: None.
Chesapeake & Ohio Canal National Historical Park Plots: none
Harpers Ferry National Historical Park Plots: None.
Manassas National Battlefield Park Plots: None.
Antietam National Battlefield Description Author(s): S. Perles
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
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 2017, 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

[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* (Virginia pine). 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*

(Virginia pine) and little understory vegetation. The dense canopy may also include admixtures of other *Pinus* (pine) species (e.g., *Pinus taeda* (loblolly pine), *Pinus echinata* (shortleaf pine), *Pinus rigida* (pitch pine), *Pinus strobus* (eastern white pine)) or other early-successional deciduous trees (e.g., *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Nyssa sylvatica* (blackgum)). 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

Chesapeake & Ohio Canal National Historical Park Environment: This community occurs in areas which have had open conditions and bare mineral soil, allowing for the establishment of *Pinus virginiana* (Virginia pine). These conditions can include old fields, old pastures, clearcuts, and eroded areas. It is found at many locations along the length of the Chesapeake & Ohio Canal.

George Washington Memorial Parkway Environment: This successional forest represents regeneration on old fields and clearings on the driest ridges and slopes. This association pioneer occurs on dry sites with infertile, often sheet-eroded soils. These areas were probably used primarily for grazing.

Manassas National Battlefield Park Environment: This vegetation type is widespread in Manassas National Battlefield Park on former fields and clearings that were abandoned within the past 80 years. Stands are short-lived, and in many stands, *Pinus virginiana* (Virginia pine) is dead or dying, and there are often many fallen trees and snags. Ruderal Virginia Pine Forest occurs on low ridges and rolling to flat uplands. Surface substrate primarily consists of dense needle litter and decaying wood.

National Capital Parks-East Environment: Stands of this type can occur in a variety of disturbed areas, and are more likely on acidic soils. Some stands have been affected by ice and wind storms, fire, and/or insect infestations.

Prince William Forest Park Environment: Stands of Ruderal Virginia Pine Forest occur on gentle slopes in Prince William Forest Park and develop on abandoned fields. They are short-lived, generally persisting less than 75 years. In many stands, *Pinus virginiana* (Virginia pine) is dead or dying and there are numerous fallen trees and snags.

Rock Creek Park Environment: This community occurs in very few places in Rock Creek Park's drier uplands.

Wolf Trap National Park for the Performing Arts Environment: Stands of Ruderal Virginia Pine Forest occur on gentle slopes in Wolf Trap National Park and develop after field abandonment. They are short-lived, generally persisting less than 75 years. In many stands, *Pinus virginiana* (Virginia pine) is dying and there are often fallen trees and snags.

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* (Virginia pine). 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* (Virginia pine) 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

Chesapeake & Ohio Canal National Historical Park Vegetation: This forest typically has a very dense canopy of *Pinus virginiana* (Virginia pine) and little understory vegetation but can be open and shrubby or grassy underneath. Other canopy or subcanopy trees vary depending on geography and may include *Acer rubrum* (red maple), *Carya alba*, *Fraxinus americana* (white ash), *Pinus pungens* (Table Mountain pine), *Pinus strobus* (eastern white pine), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus muehlenbergii* (chinquapin oak), *Quercus montana* (chestnut oak), *Quercus velutina* (black oak), and *Sassafras albidum.* Tall shrubs include *Amelanchier arborea* (common serviceberry), *Carya glabra* (pignut hickory), *Cornus florida* (flowering dogwood), *Prunus serotina var. serotina* (black cherry), *Quercus muehlenbergii* (chinquapin oak), and *Quercus rubra.* Short shrubs include *Elaeagnus sp.* (exotic), *Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum.* Vines include *Lonicera japonica* (exotic), *Smilax rotundifolia.* Herbaceous plants include *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa var. flexuosa* (wavy hairgrass), *Dichanthelium*

depauperatum (starved panicgrass), *Eragrostis hypnoides* (teal lovegrass), *Microstegium vimineum (*exotic), and *Phytolacca americana.* Piedmont and Coastal Plain successional forests dominated by *Pinus virginiana* (Virginia pine) are compositionally distinct from montane counterparts.

George Washington Memorial Parkway Vegetation: Stands occur in small patches (<1 ha) and have canopies strongly dominated by *Pinus virginiana* (Virginia pine) or codominated by *Pinus virginiana* (Virginia pine) and *Quercus* (oak) spp. *Quercus montana* (chestnut oak) and *Quercus coccinea* (scarlet oak) are the most characteristic oaks. These oaks are usually well-established in the understory, if not in the canopy. The understory also typically contains *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum). Some stands may contain saplings of *Fagus grandifolia* (American beech) and shrub-sized specimens of *Ilex opaca* (American holly) and *Asimina triloba* (pawpaw). Short shrubs and herbs are usually sparse or absent, but *Vaccinium pallidum* (Blue Ridge blueberry) may be common in some stands. More disturbed areas often have high cover of woody vines, such as *Smilax rotundifolia* (roundleaf greenbrier), *Smilax glauca* (cat greenbrier), *Lonicera japonica* (Japanese honeysuckle), and *Toxicodendron radicans* (eastern poison-ivy). The ground layer is usually covered by pine litter with few herbs or scattered patches of the clubmoss *Lycopodium digitatum* (fan clubmoss). Other common herbs are *Mitchella repens* (partridgeberry), *Polystichum acrostichoides* (Christmas fern), *Chimaphila maculata* (striped prince's pine), and *Danthonia spicata* (poverty oatgrass).

Manassas National Battlefield Park Vegetation: This forest community represents temporary, early-successional vegetation of abandoned fields. Although relatively short-lived, this forest assemblage repeatedly develops on suitable habitats of the region. It includes stands of pure *Pinus virginiana* (Virginia pine), as well as older stands where the *Pinus virginiana* (Virginia pine) is decadent and the evergreen canopy is breaking up with hardwood succession. Deciduous species can comprise up to 50% of the canopy composition and can be almost any species from the surrounding forests. Some common canopy/subcanopy associates include *Juniperus virginiana var. virginiana* (eastern red-cedar), *Fraxinus americana* (white ash), *Acer rubrum* (red maple), *Carya* (hickory) spp., and *Quercus* (oak) spp. Common deciduous subcanopy species include *Acer rubrum* (red maple), *Cornus florida* (flowering dogwood), *Cercis canadensis var. canadensis* (eastern redbud), and additional *Quercus* (oak) species. The herb layer varies from about 10% total cover to nearly absent on sites densely shaded by pines. *Lonicera japonica* (Japanese honeysuckle), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), and *Microstegium vimineum* (Nepalese browntop) are often common in the herb layer.

National Capital Parks-East Vegetation: Stands have canopies that are heavily dominated by *Pinus virginiana* (Virginia pine), with variable understory and shrub vegetation. The canopy may also contain *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), and *Liquidambar styraciflua* (sweetgum). The subcanopy may contain *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), *Fagus grandifolia* (American beech), *Ilex opaca var. opaca* (American holly), *Nyssa sylvatica* (blackgum), *Juniperus virginiana* (eastern red-cedar) (which may dominate in some cases), *Liquidambar styraciflua* (sweetgum), *Prunus serotina var. serotina* (black cherry), *Quercus alba* (white oak), *Quercus falcata* (southern red oak), *Quercus phellos* (willow oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), and *Quercus velutina* (black oak). The sparse to dense shrub layer may contain *Asimina triloba* (pawpaw), *Campsis radicans* (trumpet creeper), *Carpinus caroliniana* (American hornbeam), *Fraxinus americana* (white ash), *Kalmia latifolia* (mountain laurel), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Viburnum prunifolium* (blackhaw), *Smilax rotundifolia* (roundleaf greenbrier), and *Vaccinium* (blueberry) sp. The exotic vine *Lonicera japonica* (Japanese honeysuckle) may be present. Herbs are generally limited, but may include *Ambrosia artemisiifolia* (annual ragweed), *Andropogon virginicus* (broomsedge bluestem), *Antennaria plantaginifolia* (woman's tobacco), *Danthonia spicata* (poverty oatgrass), *Dichanthelium acuminatum* (tapered rosette grass), *Dichanthelium depauperatum* (starved panicgrass), *Eupatorium hyssopifolium* (hyssopleaf thoroughwort), *Hypericum hypericoides* (St. Andrew's cross), *Mitchella repens* (partridgeberry), and *Polystichum acrostichoides* (Christmas fern). The exotic grasses *Microstegium vimineum* (Nepalese browntop) and *Miscanthus sinensis* (Chinese silvergrass) may be present, the former possibly in dense stands. Some stands have been affected by ice and wind storms, fire, and/or insect infestations.

Prince William Forest Park Vegetation: Ruderal Virginia Pine Forest includes stands of pure *Pinus virginiana* (Virginia pine), as well as older stands where the *Pinus virginiana* (Virginia pine) is decadent and the evergreen canopy is breaking up with hardwood succession. This forest typically has a dense canopy of *Pinus virginiana* (Virginia pine) often with a mix of successional deciduous trees. Deciduous species can comprise up to 50% of the canopy composition and can be almost any species from the surrounding forests. Some common canopy/subcanopy associates include *Liriodendron tulipifera* (tuliptree), *Fagus grandifolia* (American beech), and *Quercus alba* (white oak). Common deciduous subcanopy species include *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), *Ilex opaca var. opaca* (American holly), and additional *Quercus* (oak) species. The shrub layer varies from sparse to dense, which can include high cover of woody ericaceous shrubs (such as

blueberries and huckleberries) and/or thick vines. Shrub and vine species often include *Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), *Smilax rotundifolia* (roundleaf greenbrier), *Smilax glauca* (cat greenbrier), *Lonicera japonica* (Japanese honeysuckle), and *Toxicodendron radicans* (eastern poison-ivy). The ground layer is usually covered by pine litter with few herbs or is dominated by the clubmoss *Lycopodium digitatum* (fan clubmoss). Other common herbs are *Mitchella repens* (partridgeberry), *Polystichum acrostichoides* (Christmas fern), *Chimaphila maculata* (striped prince's pine), and *Danthonia spicata* (poverty oatgrass).

Rock Creek Park Vegetation: Areas classified as this community at Rock Creek Park may no longer be dominated by *Pinus virginiana* (Virginia pine) because the pines, which colonized these areas long ago, are reaching maturity and dying. Evidence of fallen *Pinus virginiana* (Virginia pine) is quite common in these areas at the park. The canopy typically includes a mixture of hardwood trees, including *Quercus alba* (white oak), *Quercus velutina* (black oak), *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), and *Nyssa sylvatica* (blackgum). *Fagus grandifolia* (American beech) may dominate the subcanopy. The herbaceous layer is relatively sparse and species-poor, and usually has a high component of tree seedlings. Weedy natives and exotics may dominate the understory.

Wolf Trap National Park for the Performing Arts Vegetation: Ruderal Virginia Pine Forest includes stands of pure *Pinus virginiana* (Virginia pine), as well as older stands where the *Pinus virginiana* (Virginia pine) is decadent and the evergreen canopy is breaking up with hardwood succession. Stands of Ruderal Virginia Pine Forest develop after field abandonment and are short-lived, generally less than 75 years. This forest typically has a dense canopy of *Pinus virginiana* (Virginia pine) often with a mix of successional deciduous trees in the canopy and/or subcanopy. Deciduous species can be almost any species from the surrounding forests. Some common associates include *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Quercus velutina* (black oak), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), *Ilex opaca* (American holly), and *Juniperus virginiana* (eastern red-cedar). Woody shrubs and vines can have high cover and often include *Viburnum acerifolium* (mapleleaf viburnum), *Parthenocissus quinquefolia* (Virginia creeper), *Lonicera japonica* (Japanese honeysuckle), *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), and *Toxicodendron radicans* (eastern poison-ivy). The ground layer is usually covered by pine litter with few herbs or is dominated by the clubmoss *Lycopodium digitatum* (fan clubmoss). Other common herbs are *Mitchella repens* (partridgeberry), *Polystichum acrostichoides* (Christmas fern), and *Galium circaezans* (licorice bedstraw).

Global Vegetation: This forest typically has a very dense canopy of *Pinus virginiana* (Virginia pine) and little understory vegetation. *Pinus taeda* (loblolly pine), *Pinus echinata* (shortleaf pine), or *Pinus strobus* (eastern white pine) may co-occur with *Pinus virginiana* (Virginia pine) in the canopy. The canopy can also have significant admixtures of early-successional deciduous trees (e.g., *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Oxydendrum arboreum* (sourwood), *Betula lenta* (sweet birch), *Nyssa sylvatica* (blackgum)). Older stands on abandoned farmland may have tall canopies (>20 m) of decadent *Pinus virginiana* (Virginia pine) overtopping the shade-tolerant *Tsuga canadensis* (eastern hemlock), which often dominates the subcanopy and shrub layers. Scattered *Pinus rigida* (pitch pine) may be mixed in these stands. Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species; *Lonicera japonica* (Japanese honeysuckle) and *Rosa multiflora* (multiflora rose) are common. The herb layer is characterized by weedy natives and exotics such as *Lycopodium digitatum* (fan clubmoss), *Achillea millefolium var. occidentalis* (western yarrow), *Hieracium caespitosum* (meadow hawkweed), and *Lespedeza cuneata* (sericea lespedeza). Shrub and herb strata, where present at all, are usually sparse in coverage. In eastern Tennessee, the subcanopy may contain *Acer saccharum* (sugar maple) and *Cornus florida* (flowering dogwood); other associated species may include *Cercis canadensis* (eastern redbud), *Parthenocissus quinquefolia* (Virginia creeper), *Lonicera japonica* (Japanese honeysuckle), and *Microstegium vimineum* (Nepalese browntop) (Andreu and Tukman 1995). In the Central Appalachians, associates include *Pinus strobus* (eastern white pine), *Pinus echinata* (shortleaf pine), and *Pinus rigida* (pitch pine). Some stands may have a dense ericaceous shrub stratum containing *Vaccinium* (blueberry) spp., *Gaylussacia* (huckleberry) spp., *Kalmia latifolia* (mountain laurel), and *Rhododendron* (rhododendron, azalea) spp. This community contains many exotics species such as *Albizia julibrissin* (silktree), *Lonicera japonica* (Japanese honeysuckle), and *Pueraria montana var. lobata* (kudzu). *Lonicera japonica* (Japanese honeysuckle) 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

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana* (Virginia pine)
Tree subcanopy	Needle-leaved tree	*Juniperus virginiana* (eastern red-cedar)
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Cornus florida* (flowering dogwood), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood)
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Cornus florida* (flowering dogwood), *Oxydendrum arboreum* (sourwood)
Tall shrub/sapling	Needle-leaved tree	*Tsuga canadensis* (eastern hemlock)
Tall shrub/sapling	Broad-leaved deciduous tree	*Nyssa sylvatica* (blackgum)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium stamineum* (deerberry)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Vaccinium arboreum* (farkleberry)
Short shrub/sapling	Broad-leaved deciduous tree	*Cercis canadensis* (eastern redbud), *Quercus alba* (white oak), *Sassafras albidum* (sassafras)
Herb (field)	Liana	*Lonicera japonica* (Japanese honeysuckle), *Smilax glauca* (cat greenbrier), *Toxicodendron radicans* (eastern poison-ivy)
Herb (field)	Fern (Spore-bearing forb)	*Lycopodium* sp.
Nonvascular	Lichen	*Cladonia* sp.

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Pinus virginiana* (Virginia pine)
George Washington Memorial Parkway: *Acer rubrum* (red maple), *Kalmia latifolia* (mountain laurel), *Nyssa sylvatica* (blackgum), *Pinus virginiana* (Virginia pine), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), *Smilax rotundifolia* (roundleaf greenbrier)
Manassas National Battlefield Park: *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Parthenocissus quinquefolia* (Virginia creeper), *Pinus virginiana* (Virginia pine)
National Capital Parks-East: *Pinus virginiana* (Virginia pine)
Prince William Forest Park: *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Lycopodium digitatum* (fan clubmoss), *Pinus virginiana* (Virginia pine)
Rock Creek Park: *Pinus virginiana* (Virginia pine)
Wolf Trap National Park for the Performing Arts: *Pinus virginiana* (Virginia pine)
Global: *Pinus virginiana* (Virginia pine), *Tsuga canadensis* (eastern hemlock)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Elaeagnus* sp., *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
George Washington Memorial Parkway: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Prince William Forest Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium)
Rock Creek Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Wolf Trap National Park for the Performing Arts: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium)
Global: Invasive/Exotic Plants: *Albizia julibrissin* (silktree, High/Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Pueraria montana* var. *lobata* (kudzu), *Rosa multiflora* (multiflora rose, 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 montana - Quercus (coccinea, velutina)* Forest (CEGL004761)
- *Pinus echinata* Ruderal Forest (CEGL006327) occurs in similar environments but is dominated (>50% of canopy) by *Pinus echinata* (shortleaf pine) instead of *Pinus virginiana* (Virginia pine).
- *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* (loblolly pine) in the canopy, whereas CEGL002591 is mostly *Pinus virginiana* (Virginia pine).
- *Pinus taeda / Liquidambar styraciflua - Acer rubrum / Vaccinium stamineum* Ruderal Forest (CEGL006011) occurs in similar environments with similar disturbance histories but is dominated by (>50% of canopy) *Pinus taeda* (loblolly pine) instead of *Pinus virginiana* (Virginia pine).
- *Pinus virginiana - Juniperus virginiana - Ulmus alata* Ruderal Forest (CEGL007121) on more calcareous or circumneutral substrates.
- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus montana) / 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* (Japanese honeysuckle) 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* (Blue Ridge blueberry)) and less signs of severe human disturbance.

Global Related Concepts:

- *Pinus virginiana - Juniperus virginiana* Forest (Fleming and Weber 2003) =
- *Pinus virginiana* forest (Vanderhorst 2001b) =
- IA7c. Xeric Virginia Pine Ridge Forest (Allard 1990) >
- Pine-Oak Association of the Western Shore District (Shreve et al. 1910) >
- Unclassified Old-Field Successional Forest (Fleming and Moorhead 2000) **?**
- Virginia Pine - (Oak) - Heath Mid-Successional Upland (PU3) (Windisch 2014a) <
- Virginia Pine - Oak: 78 (Eyre 1980) >
- Virginia Pine Type (Schmalzer and DeSelm 1982) >
- Virginia Pine: 79 (Eyre 1980) >
- Virginia pine successional forest (Collins and Anderson 1994) =

CLASSIFICATION

Status: Standard

Classification Confidence: 3 - Weak

Chesapeake & Ohio Canal National Historical Park Classification Comments: Ruderal Virginia Pine Forest is also referred to as Successional Virginia Pine Forest.

George Washington Memorial Parkway Classification Comments: Currently, Ruderal Virginia Pine Forest (also referred to as Successional Virginia Pine Forest) is a rather rare type in George Washington Memorial Parkway, and most stands are decadent and rapidly succeeding to one of the drier oak or oak-hickory communities. This type was formerly more common, and many sites now supporting Ruderal Tuliptree Forest (Typic Type) (CEGL007221) were initially occupied by Virginia pines immediately following abandonment. Some stands of Ruderal Tuliptree Forest (Typic Type) can have scattered *Pinus virginiana* (Virginia pine) in the canopy, but it would not dominate the canopy (<50 % cover).

Manassas National Battlefield Park Classification Comments: Stands that have a scattered emergent canopy of *Pinus virginiana* (Virginia pine) over a dense subcanopy of *Juniperus virginiana var. virginiana* (eastern red-cedar) are classified not as Ruderal Virginia Pine Forest, but as Northeastern Ruderal Red-Cedar Forest (CEGL006024).

Manassas National Battlefield Park Other Comments: Ruderal Virginia Pine Forest (also referred to as Successional Virginia Pine Forest) is one of the most abundant forest communities in the park, and is also characteristic of ruderal habitats throughout the northern Virginia Culpeper Basin. Exotic weeds, particularly *Lonicera japonica* (Japanese honeysuckle), occur frequently but with low cover in this type. Although evidence of infestations by southern pine beetle (*Dendroctonus frontalis*) was not noted in the park, Virginia pine stands in this region often suffer considerable mortality from periodic outbreaks of this tiny indigenous beetle.

National Capital Parks-East Classification Comments: It should be noted that Ruderal Virginia Pine Forest (sometimes referred to as Successional Virginia Pine Forest) will succeed to other types such as Ruderal Tuliptree

Forest (Typic Type) (CEGL007221), so if an accuracy assessment is done after much time passes, a stand could change map classes if pines decline and successional hardwoods increase.

Prince William Forest Park Other Comments: Ruderal Virginia Pine Forest (also referred to as Successional Virginia Pine Forest) could be confused with Ruderal Tuliptree Forest (Typic Type) (CEGL007221) because as *Pinus virginiana* (Virginia pine) ages and dies, hardwoods such as *Liriodendron tulipifera* (tuliptree) begin to fill in the canopy gaps. Ruderal Virginia Pine Forest can be distinguished by having a canopy comprised of 50-100% *Pinus virginiana* (Virginia pine).

Rock Creek Park Classification Comments: Ruderal Virginia Pine Forest (also referred to as Successional Virginia Pine Forest) was once more widespread at Rock Creek Park, but as the stands have aged, many of the *Pinus virginiana* (Virginia pine) have died and are being replaced in the canopy by hardwoods, including various oaks and beech. Some areas where the pines are mostly dead and fallen have been classified as a deciduous hardwood forest.

Wolf Trap National Park for the Performing Arts Classification Comments: Ruderal Virginia Pine Forest (also referred to as Successional Virginia Pine Forest) could be confused with Ruderal Tuliptree Forest (Typic Type) (CEGL007221). Ruderal Virginia Pine Forest can be distinguished by having a canopy comprised of 25-100% *Pinus virginiana* (Virginia pine).

Global Classification Comments: Early-successional *Pinus virginiana* (Virginia pine) vegetation occurring over calcareous substrates is classed in ~*Pinus virginiana* - *Juniperus 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* (pitch pine) and stands mixed with *Pinus virginiana* (Virginia pine) or early-successional deciduous trees such as *Acer rubrum* (red maple) 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

Chesapeake & Ohio Canal National Historical Park Range: This successional forest occurs on a variety of successional or old field sites, some of which may have been farmed or grazed in the past.

George Washington Memorial Parkway Range: This association is rather rare in George Washington Memorial Parkway and mostly restricted to the southern portion of Great Falls Park, Fort Hunt Park, and forest surrounding Mount Vernon.

Manassas National Battlefield Park Range: Ruderal Virginia Pine Forest (also referred to as Successional Virginia Pine Forest) is one of the most abundant vegetation associations in Manassas National Battlefield Park, occurring in small to large patches on uplands throughout the park.

National Capital Parks-East Range: Stands have been documented at Oxon Hill Farm, Greenbelt Park, Harmony Hall, Patuxent North, and Piscataway - Marshall Hall.

Prince William Forest Park Range: Ruderal Virginia Pine Forest (also referred to as Successional Virginia Pine Forest) is a common vegetation association in Prince William Forest Park and occurs on uplands throughout the park in small to large patches.

Rock Creek Park Range: Ruderal Virginia Pine Forest (also referred to as Successional Virginia Pine Forest) is found on some of Rock Creek Park's drier hilltops, especially where disturbance may have occurred since the Civil War. Two small patches occur in the vicinity of the Nature Center, and a few others in the Circle Fort area in the Coastal Plain.

Wolf Trap National Park for the Performing Arts Range: Ruderal Virginia Pine Forest (also referred to as Successional Virginia Pine Forest) is mapped as 7 polygons in park, ranging in size from 0.12 to 1.18 hectares. It covers a total of 2.9 hectares (7.17 acres) in the park.

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:SNA, DC:SNA, DE:SNA, GA:SNA, IN:SNA, KY:SNA, MD:SNA, NC:SNA, NJ:SNA, PA:SNA, SC:SNA, TN:SNA, VA:SNA, WV:SNA

TNC Ecoregions: 43:C, 44:C, 49:P, 50:C, 51:C, 52:C, 58:C, 59:C, 61:C

USFS Ecoregions (2007): 221Da:CCC, 221Ej:CCC, 221En:CC?, 221Ha:CCC, 221Hb:CCP, 221Hc:CCC, 221He:CC?, 221J:CC, 223Dg:CCC, 223Eg:CCC, 231Bd:CCC, 231Be:CCC, 231Cc:CCC, 231Cd:CCC, 231Ib:CCC,

231Ic:CCC, 231If:CCC, 232Ad:P??, 232Ha:PP?, 232Hd:PPP, 232Je:PP?, M221Aa:CCP, 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

Chesapeake & Ohio Canal National Historical Park Plots: None
George Washington Memorial Parkway Plots: None.
Manassas National Battlefield Park Plots: None.
National Capital Parks-East Plots: None.
Prince William Forest Park Plots: None.
Wolf Trap National Park for the Performing Arts Plots: None.
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
George Washington Memorial Parkway Description Author(s): G.P. Fleming and K. Taverna
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
National Capital Parks-East Description Author(s): M. Pyne
Prince William Forest Park Description Author(s): K. Taverna
Rock Creek Park Description Author(s): J. Teague
Wolf Trap National Park for the Performing Arts Description Author(s): K. Taverna
Global Description Author(s): M. Andreu, M. Tukman, J.P. Vanderhorst, K.D. Patterson and S.C. Gawler
References: Allard 1990, 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 Weber 2003, 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 et al. 2010, Schmalzer and DeSelm 1982, Schotz et al. 2008, Shreve et al. 1910, Southeastern Ecology Working Group n.d.*, TNC 1998c, Taverna and Patterson 2008, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2008, Vanderhorst et al. 2010, 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

This alliance includes deciduous forests dominated by *Gleditsia triacanthos* (honeylocust), *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tuliptree), or *Robinia pseudoacacia* (black locust) 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* (tuliptree) stands occur on old clearcut sites and old fields. This suballiance includes pure, often even-aged stands of *Liriodendron tulipifera* (tuliptree). Associated species vary with geographic location. Throughout most of the range of this suballiance *Acer rubrum* (red maple), *Robinia pseudoacacia* (black locust), *Betula lenta* (sweet birch), *Acer saccharum* (sugar maple), and *Acer negundo* (box-elder) 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* (tuliptree), *Juglans cinerea* (butternut), *Robinia pseudoacacia* (black locust), *Fraxinus americana* (white ash), *Ulmus americana* (American elm), *Platanus occidentalis* (American sycamore), *Acer saccharum* (sugar maple), *Acer nigrum* (black maple), and *Morus rubra* (red mulberry). The shrub layer may or may not be well-developed; common species include *Asimina triloba* (pawpaw), *Viburnum prunifolium* (blackhaw), *Lindera benzoin* (northern spicebush), *Corylus americana* (American hazelnut), and the exotic invasive *Rosa multiflora* (multiflora rose). (3) *Robinia pseudoacacia* (black

locust) 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.

[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 Ruderal 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* (black walnut) 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* (tuliptree), *Juglans cinerea* (butternut), *Robinia pseudoacacia* (black locust), *Fraxinus americana* (white ash), *Ulmus americana* (American elm), *Platanus occidentalis* (American sycamore), *Acer saccharum* (sugar maple), *Acer nigrum* (black maple), *Morus rubra* (red mulberry), and *Aesculus flava* (yellow buckeye). Additional tree species in the subcanopy can include *Carya cordiformis* (bitternut hickory) and *Celtis occidentalis* (common hackberry). *Sassafras albidum* (sassafras) and/or *Carpinus caroliniana* (American hornbeam) may be present as small trees. The shrub layer may or may not be well-developed; common species include *Asimina triloba* (pawpaw), *Viburnum prunifolium* (blackhaw), *Lindera benzoin* (northern spicebush), *Corylus americana* (American hazelnut), and the exotic invasive *Rosa multiflora* (multiflora rose). The herb layer is variable, often with one or a few species providing most of the cover. *Verbesina alternifolia* (wingstem) (within its range) and *Ageratina altissima* (white snakeroot) are characteristic and may be dominant; other herbs include *Ambrosia trifida* (great ragweed), *Amphicarpaea bracteata* (American hogpeanut), *Agrimonia pubescens* (soft agrimony), *Apios americana* (groundnut), *Cryptotaenia canadensis* (Canadian honewort), *Galium triflorum* (fragrant bedstraw), *Osmorhiza longistylis* (longstyle sweetroot), *Dichanthelium clandestinum* (deertongue), *Packera aurea* (golden ragwort), *Polygonum virginianum* (jumpseed), *Rudbeckia laciniata* (cutleaf coneflower), *Podophyllum peltatum* (mayapple), *Impatiens capensis* (orange jewelweed), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Viola striata* (striped cream violet), and *Ambrosia trifida* (great ragweed). The invasive exotics *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), *Rosa multiflora* (multiflora rose), and *Polygonum cespitosum* (oriental ladysthumb) can be common in this community.

Environmental Description

Antietam National Battlefield Environment: These forests occur in disturbed mesic areas, including floodplains of drainages, creeks and tributaries, as well as woodlots, fencerows, and surrounding agricultural fields.
Chesapeake & Ohio Canal National Historical Park Environment: This association occurs in scattered disturbed areas along floodplains of the Potomac River and its tributaries.
Harpers Ferry National Historical Park Environment: Ruderal Black Walnut Forest occurs in the park at a disturbed site, directly adjacent to the railroad tracks near the town of Millville. The site was likely disturbed due to activity along the railroad in the past 50-80 years.
Manassas National Battlefield Park Environment: Ruderal Black Walnut Forest occurs in the park at an old homesite, along the eastern side of Stuart Hill. The homesite was likely abandoned when the park was established in 1940.
Monocacy National Battlefield Environment: These forests occur in disturbed mesic areas, including floodplains of drainages, creeks and tributaries, as well as woodlots, fencerows, and surrounding agricultural fields.

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

Antietam National Battlefield Vegetation: Forest canopy is strongly dominated by *Juglans nigra* (black walnut), though the canopy is typically somewhat open (50-75% cover). Other canopy and subcanopy associates can include *Fraxinus americana* (white ash), *Quercus* (oak) spp., *Liriodendron tulipifera* (tuliptree), *Celtis occidentalis* (common hackberry), *Acer negundo* (box-elder), and *Sassafras albidum* (sassafras). The tall-shrub layer can be of variable density. Common shrub species are *Viburnum prunifolium* (blackhaw), *Lindera benzoin* (northern spicebush), *Rosa multiflora* (multiflora rose), and *Lonicera* (honeysuckle) spp. The herbaceous layer typically contains exotic species such as *Microstegium vimineum* (Nepalese browntop), *Lonicera japonica* (Japanese honeysuckle), and *Alliaria petiolata* (garlic mustard).

Chesapeake & Ohio Canal National Historical Park Vegetation: The forest canopy is strongly dominated by *Juglans nigra* (black walnut).

Harpers Ferry National Historical Park Vegetation: *Juglans nigra* (black walnut) is dominant in the canopy in a nearly pure grove. Associated canopy species are a minor component and include weedy trees such as *Liriodendron tulipifera* (tuliptree) and *Acer rubrum* (red maple). The subcanopy has scattered trees of *Juglans nigra* (black walnut) and *Juniperus virginiana var. virginiana* (eastern red-cedar). The shrub layer is composed of weedy shrubs, vines and small trees that occur in patches. Shrubs include *Rosa multiflora* (multiflora rose), *Vitis* (grape) spp., and *Juglans nigra* (black walnut). The herb layer is dominated by *Elymus hystrix* (eastern bottlebrush grass) and *Verbesina alternifolia* (wingstem). Additional native and exotic species are interspersed throughout the herb layer with low cover.

Manassas National Battlefield Park Vegetation: *Juglans nigra* (black walnut) is dominant in the canopy in a nearly pure grove. Associated canopy species are a minor component and include weedy trees such as *Robinia pseudoacacia* (black locust), *Liriodendron tulipifera* (tuliptree), and *Acer rubrum* (red maple). The subcanopy has scattered trees of *Juniperus virginiana var. virginiana* (eastern red-cedar). The shrub layer is composed of weedy shrubs, vines and small trees that are dense in patches. Shrubs include *Rubus phoenicolasius* (wine raspberry), *Vitis* (grape) spp., *Lindera benzoin* (northern spicebush), *Juglans nigra* (black walnut), and *Acer negundo* (box-elder). The herb layer is dominated by the invasive, exotic species *Microstegium vimineum* (Nepalese browntop). Additional native and exotic species are interspersed throughout the herb layer with low cover.

Monocacy National Battlefield Vegetation: The forest canopy is strongly dominated by *Juglans nigra* (black walnut). Other canopy and subcanopy associates can include *Acer negundo* (box-elder), *Fraxinus americana* (white ash), *Robinia pseudoacacia* (black locust), *Liriodendron tulipifera* (tuliptree), *Celtis occidentalis* (common hackberry), *Prunus serotina* (black cherry), and *Ailanthus altissima* (tree of heaven). Although the canopy is typically somewhat open (50-75% cover), closed canopies can occur (75-95%). The canopy trees are often 15-20 m in height. The sparse subcanopy (20-30) contains *Acer negundo* (box-elder) and other canopy species that range in height from 6-10 m. The tall-shrub layer can be of variable density (10-40%). Common shrub species are *Viburnum prunifolium* (blackhaw), *Lindera benzoin* (northern spicebush), *Rosa multiflora* (multiflora rose), and *Lonicera* (honeysuckle) spp. The herbaceous layer can be moderate to dense (40-80% cover) and is typically strongly dominated by exotic species such as *Microstegium vimineum* (Nepalese browntop), *Lonicera japonica* (Japanese honeysuckle), *Alliaria petiolata* (garlic mustard), and *Polygonum cespitosum* (oriental ladysthumb).

Global Vegetation: The canopy can be closed to somewhat open. *Juglans nigra* (black walnut) 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* (tuliptree), *Juglans cinerea* (butternut), *Robinia pseudoacacia* (black locust), *Fraxinus americana* (white ash), *Ulmus americana* (American elm), *Platanus occidentalis* (American sycamore), *Acer saccharum* (sugar maple), *Acer nigrum* (black maple), *Morus rubra* (red mulberry), and *Aesculus flava* (yellow buckeye). Additional tree species in the subcanopy can include *Carya cordiformis* (bitternut hickory) and *Celtis occidentalis* (common hackberry). *Sassafras albidum* (sassafras) and/or *Carpinus caroliniana* (American hornbeam) may be present as small trees. The shrub layer may or may not be well-developed; common species include *Asimina*

triloba (pawpaw), *Viburnum prunifolium* (blackhaw), *Lindera benzoin* (northern spicebush), *Corylus americana* (American hazelnut), and the exotic invasive *Rosa multiflora* (multiflora rose). The herb layer is variable, often with one or a few species providing most of the cover. *Verbesina alternifolia* (wingstem) (within its range) and *Ageratina altissima* (white snakeroot) are characteristic and may be dominant; other herbs include *Amphicarpaea bracteata* (American hogpeanut), *Agrimonia pubescens* (soft agrimony), *Apios americana* (groundnut), *Cryptotaenia canadensis* (Canadian honewort), *Galium triflorum* (fragrant bedstraw), *Osmorhiza longistylis* (longstyle sweetroot), *Dichanthelium clandestinum* (deertongue), *Packera aurea* (golden ragwort), *Polygonum virginianum* (jumpseed), *Rudbeckia laciniata* (cutleaf coneflower), *Podophyllum peltatum* (mayapple), *Impatiens capensis* (orange jewelweed), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Viola striata* (striped cream violet), and *Ambrosia trifida* (great ragweed). The invasive exotics *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), and *Polygonum cespitosum* (oriental ladysthumb) 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* (black walnut) 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* (sawtooth blackberry), *Rubus allegheniensis* (Allegheny blackberry), and other related species (blackberries), which would help keep the shrub layer open and reduce species diversity.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Juglans nigra* (black walnut)
Herb (field)	Flowering forb	*Verbesina alternifolia* (wingstem)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Juglans nigra* (black walnut)
Chesapeake & Ohio Canal National Historical Park: *Juglans nigra* (black walnut)
Harpers Ferry National Historical Park: *Elymus hystrix* (eastern bottlebrush grass), *Juglans nigra* (black walnut), *Verbesina alternifolia* (wingstem)
Manassas National Battlefield Park: *Juglans nigra* (black walnut), *Microstegium vimineum* (Nepalese browntop)
Monocacy National Battlefield: *Juglans nigra* (black walnut)
Global: *Cercis canadensis* (eastern redbud), *Juglans nigra* (black walnut), *Rosa multiflora* (multiflora rose), *Verbesina alternifolia* (wingstem)

OTHER NOTEWORTHY SPECIES

Antietam National Battlefield: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rubus phoenicolasius* (wine raspberry, Medium)
Monocacy National Battlefield: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* (oriental ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low)
Global: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* (oriental ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (02-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* (black walnut) and occurs on disturbed sites, but it is largely dominated by early-successional trees in the canopy.

Global Related Concepts:

- *Juglans nigra - Robinia pseudoacacia / Lonicera japonica / Verbesina alternifolia* Association (Rawinski et al. 1996) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Antietam National Battlefield Classification Comments: Ruderal Black Walnut Forest (also referred to as Successional Black Walnut Forest) is clearly distinguishable from other deciduous forest types in the park due to an overstory dominated by *Juglans nigra.* Some of these forests may have been initially planted as orchards.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Ruderal Black Walnut Forest (also referred to as Successional Black Walnut Forest) is clearly distinguishable from other deciduous forest types in the park due to an overstory dominated by *Juglans nigra* (black walnut). Some of these forests may have been initially planted as orchards. This association is sometimes mapped individually, but small patches are usually mapped as part of the Successional Woody Wetland Map Class (COMP_WOWE) which at this park may include Northeastern Buttonbush Shrub Swamp (CEGL006069), Ruderal Box-elder Floodplain Forest (CEGL005033), and Ruderal Black Walnut Forest (CEGL007879), as well as unclassified successional shrublands and woodlands occurring in wetlands.
Harpers Ferry National Historical Park Classification Comments: Ruderal Black Walnut Forest (also referred to as Successional Black Walnut Forest) is clearly distinguishable from other deciduous forest types in the park due to an overstory dominated by *Juglans nigra* (black walnut) and an herb layer of *Elymus hystrix* (eastern bottlebrush grass) and *Verbesina alternifolia* (wingstem). Some of these forests may have been initially planted as orchards. This association is sometimes mapped individually, but small patches are usually mapped as part of the Successional Woody Wetland Map Class (COMP_WOWE) which at this park may include Ruderal Box-elder Floodplain Forest (CEGL005033) and Ruderal Black Walnut Forest (CEGL007879), as well as unclassified successional shrublands and woodlands occurring in wetlands.
Manassas National Battlefield Park Classification Comments: Ruderal Black Walnut Forest (also referred to as Successional Black Walnut Forest) is clearly distinguishable from other deciduous forest types in the park due to an overstory dominated by *Juglans nigra* (black walnut) and a carpet of *Microstegium vimineum* (Nepalese browntop) in the herb layer. Some of these forests may have been initially planted as orchards. This association is sometimes mapped individually, but small patches are usually mapped as part of the Successional Woody Wetland Map Class (COMP_WOWE) which at this park may include Ruderal Box-elder Floodplain Forest (CEGL005033) and Ruderal Black Walnut Forest (CEGL007879), as well as unclassified successional shrublands and woodlands occurring in wetlands.
Monocacy National Battlefield Classification Comments: Ruderal Black Walnut Forest (also referred to as Successional Black Walnut Forest) is clearly distinguishable from other deciduous forest types in the park due to an overstory dominated by *Juglans nigra.* Some of these forests may have been initially planted as orchards.
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

Antietam National Battlefield Range: This association can occur in disturbed mesic areas throughout the park, however, it was observed in the Snavely's Woods area.
Chesapeake & Ohio Canal National Historical Park Range: This association can occur in disturbed mesic areas throughout the park.
Harpers Ferry National Historical Park Range: Ruderal Black Walnut Forest occurs at one site in the park, at the far southwestern end near the town of Millville, directly adjacent to the railroad tracks.
Manassas National Battlefield Park Range: Ruderal Black Walnut Forest is only documented at one site in the park. It is found in the western end of the park, south of U.S. Route 29 on the east side of Stuarts Hill.
Monocacy National Battlefield Range: This association can occur in disturbed mesic areas throughout the park.
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* (black walnut) is near the northern end of its range. It may range into adjacent states.
Nations: US
States/Provinces: GA:SNA, KY:SNA, MD:SNA, NC:SNA, NJ:SNA, NY?:SNA, PA:SNA, SC:SNA, TN:SNA, VA:SNA, WV:SNA
TNC Ecoregions: 44:C, 50:C, 51:C, 52:C, 59:C, 60:C, 61:C

USFS Ecoregions (2007): 211Fc:CCC, 221Bd:CCP, 221Hc:CCC, 221Ja:C??, 223Dg:CCC, 231Aa:PPP, 231Ic:PPP, M221Bb:CCC, M221Be:CCC, M221Cc:CCC, M221Ce:CCP, 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

Antietam National Battlefield Plots: None.
Chesapeake & Ohio Canal National Historical Park Plots: None
Harpers Ferry National Historical Park Plots: None.
Manassas National Battlefield Park Plots: None.
Monocacy National Battlefield Plots: None.
Antietam National Battlefield Description Author(s): S. Perles
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Manassas National Battlefield Park Description Author(s): K. Taverna
Monocacy National Battlefield Description Author(s): S. Perles
Global Description Author(s): K.D. Patterson, R. White, S.C. Gawler, and M. Pyne
References: 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.*, Vanderhorst et al. 2008, White 2006, White and Govus 2003, White and Govus 2005

[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* (tuliptree). 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* (red maple), *Quercus* (oak) spp., *Betula lenta* (sweet birch), *Oxydendrum arboreum* (sourwood), *Acer saccharum* (sugar maple), and occasionally *Liquidambar styraciflua* (sweetgum), *Ilex opaca* (American holly), or *Robinia pseudoacacia* (black locust) may be common in stands of this type. Where oaks are present, they are frequently multi-stemmed, resulting from coppicing. The conifer *Tsuga canadensis* (eastern hemlock) is abundant in the understories of some stands. Shrub composition is variable but may include *Sambucus nigra ssp. canadensis* (American black elderberry), *Rhododendron maximum* (great laurel), *Hamamelis virginiana* (American witch-hazel), and *Vaccinium pallidum* (Blue Ridge blueberry). Herbs are likewise variable; West Virginia samples feature *Dioscorea quaternata* (fourleaf yam), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Maianthemum racemosum* (feathery false lily of the valley), *Solidago curtisii* (mountain decumbent goldenrod), *Symphyotrichum prenanthoides* (crookedstem aster), *Polystichum acrostichoides* (Christmas fern), *Dryopteris intermedia* (intermediate woodfern), *Arisaema triphyllum ssp. triphyllum* (Jack in the pulpit), *Packera aurea* (golden ragwort),

Amphicarpaea bracteata (American hogpeanut), *Thelypteris noveboracensis* (New York fern), *Lycopodium digitatum* (fan clubmoss), and *Geranium maculatum* (spotted geranium).

ENVIRONMENTAL DESCRIPTION

Catoctin Mountain Park Environment: Only two small patches of this forest type are mapped, both in the eastern portion underlain by the acidic quartzite and metasiltstone of the Weverton Formation. One site occurs on a gentle northeast-facing slope at an elevation of 350 m (1150 feet). The other stand occurs just outside the northeast boundary of the park on a steep north-facing slope upslope of Owens Creek at an elevation of 275-290 m (900-950 feet).

Chesapeake & Ohio Canal National Historical Park Environment: This successional forest occurs on dry-mesic upper slopes that have undergone past clearing or other disturbances.

George Washington Memorial Parkway Environment: This successional forest represents regeneration on moist to relatively dry old fields and cut-over forests located on ridgetops and upper slopes. Based on the presence of ericaceous shrubs and the lack of significant herbaceous flora, it is hypothesized that this community occupies soils of low fertility. This community also includes older forests that have been overwhelmingly invaded by exotic vines and herbs.

National Capital Parks-East Environment: This post-disturbance association may be found anywhere that land has been heavily impacted by agriculture or other severe disturbances and is recovering. Examples of this situation include abandoned agricultural fields and areas adjacent to former habitations, as well as along roadsides.

Prince William Forest Park Environment: Ruderal Tuliptree Forest (Typic Type) is an early- to mid-successional forest and is considered a semi-natural association. It occurs on areas which were once clearcuts, old fields, or clearings created by fire and other natural disturbances. It occurs on lower slopes, floodplains, and in draws, on all aspects and elevations in Prince William Forest Park. Soils are often eroded with little organic matter or A-horizon development.

Rock Creek Park Environment: This successional tuliptree forest is uncommon at Rock Creek Park, occurring occasionally in mesic upland landscape positions.

Wolf Trap National Park for the Performing Arts Environment: Ruderal Tuliptree Forest (Typic Type) is an early- to mid-successional forest and is considered a semi-natural association. It occurs on areas which were once clearcuts, old fields, or cleared by fire or other natural disturbances. In Wolf Trap National Park, it primarily occurs on lower sideslopes adjacent to the Wolftrap Creek floodplain.

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

Catoctin Mountain Park Vegetation: Only one of two mapped stands was checked in the field; the stand east of Chimney Rock is characterized by a mixture of *Liriodendron tulipifera* (tuliptree), *Quercus montana* (chestnut oak), *Sassafras albidum* (sassafras), and *Quercus rubra* (northern red oak). The largest-diameter trees are multi-stemmed *Liriodendron tulipifera* (tuliptree). The subcanopy is characterized by *Acer saccharum* (sugar maple), *Carya ovalis* (red hickory), and *Carya ovata* (shagbark hickory). The understory of this stand is extremely open; the shrub layer is absent, and the herb layer very sparse and included small individuals of *Vaccinium pallidum* (Blue Ridge blueberry) and a patch of *Dennstaedtia punctilobula* (eastern hayscented fern) in a canopy gap. *Asplenium platyneuron* (ebony spleenwort) is also present as widely scattered individuals. *Berberis thunbergii* (Japanese barberry) is present in small amounts.

Chesapeake & Ohio Canal National Historical Park Vegetation: Canopy is generally even aged, dense *Liriodendron tulipifera* (tuliptree), with oaks such as *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), *Quercus falcata* (southern red oak), and *Quercus rubra.* Subcanopy trees dominated by *Acer rubrum* (red maple), with scattered *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), *Acer saccharum* (sugar maple), and *Quercus rubra.* Some shrubs of *Asimina triloba* and *Lindera benzoin* may be present but these are sparse. Other shrubs include *Hamamelis virginiana* and saplings of the previously listed trees. Tree seedlings additionally may include *Carya glabra* and *Carya alba. Arisaema triphyllum* may be a common herbaceous plant. Other herbaceous plants include *Actaea racemosa* (black baneberry), *Ageratina altissima* (white snakeroot), *Carex platyphylla* (broadleaf sedge), *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Maianthemum racemosum ssp. racemosum*

(feathery false lily of the valley), *Prenanthes sp.*, *Solidago caesia* (wreath goldenrod), *Solidago flexicaulis* (zigzag goldenrod), and *Stellaria pubera.*

George Washington Memorial Parkway Vegetation: In the Potomac Gorge section of George Washington Memorial Parkway, this association is characterized by mixtures of *Liriodendron tulipifera* (tuliptree) and dry-site oaks. *Quercus coccinea* (scarlet oak) is usually the leading canopy dominant, with *Liriodendron tulipifera* (tuliptree) varying from fairly common in the stand to codominant. Locally, *Quercus velutina* (black oak) is a codominant in the canopy mix. The Coastal Plain section of the park has younger successional stands with canopies consisting of variable combinations of *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), and *Liquidambar styraciflua* (sweetgum) with scattered oaks (*Quercus falcata* (southern red oak), *Quercus rubra* (northern red oak), and *Quercus alba* (white oak)). Weedy alluvial oaks (*Quercus palustris* (pin oak), *Quercus phellos* (willow oak)) are also often present on moist flats. *Pinus virginiana* (Virginia pine) is a frequent canopy associate in all stands. The subcanopy tree layers may be sparse or contain individuals of more tolerant, potential successor species such as *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Fagus grandifolia* (American beech), and *Carya* (hickory) spp. *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), and *Cornus florida* (flowering dogwood) are common understory species. The understory and canopy trees are not usually engulfed in vines but creeping and scrambling exotic vines and/or native vines are often common. Exotic vines include *Celastrus orbiculatus* (oriental bittersweet), *Hedera helix* (English ivy), *Lonicera japonica* (Japanese honeysuckle), and *Vinca minor* (common periwinkle). Common native vines are *Campsis radicans* (trumpet creeper), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), and *Vitis* (grape) spp. The shrub and herb layers tend to be open or sparse, but patches of *Kalmia latifolia* (mountain laurel) and/or *Vaccinium pallidum* (Blue Ridge blueberry) are frequent. In some stands, clones of *Asimina triloba* (pawpaw) are invading the shrub layer. Herbaceous plants are typically sparse or absent, but at least one site is carpeted with extensive colonies of *Lycopodium obscurum* (rare clubmoss) and *Lycopodium digitatum* (fan clubmoss).

National Capital Parks-East Vegetation: Stands are dominated by *Liriodendron tulipifera* (tuliptree), usually in combination with *Quercus* (oak) spp. and *Carya* (hickory) spp. and/or with other successional hardwoods. The limited floristic data available for NACE indicate that in one stand the canopy contains *Liriodendron tulipifera* (tuliptree) and *Quercus alba* (white oak) (which dominate), along with *Liquidambar styraciflua* (sweetgum). The subcanopy may contain smaller individuals of canopy taxa, as well as *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Liquidambar styraciflua* (sweetgum), *Nyssa sylvatica* (blackgum), and *Quercus alba* (white oak). Shrubs include *Asimina triloba* (pawpaw), *Ilex opaca var. opaca* (American holly), *Asimina triloba* (pawpaw), *Euonymus americanus* (bursting-heart), and *Smilax* (greenbrier) sp. Herbs include *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley) and *Parthenocissus quinquefolia* (Virginia creeper). These are typically early-successional, young stands.

Prince William Forest Park Vegetation: The canopy of this deciduous forest typically consists of even-aged *Liriodendron tulipifera* (tuliptree), occurring with other early-successional trees such as *Acer rubrum* (red maple) and scattered *Pinus virginiana* (Virginia pine). Older successional stands can have *Quercus alba* (white oak) as a codominant in the canopy. Other deciduous trees, such as *Fagus grandifolia* (American beech), *Quercus rubra* (northern red oak), and *Carya glabra* (pignut hickory), may also be found in the canopy, but these species do not dominate. Ruderal Virginia Pine Forest (CEGL002591) is often the precursor of this association, thus standing dead or fallen *Pinus virginiana* (Virginia pine) are often present. If a distinct subcanopy has developed, typical trees include *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Acer rubrum* (red maple), *Ilex opaca var. opaca* (American holly), *Nyssa sylvatica* (blackgum), and *Carpinus caroliniana* (American hornbeam). Shrubs are mostly *Smilax rotundifolia* (roundleaf greenbrier), *Lonicera japonica* (Japanese honeysuckle), and sometimes *Ligustrum sinense* (Chinese privet). The ground layer is usually a mix of mesic forest herbs and species typical of disturbed areas, as well as exotic vines, shrubs, and herbs. A typical dominant species is *Lycopodium digitatum* (fan clubmoss). Other common species include *Amphicarpaea bracteata* (American hogpeanut), *Microstegium vimineum* (Nepalese browntop), *Polystichum acrostichoides* (Christmas fern), *Thelypteris noveboracensis* (New York fern), *Carex* (sedge) spp., and *Dichanthelium* (rosette grass) spp.

Rock Creek Park Vegetation: At Rock Creek Park, this community is characterized by the dominance of *Liriodendron tulipifera* (tuliptree) with some oak, including *Quercus alba* (white oak) and *Quercus rubra* (northern red oak) in the canopy. Non-native invasive species are often dominant in the shrub and field layers. The stature of this forest, often characterized by smaller trees growing close together, and the abundance of non-native species in the understory, give the forest a weedy appearance.

Wolf Trap National Park for the Performing Arts Vegetation: The canopy of this deciduous forest is typically composed of even-aged *Liriodendron tulipifera* (tuliptree), but it can also occur as a mixed forest. Older

successional stands can have *Quercus alba* (white oak) as a codominant in the canopy. Additional common canopy associates include *Acer rubrum* (red maple) and *Carya glabra* (pignut hickory). If a distinct subcanopy has developed, typical trees include *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Sassafras albidum* (sassafras). Common shrubs and vines include *Viburnum prunifolium* (blackhaw), *Lindera benzoin* (northern spicebush), *Smilax* (greenbrier) vines, *Lonicera japonica* (Japanese honeysuckle), *Parthenocissus quinquefolia* (Virginia creeper), *Celastrus orbiculatus* (oriental bittersweet), and *Toxicodendron radicans* (eastern poison-ivy). The ground layer is usually a mix of forest herbs and species typical of disturbed areas, as well as exotic vines, shrubs, and herbs. A common dominant is *Lonicera japonica* (Japanese honeysuckle). Other common species include *Microstegium vimineum* (Nepalese browntop), *Panicum anceps* (beaked panicgrass), *Schedonorus arundinaceus* (tall fescue), and *Dichanthelium* (rosette grass) spp.

Global Vegetation: The canopy of this ruderal upland association is dominated by *Liriodendron tulipifera* (tuliptree). *Quercus* (oak) species (*Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus falcata* (southern red oak), *Quercus nigra* (water oak), *Quercus velutina* (black oak)) are often present; additional associates may include *Acer floridanum* (southern sugar maple), *Acer rubrum* (red maple), *Carya* (hickory) spp., *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), and *Robinia pseudoacacia* (black locust). *Betula lenta* (sweet birch) is a common associate at the northern range limit. Shrub layers may include saplings of the canopy species and *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). Herbs vary across the range but may include *Actaea racemosa* (black baneberry), *Dichanthelium clandestinum* (deertongue), *Dioscorea quaternata* (fourleaf yam), *Galium circaezans* (licorice bedstraw), *Geranium maculatum* (spotted geranium), *Goodyera pubescens* (downy rattlesnake plantain), *Medeola virginiana* (Indian cucumber), *Potentilla simplex* (common cinquefoil), *Scutellaria serrata* (showy skullcap), *Thelypteris noveboracensis* (New York fern), and *Uvularia perfoliata* (perfoliate bellwort). *Lycopodium digitatum* (fan clubmoss) 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

Global Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera* (tuliptree)
Tall shrub/sapling	Broad-leaved deciduous tree	*Cornus florida* (flowering dogwood)
Herb (field)	Fern (Spore-bearing forb)	*Lycopodium digitatum* (fan clubmoss)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Acer saccharum* (sugar maple), *Asplenium platyneuron* (ebony spleenwort), *Carya ovalis* (red hickory), *Carya ovata* (shagbark hickory), *Liriodendron tulipifera* (tuliptree), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Sassafras albidum* (sassafras), *Vaccinium pallidum* (Blue Ridge blueberry)

Chesapeake & Ohio Canal National Historical Park: *Liriodendron tulipifera* (tuliptree)

George Washington Memorial Parkway: *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Smilax rotundifolia* (roundleaf greenbrier), *Vaccinium pallidum* (Blue Ridge blueberry)

National Capital Parks-East: *Ilex opaca* (American holly), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus falcata* (southern red oak)

Prince William Forest Park: *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Lycopodium digitatum* (fan clubmoss), *Quercus alba* (white oak)

Rock Creek Park: *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak), *Vaccinium pallidum* (Blue Ridge blueberry)

Wolf Trap National Park for the Performing Arts: *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Lonicera japonica* (Japanese honeysuckle), *Quercus alba* (white oak)

Global: *Acer pensylvanicum* (striped maple), *Acer rubrum* (red maple), *Actaea racemosa* (black baneberry), *Amelanchier arborea* (common serviceberry), *Carya glabra* (pignut hickory), *Dichanthelium clandestinum* (deertongue), *Fagus grandifolia* (American beech), *Galium circaezans* (licorice bedstraw), *Geranium maculatum* (spotted geranium), *Goodyera pubescens* (downy rattlesnake plantain), *Hamamelis virginiana* (American witch-hazel), *Lycopodium digitatum* (fan clubmoss), *Medeola virginiana* (Indian cucumber), *Nyssa sylvatica*

(blackgum), *Quercus falcata* (southern red oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Robinia pseudoacacia* (black locust), *Thelypteris noveboracensis* (New York fern), *Uvularia perfoliata* (perfoliate bellwort), *Vaccinium pallidum* (Blue Ridge blueberry)

OTHER NOTEWORTHY SPECIES

Catoctin Mountain Park: Invasive/Exotic Plants: *Berberis thunbergii* (Japanese barberry, High/Medium)
George Washington Memorial Parkway: Invasive/Exotic Plants: *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low)
Prince William Forest Park: Invasive/Exotic Plants: *Ligustrum sinense* (Chinese privet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Wolf Trap National Park for the Performing Arts: Invasive/Exotic Plants: *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Global: Vulnerable Plants: *Actaea racemosa* (black baneberry, G3G4), *Hexastylis naniflora* (dwarfflower heartleaf, G3), *Trillium simile* (jeweled wakerobin, G3); **Other Plants**: *Trillium rugelii* (illscented wakerobin, G4)

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)

Global Related Concepts:
- Successional forest of low-elevation plateaus (Vanderhorst 2001a) **>**
- Tulip Poplar Type (Schmalzer and DeSelm 1982) **>**
- Yellow Poplar community (Ehrenfeld 1977) **=**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Catoctin Mountain Park Classification Comments: Very little field data for Ruderal Tuliptree Forest (Typic Type) exist at the park, and classification of this type should be treated with caution. Some areas mapped as Central Appalachian Dry-Mesic Chestnut Oak - Northern Red Oak Forest (CEGL006057) may actually be this type. Ruderal Tuliptree Forest (Typic Type) is sometimes referred to as Successional Tuliptree - Oak Forest.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Ruderal Tuliptree Forest (Typic Type) is distinguished from Ruderal Tuliptree Forest (Rich Type) (CEGL007220) by its association with drier habitats, its lack of nutrient-demanding species, and its component of ericaceous shrubs. Ruderal Tuliptree Forest (Typic Type) is sometimes referred to as Successional Tuliptree - Oak Forest.
George Washington Memorial Parkway Classification Comments: Ruderal Tuliptree Forest (Typic Type) is distinguished from Ruderal Tuliptree Forest (Rich Type) (CEGL007220) by its association with drier habitats, its lack of nutrient-demanding species, and its component of ericaceous shrubs. Ruderal Tuliptree Forest (Typic Type) is sometimes referred to as Successional Tuliptree - Oak Forest.

National Capital Parks-East Classification Comments: This community, Ruderal Tuliptree Forest (Typic Type), is distinguished from Ruderal Tuliptree Forest (Rich Type) (CEGL007220) by its association with drier habitats, its lack of nutrient-demanding species, and its component of ericaceous shrubs. Ruderal Tuliptree Forest (Typic Type) is sometimes referred to as Successional Tuliptree - Oak Forest.
Prince William Forest Park Classification Comments: The composition of Ruderal Tuliptree Forest (Typic Type) varies within Prince William Forest Park, depending mostly on stand age and topographic position. The associated species of shrubs, herbs and occasional trees vary with the type of forest that once occurred on the site. Stands on or near disturbed floodplains may have *Platanus occidentalis* (American sycamore) and other species typical of temporarily flooded forests, such as *Carpinus caroliniana* (American hornbeam) and *Thelypteris noveboracensis* (New York fern). Former stands of Ruderal Virginia Pine Forest that have developed >75% deciduous canopies are included in this association and may have scattered *Pinus virginiana* (Virginia pine) in the canopy. Stands that were former pastures may have open grown *Quercus* (oak) species in the canopy (used as pasture shade trees). Ruderal Tuliptree Forest (Typic Type) is sometimes referred to as Successional Tuliptree - Oak Forest.
Prince William Forest Park Other Comments: Depending on soil chemistry and other site characteristics, this association, if left undisturbed, will succeed to one of the later successional hardwood forests occurring in the area, such as Piedmont Dry-Mesic Acidic Oak - Hickory Forest (CEGL008475), Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075), or Upper Southeast Sweetgum - Tuliptree Small Stream Forest (CEGL004418).
Rock Creek Park Classification Comments: This community is distinguished from Ruderal Tuliptree Forest (Rich Type) (CEGL007220) by the presence of *Quercus* (oak) spp. along with *Liriodendron tulipifera* (tuliptree) in the canopy, and by a low diversity of native shrubs and herbaceous plants. *Lindera benzoin* (northern spicebush) is not common here. As this successional forest ages, its distinctiveness from Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075) or other natural communities gradually disappears, except perhaps for its greater abundance of invasive species in the understory. Ruderal Tuliptree Forest (Typic Type) is sometimes referred to as Successional Tuliptree - Oak Forest.
Rock Creek Park Other Comments: This mixed forest of *Liriodendron tulipifera* (tuliptree) with some similarly-aged *Quercus* (oak) spp. is successional regrowth on what was probably a disturbed (perhaps logged) forest, but perhaps not a plowed field.
Wolf Trap National Park for the Performing Arts Classification Comments: The composition of Ruderal Tuliptree Forest (Typic Type) varies within Wolf Trap National Park depending on stand age and topographic position. Stands near disturbed floodplains may have species typical of temporarily flooded forests, such as *Carpinus caroliniana* (American hornbeam). Older stands can have a more mixed canopy but will still be dominated by even-aged trees of *Liriodendron tulipifera* (tuliptree). Ruderal Tuliptree Forest (Typic Type) is sometimes referred to as Successional Tuliptree - Oak Forest.
Wolf Trap National Park for the Performing Arts Other Comments: Depending on soil chemistry and other site characteristics, this association, if left undisturbed, will succeed to one of the later successional hardwood forests occurring in the area, such as Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075) or Low-Elevation Mixed Oak / Heath Forest (CEGL008521).
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

Catoctin Mountain Park Range: Only one small patch of this vegetation is mapped in the park, northeast of Chimney Rock. Another slightly larger stand occurs just outside the northeastern park boundary upslope from Owens Creek.
Chesapeake & Ohio Canal National Historical Park Range: This association was observed in only a few places, mostly in the vicinity of Blockhouse Point and Carderrock.
George Washington Memorial Parkway Range: In the Potomac Gorge section of the George Washington Memorial Parkway, this association is known only from several patches on higher ridges in the southwestern portion of Great Falls Park. South of Chain Bridge, it occurs in scattered patches with the largest stands located in Fort Hunt Park.

National Capital Parks-East Range: Stands of this type are found throughout NACE; most of the mapped areas and some of the observations of this type are at Piscataway. It has also been observed and mapped in the central area, on Shepherd Parkway, and on Suitland Parkway. Some small stands are mapped on the northern Baltimore-Washington Parkway.
Prince William Forest Park Range: Ruderal Tuliptree Forest (Typic Type) occurs on mid to lower slopes, floodplains, and in draws, on all aspects and elevations throughout Prince William Forest Park.
Rock Creek Park Range: Ruderal Tuliptree Forest (Typic Type) occurs in small patches throughout the park.
Wolf Trap National Park for the Performing Arts Range: Ruderal Tuliptree Forest (Typic Type) occurs primarily on sideslopes adjacent to floodplains on both sides of Trap Road.
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:SNA, DC:SNA, DE?:SNA, GA:SNA, KY:SNA, MD:SNA, NC:SNA, NJ:SNA, PA:SNA, SC:SNA, TN:SNA, VA:SNA, WV:SNA
TNC Ecoregions: 43:P, 44:C, 50:C, 51:C, 52:C, 58:C, 59:C, 61:C
USFS Ecoregions (2007): 221En:C??, 221Hb:CCP, 221Hc:CCC, 221He:CC?, 223Dg:CCC, 223Eb:CCC, 223Eg:CCC, 231Aa:CCP, 231Ab:CCC, 231Bc:CCC, 231Bd:CCC, 231Cd:CCP, 231Dc:CCC, 231Ha:CCC, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ad:C??, 232Ha:CC?, 232Je:C??, 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

Catoctin Mountain Park Inventory Notes: Additional data are needed to better document this type at the park.
Catoctin Mountain Park Plots: None.
Chesapeake & Ohio Canal National Historical Park Plots: None
George Washington Memorial Parkway Plots: None.
National Capital Parks-East Plots: None.
Prince William Forest Park Plots: None.
Rock Creek Park Plots: None.
Wolf Trap National Park for the Performing Arts Plots: None.
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
George Washington Memorial Parkway Description Author(s): G.P. Fleming and K. Taverna
National Capital Parks-East Description Author(s): M. Pyne
Prince William Forest Park Description Author(s): K. Taverna
Rock Creek Park Description Author(s): J. Teague
Wolf Trap National Park for the Performing Arts Description Author(s): K. Taverna
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, Sneddon et al. 2008, Southeastern Ecology Working Group n.d.*, 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* (tuliptree) 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* (tuliptree) 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* (tuliptree), other canopy species may include *Liquidambar styraciflua* (sweetgum), *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Platanus occidentalis* (American sycamore), *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Robinia pseudoacacia* (black locust), *Juglans nigra* (black walnut), *Halesia tetraptera* (mountain silverbell), *Fraxinus americana* (white ash), *Fagus grandifolia* (American beech), *Magnolia acuminata* (cucumber-tree), *Ulmus rubra* (slippery elm), *Quercus imbricaria* (shingle oak), *Quercus muehlenbergii* (chinquapin oak), and *Carya ovata* (shagbark hickory). Species often found in the subcanopy include *Acer saccharum* (sugar maple), *Cercis canadensis* (eastern redbud), *Ulmus alata* (winged elm), *Fraxinus americana* (white ash), *Morus rubra* (red mulberry), and *Cornus florida* (flowering dogwood). Shrubs include saplings of the subcanopy and canopy species, as well as *Lindera benzoin* (northern spicebush), *Symphoricarpos orbiculatus* (coralberry), *Asimina triloba* (pawpaw), *Staphylea trifolia* (American bladdernut), *Acer negundo* (box-elder), and *Juniperus virginiana var. virginiana* (eastern red-cedar). Exotic shrubs, including *Rosa multiflora* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), and *Lonicera japonica* (Japanese honeysuckle), are present at some sites. Herb-layer species include the exotics *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), and *Veronica hederifolia* (ivyleaf speedwell), as well as *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax tamnoides* (bristly greenbrier), *Actaea racemosa* (black baneberry), *Caulophyllum thalictroides* (blue cohosh), *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Hydrophyllum canadense* (bluntleaf waterleaf), *Adiantum pedatum* (northern maidenhair), *Polygonatum pubescens* (hairy Solomon's seal), *Verbesina alternifolia* (wingstem), *Amphicarpaea bracteata* (American hogpeanut), and *Polystichum acrostichoides* (Christmas fern).

Environmental Description

Antietam National Battlefield Environment: This association is a terrestrial forest typically found on mesic sites with moderately rich to rich soils that experienced logging or other disturbances sometime in the past.

Catoctin Mountain Park Environment: This forest association occurs on disturbed sites, generally on gentle to somewhat steep slopes on variable aspects, ranging from 180-430 m (600-1400 feet) in elevation. The substrate is often bouldery. Soils are moderately well-drained to well-drained loams or sandy loams. In some instances, evidence of former land use is seen in the form of old stone walls that are deteriorating. This forest type occurs most frequently on soils derived from the Catoctin Formation in the western and central portion of the park, with relatively greater representation on areas mapped as phyllite and schist. A few sites supporting this vegetation are found on the Weverton Formation in the eastern portion of the park. Leaf litter is often densely distributed on the ground surface.

Chesapeake & Ohio Canal National Historical Park Environment: This successional forest typically found on mesic sites with moderately rich to rich soils that experienced logging or other disturbances sometime in the past.

George Washington Memorial Parkway Environment: This successional forest represents regeneration on dry-mesic to mesic old fields and clearings abandoned in the early part of the twentieth century. Because of the presence of nutrient-demanding species (e.g., *Lindera benzoin* (northern spicebush), *Cercis canadensis* (eastern redbud)), it is hypothesized that this community occupies soils of moderate to high fertility. Much of the fertility may be the result of past fertilization for crop production or the contributions of livestock.

Harpers Ferry National Historical Park Environment: This successional forest represents regeneration on dry-mesic to mesic old fields abandoned in the early part of the twentieth century. Because of the presence of

nutrient-demanding species (e.g., *Lindera benzoin* (northern spicebush), *Acer saccharum* (sugar maple), *Cercis canadensis* (eastern redbud)), it is hypothesized that this community occupies soils of moderate to high fertility. Soil fertility may be the result of soils weathered from base-rich substrates, enrichment by agricultural activities, or both.
Monocacy National Battlefield Environment: This terrestrial deciduous forest is typically found on mesic sites with some disturbance history.
National Capital Parks-East Environment: This post-disturbance association tends to be found on base-rich or nutrient-rich sites. It may be found anywhere that land has been heavily impacted by agriculture or other severe disturbances and is recovering. Examples of this situation include abandoned agricultural fields and areas adjacent to former habitations, as well as along roadsides.
Rock Creek Park Environment: This tuliptree forest typically occurs in moist, well-developed, nutrient-rich soils. It typically occupies lower, concave landscape positions in uplands (not floodplains) that experienced logging or other disturbances sometime in the past. Groundwater may supply extra base minerals.
Wolf Trap National Park for the Performing Arts Environment: Ruderal Tuliptree Forest (Rich Type) is known from a single small area at Wolf Trap National Park, on a low gentle slope bordering a tributary of Wolftrap Creek.
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

Antietam National Battlefield Vegetation: *Liriodendron tulipifera* (tuliptree) is typically strongly dominant in the canopy, with a variety of mesic hardwood associates, including *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Celtis occidentalis* (common hackberry), *Quercus muehlenbergii* (chinquapin oak), *Tilia americana* (American basswood), *Carya cordiformis* (bitternut hickory), *Fagus grandifolia* (American beech), and *Acer negundo* (box-elder). Exotic shrubs and herbs may be common. Any of these species may occur in the subcanopy as well. A moderately dense to dense tall-shrub layer (2-5 m in height) of *Lindera benzoin* (northern spicebush) is characteristic of this association. *Lindera benzoin* (northern spicebush) is also common in the short-shrub layer (0.5-2 m), along with *Asimina triloba* (pawpaw) and *Rosa multiflora* (multiflora rose). The herbaceous layer can be highly variable. Exotic species such as *Lonicera japonica* (Japanese honeysuckle) and *Alliaria petiolata* (garlic mustard) can be abundant. Common native herbaceous species include *Polygonum virginianum* (jumpseed), *Arisaema triphyllum* (Jack in the pulpit), *Galium* (bedstraw) spp., and *Carex* (sedge) spp. *Parthenocissus quinquefolia* (Virginia creeper) is a common vine.
Catoctin Mountain Park Vegetation: The tree canopy of these forests is usually closed, but gaps are common as a result of wind or ice storm damage or other tree mortality. These forests are typically strongly dominated by *Liriodendron tulipifera* (tuliptree), indeed this may be the only tree in the canopy. This rapidly growing tree can attain diameters of 50 cm or more and averages 30-35 m in height. Stands are often even-aged. Tree regeneration may be minimal. Other common trees that are often codominant include *Fraxinus americana* (white ash) and *Acer rubrum* (red maple). Other canopy associates may include *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Carya glabra* (pignut hickory), *Prunus serotina* (black cherry), *Quercus rubra* (northern red oak), and *Robinia pseudoacacia* (black locust). *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Prunus serotina* (black cherry), and *Quercus rubra* (northern red oak) are also common in the subcanopy. The shrub layers are often very dense, and almost always strongly dominated by *Lindera benzoin* (northern spicebush). *Hamamelis virginiana* (American witch-hazel) is occasionally present. *Berberis thunbergii* (Japanese barberry) can attain high cover in either the short- or tall-shrub layer, or both. *Rosa multiflora* (multiflora rose) may also occur in the shrub layer. Tree species that occur sparingly in the shrub layers as saplings may include *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), and *Robinia pseudoacacia* (black locust). *Lindera benzoin* (northern spicebush) is often heavily browsed by deer, which limits this species to the short-shrub layer at many sites. The herbaceous layer

is of variable cover, most commonly characterized by *Arisaema triphyllum* (Jack in the pulpit); *Pilea pumila* (Canadian clearweed) may also occur as an associate. Other native herbaceous species may include *Geranium robertianum* (Robert's geranium), *Polystichum acrostichoides* (Christmas fern), and *Oxalis stricta* (common yellow oxalis). *Parthenocissus quinquefolia* (Virginia creeper) and *Toxicodendron radicans* (eastern poison-ivy) are characteristic vines, usually occurring in the herb layer but also extending into the tree canopy and providing significant cover. Exotic species are common and often dominate the herbaceous layer. These most frequently include *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), and *Polygonum cespitosum var. longisetum* (oriental ladysthumb). Tree regeneration is often minimal, as evidenced in the relative lack of tree saplings and seedlings, most commonly *Liriodendron tulipifera* (tuliptree) or *Fraxinus americana* (white ash).

Chesapeake & Ohio Canal National Historical Park Vegetation: Stands are dominated by *Liriodendron tulipifera* (tuliptree), canopy trees also include *Acer saccharum* (sugar maple), *Carya alba*, *Carya cordiformis* (bitternut hickory), *Quercus rubra* (northern red oak), *Quercus alba* (white oak), *Acer rubrum* (red maple), *Robinia pseudoacacia* (black locust), *Fraxinus americana* (white ash), *Fagus grandifolia* (American beech), and *Prunus serotina var. serotina.* The subcanopy additionally can include *Ulmus rubra* (slippery elm), *Ulmus americana* (American elm), *Acer rubrum* (red maple), *Nyssa sylvatica* and the exotic *Paulownia tomentosa.* Shrubs include saplings of the trees listed above but are often dominated by *Asimina triloba* and *Lindera benzoin.* Additional species in the shrub strata include *Cercis canadensis var. canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), plus several exotic plants, *Berberis thunbergii* (Japanese barberry), *Rosa multiflora* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), and *Ailanthus altissima.* Vines include *Smilax spp.*, *Parthenocissus quinquefolia* and the exotic *Lonicera japonica.* Exotic plants are also common in the herbaceous (field) stratum, these include *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop), and *Polygonum caespitosum var. longisetum.* Native herbaceous plants include *Anemone sp.*, *Arisaema triphyllum* (Jack in the pulpit), *Cardamine concatenata* (cutleaf toothwort), *Circaea lutetiana ssp canadensis*, *Dioscorea villosa* (wild yam), *Galium sp.*, *Geum sp.*, *Hackelia virginiana* (beggarslice), *Onoclea sensibilis* (sensitive fern), *Osmorhiza sp.*, *Osmunda claytoniana* (interrupted fern), *Oxalis stricta* (common yellow oxalis), *Phegopteris hexagonoptera* (broad beechfern), *Polystichum acrostichoides* (Christmas fern), *Polygonum virginianum* (jumpseed), and *Sanicula canadensis.*

George Washington Memorial Parkway Vegetation: The canopy is strongly dominated by tall, even-aged *Liriodendron tulipifera* (tuliptree). Other mesophytic trees such as *Fraxinus americana* (white ash), *Fagus grandifolia* (American beech), or *Acer rubrum* (red maple) are occasionally scattered in the overstory. On sites of low topographic position, *Platanus occidentalis* (American sycamore) and *Acer negundo* (box-elder) may be scattered associates. The subcanopy tree layers may be sparse or may be well-developed with more shade-tolerant hardwoods, especially *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Carya* (hickory) spp., and *Ulmus rubra* (slippery elm). Climbing and scrambling lianas, including *Toxicodendron radicans* (eastern poison-ivy), *Vitis* (grape) spp., *Parthenocissus quinquefolia* (Virginia creeper), and *Lonicera japonica* (Japanese honeysuckle), *Hedera helix* (English ivy), and *Celastrus orbiculatus* (oriental bittersweet) are usually common. The shrub layer varies from patchy to dense. *Lindera benzoin* (northern spicebush) is usually present and sometimes strongly dominates. Additional shrubs may include *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), *Viburnum prunifolium* (blackhaw), *Cercis canadensis* (eastern redbud), and the exotics *Lonicera maackii* (Amur honeysuckle), *Rubus phoenicolasius* (wine raspberry), and *Viburnum dilatatum* (linden arrow-wood). The herb layer frequently contains both native and exotic species. Among the latter, *Alliaria petiolata* (garlic mustard) and *Microstegium vimineum* (Nepalese browntop) may be abundant and highly invasive. Characteristic native herbs include *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Galium aparine* (stickywilly), *Polystichum acrostichoides* (Christmas fern), and *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley).

This association is a long-lived successional type, owing to the fast growth and longevity of the dominant *Liriodendron tulipifera* (tuliptree). Over time, the dominant canopy trees tend to develop widely spreading crowns that make them susceptible to windthrow, providing opportunities for release of more tolerant hardwoods in the understory.

Harpers Ferry National Historical Park Vegetation: The canopy is strongly dominated by tall, even-aged *Liriodendron tulipifera* (tuliptree). Other mesophytic trees such as *Fraxinus americana* (white ash), *Carya cordiformis* (bitternut hickory), *Acer saccharum* (sugar maple), or *Acer rubrum* (red maple) are occasionally scattered in the overstory. On sites of low topographic position, *Platanus occidentalis* (American sycamore) and *Acer negundo* (box-elder) may be scattered associates. The subcanopy tree layers may be sparse or may be well-developed with more shade-tolerant hardwoods, especially *Fagus grandifolia* (American beech), *Fraxinus*

americana (white ash), *Carya* (hickory) spp., and *Ulmus rubra* (slippery elm). Climbing and scrambling lianas, including *Toxicodendron radicans* (eastern poison-ivy), *Vitis* (grape) spp., *Parthenocissus quinquefolia* (Virginia creeper), and *Lonicera japonica* (Japanese honeysuckle), are usually common. The shrub layer varies from patchy to dense. *Lindera benzoin* (northern spicebush) is usually present and often strongly dominates. Additional shrubs may include *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), *Viburnum prunifolium* (blackhaw), *Cercis canadensis* (eastern redbud), and the exotics *Lonicera maackii* (Amur honeysuckle), *Rubus phoenicolasius* (wine raspberry), and *Viburnum dilatatum* (linden arrow-wood). The herb layer frequently contains both native and exotic species. Among the latter, *Alliaria petiolata* (garlic mustard) and *Microstegium vimineum* (Nepalese browntop) may be abundant and highly invasive. Characteristic native herbs include *Osmorhiza claytonii* (Clayton's sweetroot), *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Galium aparine* (stickywilly), *Polystichum acrostichoides* (Christmas fern), and *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley).

Monocacy National Battlefield Vegetation: *Liriodendron tulipifera* (tuliptree) is typically strongly dominant in the canopy, with a variety of mesic hardwood associates, including *Fraxinus americana* (white ash), *Platanus occidentalis* (American sycamore), *Fagus grandifolia* (American beech), *Acer negundo* (box-elder), *Juglans nigra* (black walnut), *Celtis occidentalis* (common hackberry), *Carya cordiformis* (bitternut hickory), *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Ulmus americana* (American elm), and *Quercus* (oak) spp. The canopy extends from 15-20 m in height with approximately 75% cover. The sparse subcanopy (20-40%) is variable and extends from 6-12 m in height. Any of the canopy species listed above can be present, although *Acer negundo* (box-elder) is a common subcanopy species. A moderately dense to dense tall-shrub layer (2-5 m) of *Lindera benzoin* (northern spicebush) is characteristic of this association. *Lindera benzoin* (northern spicebush) is also common in the short-shrub layer (0.5-2 m), along with *Asimina triloba* (pawpaw) and *Rosa multiflora* (multiflora rose). The herbaceous layer can be highly variable. Exotic species such as *Microstegium vimineum* (Nepalese browntop), *Lonicera japonica* (Japanese honeysuckle), and *Alliaria petiolata* (garlic mustard) can be abundant. Common native herbaceous species include *Polygonum virginianum* (jumpseed), *Boehmeria cylindrica* (small-spike false nettle), *Laportea canadensis* (Canadian woodnettle), *Arisaema triphyllum* (Jack in the pulpit), *Phytolacca americana* (American pokeweed), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Galium* (bedstraw) spp., and *Carex* (sedge) spp. *Parthenocissus quinquefolia* (Virginia creeper) is a common vine.

National Capital Parks-East Vegetation: Stands of this type are dominated by *Liriodendron tulipifera* (tuliptree), sometimes strongly so. The limited floristic data available for NACE indicate that the canopy also contains *Acer rubrum* (red maple), *Fraxinus americana* (white ash), and *Platanus occidentalis* (American sycamore). The subcanopy may contain these species as well as some combination of *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Liquidambar styraciflua* (sweetgum), *Robinia pseudoacacia* (black locust), and *Sassafras albidum* (sassafras). Shrubs may include *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Ilex opaca var. opaca* (American holly), and *Lindera benzoin* (northern spicebush). Herbs include *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), *Boehmeria cylindrica* (small-spike false nettle), *Polystichum acrostichoides* (Christmas fern), and the exotics *Alliaria petiolata* (garlic mustard) and *Microstegium vimineum* (Nepalese browntop). These are typically early-successional, young stands.

Rock Creek Park Vegetation: At Rock Creek Park, the canopy of this forest is often dominated by large-diameter, towering *Liriodendron tulipifera* (tuliptree). The understory of this mesic forest is often lush, containing *Lindera benzoin* (northern spicebush) and various herbs. These forests tend to be heavily invaded by non-native plant species. As older *Liriodendron tulipifera* (tuliptree) trees die out, *Fagus grandifolia* (American beech), *Quercus rubra* (northern red oak), and *Quercus alba* (white oak) might be predicted to replace them. However, since some *Liriodendron tulipifera* (tuliptree) specimens have reportedly lived to be 300+ years old, it could be a long time before these stands of pure *Liriodendron tulipifera* (tuliptree) give way to a mix of tree species, unless storms or other disturbances bring down mature trees (G. Fleming pers. comm. 2008).

Wolf Trap National Park for the Performing Arts Vegetation: See Global Vegetation.

Global Vegetation: Stands are dominated by *Liriodendron tulipifera* (tuliptree) but also include various other species, including ones indicative of nutrient-rich or circumneutral environments. Other species include *Liquidambar styraciflua* (sweetgum), *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Platanus occidentalis* (American sycamore), *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Robinia pseudoacacia* (black locust), *Juglans nigra* (black walnut), *Halesia tetraptera* (mountain silverbell), *Fraxinus americana* (white ash), *Fagus grandifolia* (American beech), *Magnolia acuminata* (cucumber-tree), *Ulmus rubra* (slippery elm), *Quercus imbricaria* (shingle oak), *Quercus muehlenbergii* (chinquapin oak), and *Carya ovata* (shagbark hickory) (NatureServe Ecology unpubl. data, VDNH unpubl. data, WVNHP unpubl. data.). Species often

found in the subcanopy include *Acer saccharum* (sugar maple), *Cercis canadensis* (eastern redbud), *Ulmus alata* (winged elm), *Morus rubra* (red mulberry), *Sassafras albidum* (sassafras), and *Cornus florida* (flowering dogwood). *Cercis canadensis* (eastern redbud) is often abundant on soils underlain by carbonate strata. Shrubs include saplings of the subcanopy and canopy species, as well as *Symphoricarpos orbiculatus* (coralberry), *Lindera benzoin* (northern spicebush), *Asimina triloba* (pawpaw), and *Juniperus virginiana var. virginiana* (eastern red-cedar). *Lindera benzoin* (northern spicebush) 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* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), and *Lonicera japonica* (Japanese honeysuckle), are present at some sites. Vines, which may be abundant, include *Aristolochia macrophylla* (pipevine), *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax tamnoides* (bristly greenbrier), and *Vitis aestivalis var. bicolor* (summer grape). Herbaceous species include the exotics *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), and *Veronica hederifolia* (ivyleaf speedwell), as well as *Actaea racemosa* (black baneberry), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), *Caulophyllum thalictroides* (blue cohosh), *Cryptotaenia canadensis* (Canadian honewort), *Galium triflorum* (fragrant bedstraw), *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Hydrophyllum canadense* (bluntleaf waterleaf), *Osmorhiza longistylis* (longstyle sweetroot), *Adiantum pedatum* (northern maidenhair), *Polygonatum pubescens* (hairy Solomon's seal), *Polystichum acrostichoides* (Christmas fern), *Verbesina alternifolia* (wingstem), *Amphicarpaea bracteata* (American hogpeanut), *Solidago caesia* (wreath goldenrod), and *Polystichum acrostichoides* (Christmas fern). (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* (sugarberry) and *Juglans nigra* (black walnut).

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

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera* (tuliptree)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree)

Catoctin Mountain Park: *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Arisaema triphyllum* (Jack in the pulpit), *Carya glabra* (pignut hickory), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Oxalis stricta* (common yellow oxalis), *Pilea pumila* (Canadian clearweed), *Polystichum acrostichoides* (Christmas fern), *Prunus serotina* (black cherry), *Quercus rubra* (northern red oak), *Robinia pseudoacacia* (black locust), *Toxicodendron radicans* (eastern poison-ivy)

Chesapeake & Ohio Canal National Historical Park: *Asimina triloba* (pawpaw), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree)

George Washington Memorial Parkway: *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Toxicodendron radicans* (eastern poison-ivy)

Harpers Ferry National Historical Park: *Liriodendron tulipifera* (tuliptree), *Parthenocissus quinquefolia* (Virginia creeper)

Monocacy National Battlefield: *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree)

National Capital Parks-East: *Arisaema triphyllum* (Jack in the pulpit), *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Ilex opaca* var. *opaca* (American holly), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Polystichum acrostichoides* (Christmas fern)

Rock Creek Park: *Arisaema triphyllum* (Jack in the pulpit), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Polystichum acrostichoides* (Christmas fern)

Wolf Trap National Park for the Performing Arts: *Acer rubrum* (red maple), *Circaea lutetiana* ssp. *canadensis* (broadleaf enchanter's nightshade), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Toxicodendron radicans* (eastern poison-ivy)

Global: *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Aristolochia macrophylla* (pipevine), *Asarum canadense* (Canadian

wildginger), *Asimina triloba* (pawpaw), *Carya ovata* (shagbark hickory), *Cercis canadensis* (eastern redbud), *Cryptotaenia canadensis* (Canadian honewort), *Galium triflorum* (fragrant bedstraw), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Osmorhiza longistylis* (longstyle sweetroot), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Toxicodendron radicans* (eastern poison-ivy), *Ulmus rubra* (slippery elm)

OTHER NOTEWORTHY SPECIES

Antietam National Battlefield: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Catoctin Mountain Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low)
Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Paulownia tomentosa* (princesstree, Medium/Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium)
George Washington Memorial Parkway: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Monocacy National Battlefield: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
National Capital Parks-East: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Rock Creek Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Wolf Trap National Park for the Performing Arts: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium)
Global: Vulnerable Plants: *Cardamine clematitis* (small mountain bittercress, G3), *Panax quinquefolius* (American ginseng, G3G4, under collection pressure), *Penstemon smallii* (Small's beardtongue, G3), *Schisandra glabra* (bay starvine, G3), *Scutellaria saxatilis* (smooth rock skullcap, G3G4); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Veronica hederifolia* (ivyleaf speedwell); **Other Plants**: *Trillium rugelii* (illscented wakerobin, G4)

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.

Global Related Concepts:

- *Liriodendron tulipifera / Lindera benzoin* Forest (Lea 2000) **<**
- *Liriodendron tulipifera / Lindera benzoin* Successional Forest (Young et al. 2007a) **=**
- Oak-Hickory Association of the Western Shore District (Shreve et al. 1910) **>**
- Successional forest of low-elevation plateaus (Vanderhorst 2001a) **>**
- Tulip Poplar Type (Schmalzer and DeSelm 1982) **>**
- Yellow Poplar - Sugar Maple - Cucumber (Rentch et al. 2005) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Catoctin Mountain Park Classification Comments: This community often occurs in association with, or as an inclusion within, High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125). It appears that Ruderal Tuliptree Forest (Rich Type) (CEGL007220) may be transitioning to High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125). It is sometimes difficult to distinguish between the two associations, in particular when Ruderal Tuliptree Forest (Rich Type) supports somewhat higher tree diversity, and a higher cover of *Acer saccharum* (sugar maple) than average stands of this type. Ruderal Tuliptree Forest (Rich Type) is also referred to as Successional Tuliptree Forest (Rich Type).
George Washington Memorial Parkway Classification Comments: Over time, Ruderal Tuliptree Forest (Rich Type) probably most often succeeds to Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest (CEGL006055) as the stand becomes more mixed. Stands on somewhat less fertile sites may succeed to Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075). Ruderal Tuliptree Forest (Rich Type) is distinguished from Ruderal Tuliptree Forest (Typic Type) (CEGL007221) by its association with more mesic habitats and its component of nutrient-demanding species such as *Lindera benzoin* (northern spicebush) and *Cercis canadensis* (eastern redbud). Ruderal Tuliptree Forest (Rich Type) is also referred to as Successional Tuliptree Forest (Rich Type).
Harpers Ferry National Historical Park Classification Comments: Over time, Ruderal Tuliptree Forest (Rich Type) probably most often succeeds to Southern Appalachian Rich Cove Forest (Typic Type) (CEGL007710) as the stand becomes more mixed. A number of species occur in both types, and it is distinguished from Southern Appalachian Rich Cove Forest (Typic Type) by the dominance of tall, even-aged *Liriodendron tulipifera* (tuliptree) in the canopy and weedier shrub and herb layers. Ruderal Tuliptree Forest (Rich Type) is also referred to as Successional Tuliptree Forest (Rich Type).
National Capital Parks-East Classification Comments: Ruderal Tuliptree Forest (Rich Type) is also referred to as Successional Tuliptree Forest (Rich Type). There seems to be some uncertainty in the assignment of observation points to this type, in relation to Upper Southeast Sweetgum - Tuliptree Small Stream Forest (CEGL004418), as well as Ruderal Virginia Pine Forest (CEGL002591), Mid-Atlantic Mesic Mixed Hardwood Forest (CEGL006075), Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest (CEGL006919), and Ruderal Sweetgum Forest (CEGL007216). This is at least partly due to the nature of observation point data, in that it may lack relative cover values, even if these data points may contain robust species lists.
Rock Creek Park Classification Comments: Ruderal Tuliptree Forest (Rich Type) is also referred to as Successional Tuliptree Forest (Rich Type). The successional nature of this natural community is evidenced by the even-aged stand of *Liriodendron tulipifera* (tuliptree). At Rock Creek Park, after a forest has been cleared, if *Liriodendron tulipifera* (tuliptree) seeds are present in the seed bank or are blown in by the wind from nearby trees, they are quick to germinate, often making *Liriodendron tulipifera* (tuliptree) among the first trees to come back on moist soil, shading out slower-germinating competitors for sunlight. An even-aged stand of pure *Liriodendron tulipifera* (tuliptree), therefore, is evidence of forest regrowth from some past major disturbance such as an historic agricultural clearing. Upwards of a century has passed since the soil disturbance that created most examples of this semi-natural forest and the regrown forest appears quite majestic in some areas today.
Wolf Trap National Park for the Performing Arts Classification Comments: Ruderal Tuliptree Forest (Rich Type) is similar to Ruderal Tuliptree Forest (Typic Type) (CEGL007221) but can be distinguished by the common occurrence of the nutrient-demanding *Lindera benzoin* (northern spicebush) in the tall-shrub layer. It is also similar to Northern Piedmont Small Stream Floodplain Forest (CEGL006492) but occurs on uplands rather than floodplains, and has a more monospecific canopy of *Liriodendron tulipifera* (tuliptree). Ruderal Tuliptree Forest (Rich Type) (CEGL007220) is also referred to as Successional Tuliptree Forest (Rich Type).
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

Antietam National Battlefield Range: This association occurs primarily in the Snavely's Woods section of the park.
Catoctin Mountain Park Range: Ruderal Tuliptree Forest (Rich Type) is fairly widespread within the park, occurring most frequently in the central and western portions of the park underlain by the Catoctin Formation.
Chesapeake & Ohio Canal National Historical Park Range: Patches of this association are scattered throughout the park.
George Washington Memorial Parkway Range: Patches of this association are scattered throughout the George Washington Memorial Parkway, primarily in gentler topography of uplands removed from the Potomac River.
Harpers Ferry National Historical Park Range: Patches of this association are scattered throughout the park, primarily in gentler topography of uplands removed from the Potomac and Shenandoah rivers.
Monocacy National Battlefield Range: This association occurs on terraces along small tributaries to the Monocacy River and mesic toeslopes in the Brooks Hill area.
National Capital Parks-East Range: Stands of this type are found throughout NACE; most of the mapped areas and some of the observations of this type are at Fort Washington and at Piscataway. It has also been observed and mapped in the central area, at Oxon Hill Farm, and at Fort Foote. The overwhelming majority of the mapped areas are south of the Anacoastia River, primarily at Piscataway.
Rock Creek Park Range: This *Liriodendron tulipifera* (tuliptree)-dominated community can be found occasionally throughout the park on somewhat moist, well-developed soils. It typically occupies lower, concave landscape positions in uplands (not floodplains).
Wolf Trap National Park for the Performing Arts Range: Ruderal Tuliptree Forest (Rich Type) is known from a single small area at Wolf Trap National Park, on a low gentle slope just west of the maintenance building and parking lot adjacent to the Dulles Toll Road.
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:SNA, DC:SNA, DE:SNA, GA:SNA, KY:SNA, MD:SNA, MS:SNA, NY:SNA, PA:SNA, TN:SNA, VA:SNA, WV:SNA
TNC Ecoregions: 43:C, 44:C, 50:C, 51:C, 52:C, 58:C, 59:C
USFS Ecoregions (2007): 221Dd:CCC, 221De:CCC, 221Hc:CCC, 221He:CC?, 221Jb:CCC, 223Dg:CCC, 223Dj:CCC, 223Eg:CCC, 231Bd:CCC, 231Ic: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

Antietam National Battlefield Plots: None.
Catoctin Mountain Park Plots: CATO.14, CATO.16, CATO.28.
Chesapeake & Ohio Canal National Historical Park Plots: None
George Washington Memorial Parkway Plots: None.
Harpers Ferry National Historical Park Plots: None.
Monocacy National Battlefield Plots: None.
National Capital Parks-East Plots: None.
Rock Creek Park Plots: None.
Wolf Trap National Park for the Performing Arts Plots: None.
Antietam National Battlefield Description Author(s): S. Perles
Catoctin Mountain Park Description Author(s): L. Sneddon

Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Harpers Ferry National Historical Park Description Author(s): G. Fleming and K. Taverna
Monocacy National Battlefield Description Author(s): S. Perles
National Capital Parks-East Description Author(s): M. Pyne
Rock Creek Park Description Author(s): J. Teague
Wolf Trap National Park for the Performing Arts Description Author(s): G. Fleming
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 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., Vanderhorst 2001a, Vanderhorst et al. 2007, Vanderhorst et al. 2008, White 2005, White 2006, Young et al. 2006, Young et al. 2007a, Young et al. 2009

[CEGL007281] *Robinia pseudoacacia - Celtis occidentalis - (Fraxinus americana, Liriodendron tulipifera)* Ruderal Forest

Translated Name: **Black Locust - Common Hackberry - (White Ash, Tuliptree) Ruderal Forest**
Common Name: **Ruderal Black Locust Calcareous 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: A dry-mesic to mesic successional slope forest of the Ridge and Valley, with *Robinia pseudoacacia* (black locust) (up to 50%) and *Celtis occidentalis* (common hackberry) (5-50%) making up most of the total canopy cover; *Fraxinus americana* (white ash) or *Liriodendron tulipifera* (tuliptree) may contribute 1-75% of the total canopy cover. Other common canopy species are *Acer saccharum* (sugar maple) and *Ulmus rubra* (slippery elm). The subcanopy is typically dominated by *Acer saccharum* (sugar maple) and *Asimina triloba* (pawpaw). This differs from the Ruderal Black Locust Forest (CEGL007279) in having a more mixed canopy, in occurring over calcareous substrates, and in having calciphilic species. This successional forest is found on calcareous shale ridges and knobs, and at least some stands are thought to have resulted from clearcutting.

Environmental Description

Antietam National Battlefield Environment: These forests are common in woodlots, fencerows, surrounding agricultural fields and other disturbed areas of the park.
Chesapeake & Ohio Canal National Historical Park Environment: This ruderal community occurs on dry-mesic to mesic slopes in the Ridge and Valley ecoregion.
Monocacy National Battlefield Environment: These forests are common in woodlots, fencerows, surrounding agricultural fields and other disturbed areas of the park

Vegetation Description

Antietam National Battlefield Vegetation: *Robinia pseudoacacia* (black locust) comprises less than 50% of the canopy and is codominant with one of more of the following species: *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Prunus* (plum) spp., *Ailanthus altissima* (tree of heaven), *Acer rubrum* (red maple), *Acer negundo* (box-elder), *Juniperus virginiana* (eastern red-cedar), and/or *Juglans nigra* (black walnut). Exotic invasive species can be common or abundant in the shrub and herbaceous layers. *Rosa multiflora* (multiflora rose), *Lonicera morrowii* (Morrow's honeysuckle), or *Lonicera tatarica* (Tatarian honeysuckle) can be abundant in the tall- or short-shrub layers. *Rubus* (blackberry) spp. are also common short shrubs. In the herbaceous layer, *Alliaria petiolata* (garlic mustard), *Lonicera japonica* (Japanese honeysuckle), *Duchesnea indica* (Indian strawberry), *Polygonum virginianum* (jumpseed), *Galium aparine* (stickywilly), and *Ageratina altissima* (white snakeroot) are typical. Vines such as *Parthenocissus quinquefolia* (Virginia creeper) and *Vitis* (grape) spp. can be abundant in all or some strata of the stand.
Chesapeake & Ohio Canal National Historical Park Vegetation: See Global Vegetation.

Monocacy National Battlefield Vegetation: *Robinia pseudoacacia* (black locust) is the dominant canopy species, however, it comprises less than 50% of the canopy and is codominant with one of more of the following species: *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Prunus* (plum) spp., *Acer negundo* (box-elder), *Celtis occidentalis* (common hackberry), *Ailanthus altissima* (tree of heaven), and/or *Acer rubrum* (red maple). The canopy extends from 15-20 m in height with 70-80% cover. The moderately sparse subcanopy (20-40%) ranges in height from 6-12 m and contains one or more of the canopy species, typically *Acer negundo* (box-elder) and *Ailanthus altissima* (tree of heaven). Exotic invasive species can be common or abundant in the shrub and herbaceous layers. *Rosa multiflora* (multiflora rose), *Lonicera morrowii* (Morrow's honeysuckle), or *Berberis thunbergii* (Japanese barberry) can be abundant in the sparse short-shrub layer (5-10%). *Rubus* (blackberry) spp. are also common short shrubs. In the herbaceous layer, *Alliaria petiolata* (garlic mustard), *Lonicera japonica* (Japanese honeysuckle), *Glechoma hederacea* (ground ivy), *Duchesnea indica* (Indian strawberry), *Polygonum virginianum* (jumpseed), *Galium aparine* (stickywilly), and *Ageratina altissima* (white snakeroot) are typical. Vines such as *Parthenocissus quinquefolia* (Virginia creeper) and *Vitis* (grape) spp. can be abundant in all or some strata of the stand.
Global Vegetation: Stands of this successional forest are dominated by *Robinia pseudoacacia* (black locust) (up to 50%) and *Celtis occidentalis* (common hackberry) (5-50%), which make up most of the total canopy cover. In addition, *Fraxinus americana* (white ash) or *Liriodendron tulipifera* (tuliptree) may contribute 1-75% of the total canopy cover. Other common canopy species are *Acer saccharum* (sugar maple) and *Ulmus rubra* (slippery elm). The subcanopy is typically dominated by *Acer saccharum* (sugar maple) and *Asimina triloba* (pawpaw).
Global Dynamics: This successional forest is found on calcareous shale ridges and knobs, and at least some stands are thought to have resulted from clearcutting (Andreu and Tukman 1995).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Celtis occidentalis* (common hackberry), *Robinia pseudoacacia* (black locust)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Acer negundo* (box-elder), *Acer rubrum* (red maple), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Prunus* spp., *Robinia pseudoacacia* (black locust)
Chesapeake & Ohio Canal National Historical Park: *Acer negundo* (box-elder), *Acer rubrum* (red maple), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Prunus* spp., *Robinia pseudoacacia* (black locust)
Monocacy National Battlefield: *Acer negundo* (box-elder), *Acer rubrum* (red maple), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Robinia pseudoacacia* (black locust)
Global: *Celtis occidentalis* (common hackberry), *Robinia pseudoacacia* (black locust)

OTHER NOTEWORTHY SPECIES

Antietam National Battlefield: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Lonicera tatarica* (Tatarian honeysuckle, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Lonicera tatarica* (Tatarian honeysuckle, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Monocacy National Battlefield: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (14-May-2001). Examples of this association are successional forests composed of species native to North America. Grank changed from GW to GD 2001-05-14.

RELATED CONCEPTS

Global Similar Types:

- *Celtis (laevigata, occidentalis) - Ulmus* spp. - (*Aesculus glabra*) Ruderal Forest (CEGL004697) of central Tennessee.
- *Juglans nigra - Celtis occidentalis* Ruderal Forest (CEGL004693) of Interior Low Plateau Kentucky.
- *Robinia pseudoacacia* Ruderal Forest (CEGL007279)

Global Related Concepts:

- *Robinia pseudoacacia - Celtis occidentalis - Fraxinus americana* (Andreu and Tukman 1995) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Antietam National Battlefield Classification Comments: Ruderal Black Locust Calcareous Forest (sometimes referred to as Calcareous Black Locust Successional Forest) is distinguished from Ruderal Black Locust Forest (CEGL007279) by having less than 50% cover of *Robinia pseudoacacia* (black locust) in the canopy, with other species listed above as codominant. In CEGL007279, *Robinia pseudoacacia* (black locust) comprises at least 50%, and typically greater than 75% of the canopy. This association may be mapped as part of the Successional Mixed Deciduous Forest Map Class (COMP_SDMF), which at this park includes three associations, Ruderal Tree-of-Heaven Forest (CEGL007191), Ruderal Black Locust Forest (CEGL007279), and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to other undescribed successional forests.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Ruderal Black Locust Calcareous Forest (also referred to as Calcareous Black Locust Successional Forest) is sometimes mapped individually but is usually mapped as part of the Successional Mixed Deciduous Forest Map Class (COMP_SDMF), which at this park includes four associations, Northeastern Ruderal Hardwood Forest (CEGL006599), Ruderal Tree-of-Heaven Forest (CEGL007191), Ruderal Black Locust Forest (CEGL007279), and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to undescribed ruderal vegetation.
Monocacy National Battlefield Classification Comments: Ruderal Black Locust Calcareous Forest (sometimes referred to as Calcareous Black Locust Successional Forest) may be mapped as part of the Successional Mixed Deciduous Forest Map Class (COMP_SDMF), which at this park includes two associations, Northeastern Ruderal Hardwood Forest (CEGL006599) and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to other undescribed successional forests.
Global Classification Comments: This association is described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County; 43 stands sampled), where this successional forest is found on calcareous shale ridges and knobs, and at least some stands are thought to have resulted from clearcutting (Andreu and Tukman 1995).

ELEMENT DISTRIBUTION

Antietam National Battlefield Range: This association occurs in woodlots, fencerows, surrounding agricultural fields and other disturbed areas, mostly in the northern section of the park.
Chesapeake & Ohio Canal National Historical Park Range: This association is mapped as Successional Mixed Deciduous Forest Map Class (COMP_SDMF) at many locations along the length of Chesapeake & Ohio Canal.
Monocacy National Battlefield Range: This association occurs in woodlots, fencerows, surrounding agricultural fields and other disturbed areas of the park.
Global Range: This forest occurs in the Ridge and Valley physiographic province of the southeastern United States, and possibly in the adjacent Southern Blue Ridge.
Nations: US
States/Provinces: MD:SNA, TN:SNA, VA:SNA, WV:SNA
TNC Ecoregions: 50:C, 51:P, 52:C, 59:C, 61:C
USFS Ecoregions (2007): 221J:CC
Federal Lands: NPS (Antietam, C&O Canal, Chickamauga-Chattanooga?, Monocacy); TVA (Tellico); USFS (Cherokee?); USFWS (National Conservation Training Center)

ELEMENT SOURCES

Antietam National Battlefield Plots: None.

Chesapeake & Ohio Canal National Historical Park Plots: None.
Monocacy National Battlefield Plots: None.
Antietam National Battlefield Description Author(s): S. Perles
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
Monocacy National Battlefield Description Author(s): S. Perles
Global Description Author(s): M. Andreu and M. Tukman
References: Andreu and Tukman 1995, Andreu and Tukman 1995*, Southeastern Ecology Working Group n.d.

[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* (black locust) to stabilize and enrich nutrient-poor soils that are subject to erosion. The vegetation is dominated by *Robinia pseudoacacia* (black locust). Associated woody species vary from site to site and include *Prunus serotina* (black cherry), *Juniperus virginiana* (eastern red-cedar), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Carya ovata* (shagbark hickory), *Celtis occidentalis* (common hackberry), *Juglans nigra* (black walnut), *Quercus rubra* (northern red oak), *Ulmus rubra* (slippery elm), and in some areas *Acer platanoides* (Norway maple) or *Ailanthus altissima* (tree of heaven). Understory vegetation is highly variable depending on site history and often includes *Toxicodendron radicans* (eastern poison-ivy); *Lindera benzoin* (northern spicebush) is sometimes present. The invasive non-native *Rosa multiflora* (multiflora rose) may be present as a shrub, along with the non-native bramble *Rubus phoenicolasius* (wine raspberry). Non-native species such as *Alliaria petiolata* (garlic mustard), *Chelidonium majus* (celandine), *Glechoma hederacea* (ground ivy), and *Convallaria majalis* (European lily-of-the-valley) can characterize the herb layer, which may also have a native component.

Environmental Description

Antietam National Battlefield Environment: These forests are common in woodlots, fencerows, surrounding agricultural fields and other disturbed areas of the park.
Catoctin Mountain Park Environment: This successional forest represents regeneration on disturbed sites.
Chesapeake & Ohio Canal National Historical Park Environment: This successional forest represents regeneration on disturbed sites.
National Capital Parks-East Environment: This post-disturbance association may be found anywhere that land has been heavily impacted by agriculture or other severe disturbances and is recovering. Examples of this situation include abandoned agricultural fields and areas adjacent to former habitations, as well as along roadsides. Sometimes, *Robinia pseudoacacia* (black locust) is planted to stabilize and enrich nutrient-poor soils that are subject to erosion, and this type may become established under those conditions.
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* (black locust) 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

Antietam National Battlefield Vegetation: *Robinia pseudoacacia* (black locust) comprises 50% or greater of the canopy, typically greater than 75%. *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Prunus* (plum) spp., *Ailanthus altissima* (tree of heaven), *Acer rubrum* (red maple), *Acer negundo* (box-elder),

and/or *Juglans nigra* (black walnut) can be occasionally present. Exotic invasive species can be common or abundant in the short-shrub and herbaceous layers. Vines can be abundant in all or some strata of the stand.
Catoctin Mountain Park Vegetation: The vegetation is dominated by *Robinia pseudoacacia* (black locust) (black locust).
Chesapeake & Ohio Canal National Historical Park Vegetation: The vegetation is dominated by *Robinia pseudoacacia* (black locust) (black locust).
National Capital Parks-East Vegetation: Stands of this vegetation type are dominated by *Robinia pseudoacacia* (black locust) forming a partial to nearly complete canopy. Associated woody species vary from site to site.
Global Vegetation: The vegetation is dominated by *Robinia pseudoacacia* (black locust) forming a partial to nearly complete canopy. Associated woody species vary from site to site and include *Prunus serotina* (black cherry), *Juniperus virginiana* (eastern red-cedar), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Carya ovata* (shagbark hickory), *Celtis occidentalis* (common hackberry), *Juglans nigra* (black walnut), *Quercus rubra* (northern red oak), *Ulmus rubra* (slippery elm), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and in some areas *Acer platanoides* (Norway maple) or *Ailanthus altissima* (tree of heaven). In addition, *Cornus florida* (flowering dogwood) may be present in the subcanopy. Understory vegetation is highly variable depending on site history and often includes *Toxicodendron radicans* (eastern poison-ivy); *Lindera benzoin* (northern spicebush) is sometimes present. The invasive non-natives *Rosa multiflora* (multiflora rose) and *Elaeagnus umbellata* (autumn olive) are typically the most common shrubs, along with the non-native bramble *Rubus phoenicolasius* (wine raspberry). Non-native species such as *Alliaria petiolata* (garlic mustard), *Chelidonium majus* (celandine), *Glechoma hederacea* (ground ivy), *Dactylis glomerata* (orchardgrass), *Daucus carota* (Queen Anne's lace), and *Convallaria majalis* (European lily-of-the-valley) can characterize the herb layer, which may have a native component as well, for example with (depending on geography) *Ageratina altissima* (white snakeroot), *Dichanthelium clandestinum* (deertongue), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Leersia virginica* (whitegrass), *Parthenocissus quinquefolia* (Virginia creeper), *Pilea pumila* (Canadian clearweed), *Solidago canadensis* (Canada goldenrod), *Solidago rugosa* (wrinkleleaf goldenrod), *Verbesina alternifolia* (wingstem), *Verbesina occidentalis* (yellow crownbeard), and *Viola* (violet) spp.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Robinia pseudoacacia* (black locust)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Robinia pseudoacacia* (black locust)
Catoctin Mountain Park: *Robinia pseudoacacia* (black locust)
Chesapeake & Ohio Canal National Historical Park: *Robinia pseudoacacia* (black locust)
National Capital Parks-East: *Robinia pseudoacacia* (black locust)
Global: *Acer rubrum* (red maple), *Robinia pseudoacacia* (black locust), *Rosa multiflora* (multiflora rose)

OTHER NOTEWORTHY SPECIES

Antietam National Battlefield: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium)
Catoctin Mountain Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium)
Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium)
National Capital Parks-East: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium)
Global: Invasive/Exotic Plants: *Acer platanoides* (Norway maple, High/Medium), *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Chelidonium majus* (celandine, Medium/Insignificant), *Convallaria majalis* (European lily-of-the-valley), *Dactylis glomerata* (orchardgrass, Medium/Insignificant), *Daucus carota* (Queen Anne's lace, Low), *Elaeagnus umbellata* (autumn olive, High), *Glechoma hederacea* (ground ivy, Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (24-Oct-2002). Although *Robinia pseudoacacia* (black locust) 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* (locust) 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)

Global Related Concepts:

- *Juglans nigra - Robinia pseudoacacia / Lonicera japonica / Verbesina alternifolia* Association (Rawinski et al. 1996) **?**
- Successional black locust disturbed forests (CAP pers. comm. 1998) **?**
- Successional communities (Ehrenfeld 1977) **>**

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Antietam National Battlefield Classification Comments: Ruderal Black Locust Forest (CEGL007279) (sometimes referred to as Successional Black Locust Forest) is distinguished from Ruderal Black Locust Calcareous Forest (CEGL007281) by the strong dominance of *Robinia pseudoacacia* (black locust), comprising at least 50%, and typically greater than 75%, of the canopy. (In CEGL007281, *Robinia pseudoacacia* (black locust) is codominant with one or more other species and does not comprise greater than 50% of the canopy.) This association is part of the Successional Mixed Deciduous Forest Map Class (COMP_SMDF), which includes four associations, Northeastern Ruderal Hardwood Forest (CEGL006599), Ruderal Tree-of-Heaven Forest (CEGL007191), Ruderal Black Locust Forest (CEGL007279), and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to undescribed ruderal vegetation.

Catoctin Mountain Park Classification Comments: Ruderal Black Locust Forest (CEGL007279) (sometimes referred to as Successional Black Locust Forest) is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF), which at this park includes two associations, Northeastern Ruderal Hardwood Forest (CEGL006599) and Ruderal Black Locust Forest (CEGL007279), in addition to undescribed ruderal vegetation.

Chesapeake & Ohio Canal National Historical Park Classification Comments: Ruderal Black Locust Forest (CEGL007279) (sometimes referred to as Successional Black Locust Forest) is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF), which at this park includes four associations, Northeastern Ruderal Hardwood Forest (CEGL006599), Ruderal Tree-of-Heaven Forest (CEGL007191), Ruderal Black Locust Forest (CEGL007279), and Ruderal Black Locust Calcareous Forest (CEGL007281) in addition to undescribed ruderal vegetation.

National Capital Parks-East Classification Comments: Ruderal Black Locust Forest (CEGL007279) (sometimes referred to as Successional Black Locust Forest) is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF), which at this park includes two associations, Northeastern Ruderal Hardwood Forest (CEGL006599) and Ruderal Black Locust Forest (CEGL007279), in addition to undescribed ruderal vegetation.

Element Distribution

Antietam National Battlefield Range: This association occurs in woodlots, fencerows, surrounding agricultural fields and other disturbed areas of the park. This association has been observed at Antietam National Battlefield. It is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF) which is mapped at several locations in the park. Some of these locations may represent this community.

Catoctin Mountain Park Range: This association has been observed at the park. It is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF) which is mapped at several locations in the park. Some of these locations may represent this community.

Chesapeake & Ohio Canal National Historical Park Range: This association has been observed at the park. It is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF) which is mapped at many locations along the length of Chesapeake & Ohio Canal. Some of these locations may represent this community

National Capital Parks-East Range: This association has been observed at National Capital Parks East. It is included in the Successional Mixed Deciduous Forest Map Class (COMP_SDMF) which is mapped at several locations in the park. Some of these locations may represent this community.
Global Range: This black locust ruderal forest is found locally throughout the eastern United States.
Nations: US
States/Provinces: AR:SNA, DC?:SNA, DE:SNA, IA:SNA, KY:SNA, MA:SNA, MD:SNA, MS:SNA, NC:SNA, NJ:SNA, NY:SNA, OH:SNA, OK:SNA, PA:SNA, TN:SNA, VA:SNA, VT:SNA, WV:SNA
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 (2007): 221Aa:CC?, 221Ab:CCC, 221Ae:CCC, 221Ai:CCC, 221Bc:CCP, 221Ea:C??, 221Fa:CCC, 222Ic:CCC, 223Ab:CCC, 223Ag:CCC, 223An:CCP, 231Ha:CCC, 232Ad:CCC, M211Ba:CCP, M221Aa:CCP, M221Ab:CCC, M221Ac:CCP, M221Ad:CCP, M221Ba:CCP, M221Bb:CCC, M221Bc:CCP, M221Bd:CCP, M221Be:CCC, 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, Roosevelt-Vanderbilt, Saratoga, Vicksburg); USFS (George Washington, Jefferson, Monongahela, Nantahala, Ouachita, Ouachita (Mountains), Ozark, Pisgah); USFWS (Montezuma)

ELEMENT SOURCES

Antietam National Battlefield Plots: None.
Catoctin Mountain Park Plots: None.
Chesapeake & Ohio Canal National Historical Park Plots: None.
National Capital Parks-East Plots: None.
Antietam National Battlefield Description Author(s): S. Perles
Catoctin Mountain Park Description Author(s): J. Teague
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
National Capital Parks-East Description Author(s): M. Pyne
Global Description Author(s): D. Faber-Langendoen, S.C. Gawler and L.A. Sneddon
References: Baalman 1965, CAP pers. comm. 1998, Edinger et al. 2014a, Edinger et al. 2014b, Ehrenfeld 1977, Elias 1980, Fike 1999, Fleming and Coulling 2001, Gaertner 1955, Gawler et al. 2017, Hoagland 2000, Hop et al. 2012a, Hop et al. 2013, INAI 2017, Lea et al. 2013, McDonald 1938, NRCS 2004a, Patterson 2008d, Rabie 2000, Rawinski et al. 1996, Sechler et al. 2014, Sneddon et al. 2008, Sneddon et al. 2010, Southeastern Ecology Working Group n.d.*, Vanderhorst et al. 2007, Vanderhorst et al. 2008

G032. EASTERN NORTH AMERICAN EXOTIC RUDERAL FOREST

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 thunbergii* (Japanese black pine) and Hardwoods: *Acer platanoides* (Norway maple), *Ailanthus altissima* (tree of heaven), *Malus fusca* (Oregon crabapple), and *Robinia pseudoacacia* (black locust). Although *Robinia pseudoacacia* (black locust) 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* (Japanese honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), *Lonicera tatarica* (Tatarian honeysuckle), *Lonicera x bella)*, *Rhamnus cathartica* (common buckthorn), and others. The most common exotic tree species found in abandoned plantations include *Larix decidua* (European larch), *Picea abies* (Norway spruce), and *Pinus sylvestris* (Scotch pine). 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

This alliance includes semi-natural forests dominated by naturalized *Acer platanoides* (Norway maple), *Ailanthus altissima* (tree of heaven), *Paulownia tomentosa* (princesstree), *Pinus nigra* (Austrian pine), or *Pinus thunbergii* (Japanese black pine). These are all exotic tree species that have locally established in the region. *Pinus thunbergii* (Japanese black pine) 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 thunbergii* (Japanese black pine) or *Pinus nigra* (Austrian pine). *Ailanthus altissima* (tree of heaven) 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* (Norway maple) 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* (white ash) and *Acer saccharum* (sugar maple) (the latter especially susceptible to exclusion by *Acer platanoides* (Norway maple)), may be present in very limited amounts. Other stands may have non-native associates, including *Pinus nigra* (Austrian pine), *Pinus sylvestris* (Scotch pine), or *Robinia pseudoacacia* (black locust). The deep shade cast by *Acer platanoides* (Norway maple) limits understory growth, aside from regeneration of *Acer platanoides* (Norway maple), or incursions by non-native shrubs such as *Rosa multiflora* (multiflora rose), *Berberis vulgaris* (common barberry), *Lonicera japonica* (Japanese honeysuckle), or *Lonicera morrowii* (Morrow's honeysuckle). 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* (garlic mustard), *Eurybia divaricata* (white wood aster), *Toxicodendron radicans* (eastern poison-ivy), and *Vinca minor* (common periwinkle). *Paulownia tomentosa* (princesstree), 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* (tree of heaven) makes up 25-50% of the canopy; with other associated canopy species of *Fraxinus pennsylvanica* (green ash) and *Acer saccharinum* (silver maple). At this time, these forests are treated as D-ranked examples of native types.

Environmental Description

Antietam National Battlefield Environment: These forests are common in woodlots, fencerows, surrounding agricultural fields and other disturbed areas of the park.
Chesapeake & Ohio Canal National Historical Park Environment: Occurs on steep rocky slopes and rock outcrops.
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

Antietam National Battlefield Vegetation: Forest is strongly dominated by *Ailanthus altissima* (tree of heaven). Canopy and subcanopy associates include *Robinia pseudoacacia* (black locust), *Juglans nigra* (black walnut), *Pinus strobus* (eastern white pine), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Prunus* (plum) spp., *Ailanthus altissima* (tree of heaven), *Acer rubrum* (red maple), *Acer negundo* (box-elder), and/or

Juniperus virginiana (eastern red-cedar). Exotic invasive species can be common or abundant in the shrub and herbaceous layers. *Rosa multiflora* (multiflora rose), *Lonicera morrowii* (Morrow's honeysuckle), or *Lonicera tatarica* (Tatarian honeysuckle) can be abundant in the tall- or short-shrub layers. *Rhus* (sumac) spp. are also common tall shrubs. *Rubus* (blackberry) spp. are typical short shrubs. In the herbaceous layer, *Alliaria petiolata* (garlic mustard), *Lonicera japonica* (Japanese honeysuckle), *Duchesnea indica* (Indian strawberry), *Polygonum* (knotweed) spp., *Dactylis glomerata* (orchardgrass), *Geum* (avens) spp., and *Ageratina altissima* (white snakeroot) are typical. Vines such as *Parthenocissus quinquefolia* (Virginia creeper), *Vitis* (grape) spp., and *Celastrus orbiculatus* (oriental bittersweet) can be abundant in all or some strata.
Chesapeake & Ohio Canal National Historical Park Vegetation: The forest canopy is dominated by *Ailanthus altissima (*exotic). Other subcanopy trees include *Celtis occidentalis* (common hackberry), and *Fraxinus americana* (white ash). Vines include *Lonicera japonica* and *Vitis vulpina.* Herbaceous plants include *Chasmanthium latifolium* (Indian woodoats), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Solidago juncea* (early goldenrod), and *Verbascus thapsus.*
Global Vegetation: This southeastern forest association is strongly dominated by the alien *Ailanthus altissima* (tree of heaven).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Ailanthus altissima* (tree of heaven)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Ailanthus altissima* (tree of heaven)
Chesapeake & Ohio Canal National Historical Park: *Ailanthus altissima* (tree of heaven)
Global: *Ailanthus altissima* (tree of heaven)

OTHER NOTEWORTHY SPECIES

Antietam National Battlefield: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Dactylis glomerata* (orchardgrass, Medium/Insignificant), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Lonicera tatarica* (Tatarian honeysuckle, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Verbascum thapsus* (common mullein, Medium)
Global: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (04-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
Antietam National Battlefield Classification Comments: Ruderal Tree-of-Heaven Forest (also referred to as Successional Tree-of-Heaven Forest) is sometimes mapped individually but in NCR is usually mapped as part of the Successional Mixed Deciduous Forest Map Class (COMP_SMDF). This map class includes three associations at this park, Ruderal Tree-of-Heaven Forest (CEGL007191), Ruderal Black Locust Forest (CEGL007279), and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to undescribed ruderal vegetation.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Ruderal Tree-of-Heaven Forest (also referred to as Successional Tree-of-Heaven Forest) is sometimes mapped individually but is usually mapped as part of the Successional Mixed Deciduous Forest Map Class (COMP_SMDF). This map class includes four associations at this park, Northeastern Ruderal Hardwood Forest (CEGL006599), Ruderal Tree-of-Heaven Forest (CEGL007191), Ruderal Black Locust Forest (CEGL007279), and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to undescribed ruderal vegetation.

ELEMENT DISTRIBUTION

Antietam National Battlefield Range: This association occurs in woodlots, fencerows, surrounding agricultural fields and other disturbed areas, mostly in the northern section of the park.
Chesapeake & Ohio Canal National Historical Park Range: This association was only mapped at Point of Rocks (Canal mile 48-49), in an area of steep rocky slopes and rock outcrops. In this situation, stands dominated by *Ailanthus altissima* (tree of heaven) were thought to be successional (to CEGL003683), and were mapped as Ruderal Tree-of-Heaven Forest (CEGL007191) rather than as part of the composite Successional Mixed Deciduous Forest Map Class (COMP_SMDF). Elsewhere, stands dominated by *Ailanthus altissima* (tree of heaven) were generally subsumed under the composite Successional Mixed Deciduous Forest Map Class (COMP_SMDF).
Global Range: *Ailanthus altissima* (tree of heaven) 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:SNA, CT:SNA, KY:SNA, MD:SNA, NC:SNA, NJ?:SNA, NY:SNA, PA:SNA, TN:SNA, VA:SNA, WV:SNA
TNC Ecoregions: 38:C, 39:C, 43:P, 44:C, 50:P, 51:C, 52:C, 59:C, 61:C
USFS Ecoregions (2007): 221Ae:CCC, 221Ea:C??, 223Eg: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, 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, Roosevelt-Vanderbilt); USFS (Ouachita (Mountains)?, Ouachita?, Ozark?)

ELEMENT SOURCES

Antietam National Battlefield Plots: None.
Chesapeake & Ohio Canal National Historical Park Plots: none
Antietam National Battlefield Description Author(s): S. Perles
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
Global Description Author(s): A.S. Weakley
References: Edinger et al. 2014a, Nordman et al. 2011, Patterson 1976, Patterson 2008a, Patterson 2008c, Sechler et al. 2014, Southeastern Ecology Working Group n.d.*

1.B.3. Temperate Flooded & Swamp Forest

Temperate Flooded & Swamp Forest is a tree-dominated wetland influenced by minerotrophic groundwater, either on mineral or organic (peat) soil, found in mid-latitudes of the globe.

1.B.3.NA. EASTERN NORTH AMERICAN-GREAT PLAINS FLOODED & SWAMP FOREST

This division includes swamp and floodplain forests and woodlands found in poorly-drained basins or along lakeshores and deciduous wet forests along small- to large-sized rivers (on a wide range of soil types), ranging across much of cool-temperate eastern North America.

M029. Central Hardwood Floodplain Forest

This macrogroup encompasses north-temperate floodplain forests dominated by some combination of *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Celtis laevigata* (sugarberry), *Celtis occidentalis* (common hackberry), *Fraxinus pennsylvanica* (green ash), *Liquidambar styraciflua* (sweetgum), *Platanus occidentalis* (American sycamore), *Populus deltoides* (eastern cottonwood), and/or *Ulmus americana* (American elm). Associated trees include *Acer rubrum* (red maple), *Betula nigra* (river birch), and/or *Liriodendron tulipifera* (tuliptree). Common shrubs include *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Cornus amomum* (silky dogwood), and *Viburnum* (viburnum) spp. Vines, including *Parthenocissus* (creeper) spp., *Toxicodendron radicans* (eastern poison-ivy), and/or *Vitis* (grape) spp., are often abundant. The herb layer in the forested portions often features abundant spring ephemerals, giving way to a fern- or forb-dominated understory in many areas by mid-summer. This macrogroup occurs in eastern North America ranging from central Minnesota south to the Ozarks of Arkansas and Missouri east to New England and southern Canada. Some examples reach as

far south as the plains of Alabama to Arkansas. Low-lying areas are underwater each spring; microtopography determines how long the various habitats are inundated. Reservoirs and conversion to agriculture have had a serious and negative effect on this macrogroup. Historically, drought, grazing, and fire influenced this macrogroup.

G673. EAST-CENTRAL FLOODPLAIN FOREST

Stands of these floodplain forests are dominated by some combination of *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Celtis laevigata* (sugarberry), *Fraxinus pennsylvanica* (green ash), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore), and *Ulmus americana* (American elm). Other species that may be present include *Acer negundo* (box-elder). 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

This alliance contains floodplain forests where *Acer saccharinum* (silver maple) is prevalent. Other tree associates include *Acer negundo* (box-elder), *Betula nigra* (river birch), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore), *Populus deltoides* (eastern cottonwood), *Quercus palustris* (pin oak), *Salix nigra* (black willow), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). Common shrub species include *Alnus serrulata* (hazel alder), *Asimina triloba* (pawpaw), *Cephalanthus occidentalis* (common buttonbush), *Ilex decidua* (possum-haw), and *Lindera benzoin* (northern spicebush). Characteristic herbs include *Boehmeria cylindrica* (small-spike false nettle), *Impatiens capensis* (orange jewelweed), *Laportea canadensis* (Canadian woodnettle), *Leersia lenticularis* (catchfly grass), *Matteuccia struthiopteris* (ostrich fern), *Onoclea sensibilis* (sensitive fern), *Pilea pumila* (Canadian clearweed), 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	East-Central 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* (silver maple), with *Acer negundo* (box-elder) dominating a subcanopy layer. Other minor overstory and understory associates include *Populus deltoides* (eastern cottonwood), *Platanus occidentalis* (American sycamore), *Celtis occidentalis* (common hackberry), *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), and *Juglans nigra* (black walnut). The shrub layer ranges from sparse to dense but is usually dominated by *Lindera benzoin* (northern spicebush). Characteristic species of the herb layer are *Ageratina altissima* (white snakeroot), *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Viola sororia* (common blue violet), *Leersia virginica* (whitegrass), *Verbesina alternifolia* (wingstem), *Urtica dioica ssp. dioica* (stinging nettle), *Elymus virginicus* (Virginia wildrye), *Elymus riparius* (riverbank wildrye), *Geum canadense* (white avens), *Pilea pumila* (Canadian clearweed), *Rudbeckia laciniata* (cutleaf coneflower), and *Cryptotaenia canadensis* (Canadian honewort). Vines of

Toxicodendron radicans (eastern poison-ivy) and *Parthenocissus quinquefolia* (Virginia creeper) are common. Early-successional stands are usually strongly dominated by even-aged *Acer saccharinum* (silver maple).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This forest association occurs on the floodplain of the Potomac River, the length of the Chesapeake & Ohio Canal. It generally is found on river banks and first bottoms, which are temporarily flooded. In the Potomac Gorge, the average flood-return interval was from about 0.5 to 2.5 years (Lea 2000).

George Washington Memorial Parkway Environment: Piedmont-Central Appalachian Silver Maple Floodplain Forest occurs along the lower-gradient reaches of the Potomac River. It occurs in discontinuous, linear patches and is not extensive on the Virginia side of the river. It is restricted to riverbanks and the lower elevations of floodplains that have an average flood-return interval of 0.35 to 2.4 years and a 25 to 90% annual probability of flooding (Lea 2000). The surface substrate at most sites has a high percentage (mean = 45%) of exposed mineral soil due to the removal of litter by flooding. Soils vary from well-drained to somewhat poorly drained. Samples from low, somewhat poorly drained first-bottoms were fine-textured silt loams with a mean sand-to-silt ratio of 1:2.7 and up to 27% clay content. Samples from well-drained, often slightly sloping terraces and riverbanks are sandy loams with a mean sand-to-silt ratio of 6.5:1 and <5% clay content. Regardless of textural characteristics, soils supporting this type are strongly calcareous, with relatively high pH (mean = 6.7) and 95-100% base saturation.

Harpers Ferry National Historical Park Environment: Piedmont-Central Appalachian Silver Maple Floodplain Forest occurs on riverbanks and low floodplain terraces of the Potomac and Shenandoah rivers. It occurs in discontinuous, linear patches. It is restricted to the lower elevations of floodplains and riverbanks that have an average flood-return interval of about 0.5 to 2.5 years (Lea 2000). The surface substrate at most sites has a high percentage of exposed mineral soil due to the removal of litter by flooding. Soils can vary from well-drained to somewhat poorly drained. Regardless of textural characteristics, soils supporting this type are typically strongly calcareous with relatively high pH.

Monocacy National Battlefield Environment: This riparian association is common on the floodplain terraces of the Monocacy River. Soils are typically sandy or silty loams. The vegetation experiences periodic flooding.

National Capital Parks-East Environment: At NACE, this community appears to be restricted to the floodplains of the Potomac and Anacostia rivers, where it occurs on first bottoms and banks immediately adjacent to the river.

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

Chesapeake & Ohio Canal National Historical Park Vegetation: This community is a closed forest typically dominated by *Acer saccharinum* (silver maple), with *Acer negundo* (box-elder) dominating a subcanopy layer. Along the Potomac, particularly on sandier sites, *Platanus occidentalis* (American sycamore) may codominate the canopy layer. Other trees include *Celtis occidentalis*, *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), *Populus deltoids*, *Ulmus americana* (American elm), *Ulmus rubra.* In addition to tree seedlings and saplings, shrubs include *Asimina triloba* (pawpaw), and *Lindera benzoin.* There are more than 30 exotic species documented from these stands. Characteristic species of the herb layer are *Ageratina altissima* (white snakeroot), *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Viola sororia* (common blue violet), *Leersia virginica* (whitegrass), *Verbesina alternifolia* (wingstem), *Urtica dioica* (stinging nettle), *Elymus virginicus* (Virginia wildrye), *Elymus riparius* (riverbank wildrye), *Geum canadense* (white avens), *Pilea pumila* (Canadian clearweed), *Rudbeckia laciniata* (cutleaf coneflower), and *Cryptotaenia canadensis* (Canadian honewort). Vines of *Toxicodendron radicans* (eastern poison-ivy) and *Parthenocissus quinquefolia* (Virginia creeper) are common.

George Washington Memorial Parkway Vegetation: Stands are uneven-aged, open to closed forests dominated by large *Acer saccharinum* (silver maple), which accounts for 65% of the large-tree density. The largest trees are >75 cm (30 inches) dbh in all plots; maximum canopy height ranges from 26 to 37 m (85-121 feet; mean = 31 m [102 feet]). Canopy dominants growing on riverbanks typically lean or arch toward the river, away from taller trees on the adjacent higher floodplain. *Platanus occidentalis* (American sycamore) is the most constant overstory associate, but is much less abundant and important than *Acer saccharinum* (silver maple). Canopy-sized individuals of *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), *Acer negundo* (box-elder), *Juglans nigra* (black walnut), and *Populus deltoides ssp. deltoides* (eastern cottonwood) are occasionally present but widely

scattered. Climbing lianas of *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), and *Vitis* (grape) spp. are fairly common on the large canopy dominants. *Acer negundo* (box-elder) strongly dominates the open subcanopy tree layers, with *Ulmus americana* (American elm) also usually present. The shrub layer is typically open or sparse (31% mean stratum cover) and consists partly of saplings or basal sprouts of *Acer negundo* (box-elder) and scattered patches of *Asimina triloba* (pawpaw). *Lindera benzoin* (northern spicebush) contributes the highest cover to the shrub layer, sometimes exceeding 25% cover in an individual plot.

The herb layer undergoes pronounced seasonal variation in composition and density. It is generally sparse and low during the spring and early summer, when flooding is frequent, reaching maximal diversity and growth from mid to late summer. Coarse, perennial forbs are prevalent at this time, with variable patch-dominance of *Urtica dioica ssp. dioica* (stinging nettle), *Laportea canadensis* (Canadian woodnettle), *Polygonum virginianum* (jumpseed), *Verbesina alternifolia* (wingstem), *Boehmeria cylindrica* (small-spike false nettle), and *Ageratina altissima var. altissima* (white snakeroot) most typical. Other characteristic species that occur at lower cover include *Viola sororia* (common blue violet), *Leersia virginica* (whitegrass), *Impatiens capensis* (orange jewelweed), *Pilea pumila* (Canadian clearweed), *Teucrium canadense* (Canada germander), *Rudbeckia laciniata* (cutleaf coneflower), *Cryptotaenia canadensis* (Canadian honewort), and many others. Weedy, less shade-tolerant herbs (e.g., *Verbesina alternifolia* (wingstem), *Teucrium canadense* (Canada germander)) are often more abundant on riverbank sites, which receive increased lateral illumination and are more frequently flooded. Exotic herbs, especially *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), and *Glechoma hederacea* (ground ivy), are plentiful. Total species richness ranges from 30 to 54 taxa per 400 square meters.

Harpers Ferry National Historical Park Vegetation: Stands are uneven-aged, open to closed forests dominated by large *Acer saccharinum* (silver maple), which can account for up to 75% of the large-tree density. Canopy dominants growing on riverbanks typically lean or arch toward the river, away from taller trees on the adjacent higher floodplain. *Platanus occidentalis* (American sycamore) is the most constant overstory associate, but is much less abundant and important than *Acer saccharinum* (silver maple). Canopy-sized individuals of *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), and *Acer negundo* (box-elder) are occasionally present but widely scattered. *Acer negundo* (box-elder) strongly dominates the open subcanopy tree layers, with *Ulmus americana* (American elm) also usually present. The shrub layer is typically open or sparse but can have high cover of *Lindera benzoin* (northern spicebush) and/or *Asimina triloba* (pawpaw). The exotic shrub *Rhodotypos scandens* (jetbead) is also often found in scattered patches in the shrub layer.

The herb layer undergoes pronounced seasonal variation in composition and density. It is generally sparse and low during the spring and early summer, when flooding is frequent, reaching maximal diversity and growth from mid to late summer. Coarse, perennial forbs are prevalent at this time, with variable patch-dominance of *Laportea canadensis* (Canadian woodnettle), *Polygonum virginianum* (jumpseed), *Verbesina alternifolia* (wingstem), *Boehmeria cylindrica* (small-spike false nettle), and *Ageratina altissima var. altissima* (white snakeroot) most typical. Other characteristic species that occur at lower cover include *Viola sororia* (common blue violet), *Leersia virginica* (whitegrass), *Impatiens capensis* (orange jewelweed), *Pilea pumila* (Canadian clearweed), *Teucrium canadense* (Canada germander), *Rudbeckia laciniata* (cutleaf coneflower), *Cryptotaenia canadensis* (Canadian honewort), and many others. Weedy, less shade-tolerant herbs (e.g., *Verbesina alternifolia* (wingstem), *Teucrium canadense* (Canada germander)) are often more abundant on riverbank sites, which receive increased lateral illumination and are more frequently flooded. Exotic herbs, especially *Microstegium vimineum* (Nepalese browntop) and *Alliaria petiolata* (garlic mustard), are plentiful.

Monocacy National Battlefield Vegetation: The open to closed canopy is strongly dominated by *Acer saccharinum* (silver maple), often growing as large multi-trunked trees. *Acer negundo* (box-elder) can be strongly abundant in the subcanopy and tall-shrub layers. Other canopy species include *Platanus occidentalis* (American sycamore), *Juglans nigra* (black walnut), and *Quercus shumardii* (Shumard oak). The subcanopy is moderately dense (25-50% cover) and can contain *Fraxinus pennsylvanica* (green ash), *Carya cordiformis* (bitternut hickory), *Ostrya virginiana* (hophornbeam), and Celtis occidentalis. The sparse tall-shrub layer (5-10% cover) is composed of *Acer negundo* (box-elder) and *Asimina triloba* (pawpaw). The herbaceous layer can be dense (70% cover). Common species include *Glechoma hederacea* (ground ivy), *Laportea canadensis* (Canadian woodnettle), *Urtica dioica* (stinging nettle), *Verbesina alternifolia* (wingstem), *Polygonum* (knotweed) spp., and *Viola* (violet) spp. The exotic invasive species *Microstegium vimineum* (Nepalese browntop) and *Alliaria petiolata* (garlic mustard) can be abundant. Vines such as *Vitis* (grape) spp., *Parthenocissus quinquefolia* (Virginia creeper), and *Toxicodendron radicans* (eastern poison-ivy) are often present.

National Capital Parks-East Vegetation: The canopy contains *Acer saccharinum* (silver maple), *Populus deltoides ssp. deltoides* (eastern cottonwood), and *Ulmus americana* (American elm). The subcanopy may contain some combination of *Acer negundo* (box-elder), *Acer rubrum* (red maple), *Campsis radicans* (trumpet creeper),

Celtis (hackberry) sp., *Diospyros virginiana* (common persimmon), *Fraxinus* (ash) sp., *Morus* (mulberry) sp., *Platanus occidentalis* (American sycamore), and *Robinia pseudoacacia* (black locust). The shrub stratum may be dominated by *Acer negundo* (box-elder), with *Crataegus* (hawthorn) sp., *Diospyros virginiana* (common persimmon), *Lindera benzoin* (northern spicebush), *Campsis radicans* (trumpet creeper), and *Toxicodendron radicans* (eastern poison-ivy). Herbs include *Polygonum* (knotweed) sp. and the exotic *Microstegium vimineum* (Nepalese browntop).

Global Vegetation: This community is a closed forest typically dominated by *Acer saccharinum* (silver maple), with *Acer negundo* (box-elder) dominating a subcanopy layer. Along the Potomac, particularly on sandier sites, *Platanus occidentalis* (American sycamore) may codominate the canopy layer. Minor overstory and understory associates include *Populus deltoides* (eastern cottonwood), *Celtis occidentalis* (common hackberry), *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), and *Juglans nigra* (black walnut). At topographically lower sites, the shrub layer is often sparse; on higher surfaces, it may be moderately dense, with *Lindera benzoin* (northern spicebush) usually the dominant species. Characteristic species of the herb layer are *Ageratina altissima* (white snakeroot), *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Viola sororia* (common blue violet), *Leersia virginica* (whitegrass), *Verbesina alternifolia* (wingstem), *Urtica dioica ssp. dioica* (stinging nettle), *Elymus virginicus* (Virginia wildrye), *Elymus riparius* (riverbank wildrye), *Geum canadense* (white avens), *Pilea pumila* (Canadian clearweed), *Rudbeckia laciniata* (cutleaf coneflower), and *Cryptotaenia canadensis* (Canadian honewort). Vines of *Toxicodendron radicans* (eastern poison-ivy) and *Parthenocissus quinquefolia* (Virginia creeper) are common. Invasive introduced species such as *Alliaria petiolata* (garlic mustard), *Stellaria media* (common chickweed), *Microstegium vimineum* (Nepalese browntop), *Glechoma hederacea* (ground ivy), *Urtica dioica ssp. dioica* (stinging nettle), and *Humulus japonicus* (Japanese hop) 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* (silver maple).

Global Dynamics: Early-successional stands are usually strongly dominated by even-aged *Acer saccharinum* (silver maple).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum* (silver maple)
Tree subcanopy	Broad-leaved deciduous tree	*Acer negundo* (box-elder)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Acer negundo* (box-elder), *Acer saccharinum* (silver maple)

George Washington Memorial Parkway: *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Laportea canadensis* (Canadian woodnettle), *Lindera benzoin* (northern spicebush), *Urtica dioica* ssp. *dioica* (stinging nettle)

Harpers Ferry National Historical Park: *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Laportea canadensis* (Canadian woodnettle), *Lindera benzoin* (northern spicebush)

Monocacy National Battlefield: *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Laportea canadensis* (Canadian woodnettle)

National Capital Parks-East: *Acer negundo* (box-elder), *Acer saccharinum* (silver maple)

Global: *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Ageratina altissima* (white snakeroot), *Cryptotaenia canadensis* (Canadian honewort), *Elymus riparius* (riverbank wildrye), *Elymus virginicus* (Virginia wildrye), *Geum canadense* (white avens), *Impatiens pallida* (pale touch-me-not), *Laportea canadensis* (Canadian woodnettle), *Leersia virginica* (whitegrass), *Lindera benzoin* (northern spicebush), *Parthenocissus quinquefolia* (Virginia creeper), *Pilea pumila* (Canadian clearweed), *Rudbeckia laciniata* (cutleaf coneflower), *Toxicodendron radicans* (eastern poison-ivy), *Urtica dioica* ssp. *dioica* (stinging nettle), *Verbesina alternifolia* (wingstem), *Viola sororia* (common blue violet)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Artemisia vulgaris* var. *vulgaris*, *Arthraxon hispidus* (small carpgrass, Medium/Low), *Barbarea vulgaris* (garden yellowrocket, Low/Insignificant), *Brassica nigra* (black mustard, High/Low), *Cardamine hirsuta* (hairy bittercress), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Commelina communis* (Asiatic dayflower), *Duchesnea indica* (Indian strawberry,

Low/Insignificant), *Euonymus fortunei* (winter creeper, High/Medium), *Fallopia japonica* var. *japonica* (Japanese knotweed, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Hesperis matronalis* (dames rocket, Medium/Low), *Humulus japonicus* (Japanese hop, Medium/Low), *Lamium purpureum* (purple deadnettle), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Ornithogalum nutans* (drooping star of Bethlehem, Insignificant), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Ranunculus bulbosus* (St. Anthony's turnip), *Rubus phoenicolasius* (wine raspberry, Medium), *Rumex crispus* (curly dock, Low/Insignificant), *Saponaria officinalis* (bouncingbet, Low/Insignificant), *Stellaria media* (common chickweed, Low), *Taraxacum officinale* (common dandelion), *Urtica dioica* (stinging nettle), *Veronica hederifolia* (ivyleaf speedwell)
George Washington Memorial Parkway: Vulnerable Plants: *Carex conjuncta* (soft fox sedge, G4G5, VA state-vulnerable), *Erigenia bulbosa* (harbinger of spring, G5, VA state-vulnerable), *Floerkea proserpinacoides* (false mermaidweed, G5, VA state-vulnerable), *Hasteola suaveolens* (false Indian plantain, G4, VA state-imperiled), *Matteuccia struthiopteris* (ostrich fern, G5, VA state-critically imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Clematis terniflora* (sweet autumn virginsbower), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Urtica dioica* ssp. *dioica* (stinging nettle)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Rhodotypos scandens* (jetbead, Medium/Low), *Urtica dioica* ssp. *dioica* (stinging nettle)
Monocacy National Battlefield: Vulnerable Plants: *Quercus shumardii* (Shumard oak, G5, MD state-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Global: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Humulus japonicus* (Japanese hop, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Stellaria media* (common chickweed, Low), *Urtica dioica* ssp. *dioica* (stinging nettle)

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)

Global Related Concepts:
- *Acer saccharinum - Acer negundo - Ulmus americana / Eupatorium rugosum* Forest (Lea 2000) =
- *Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Forest (Fleming and Patterson 2003) =
- *Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Forest (Fleming and Taverna 2006) =
- *Acer saccharinum - Acer negundo / Elymus virginicus - Laportea canadensis* Forest (Fleming and Coulling 2001) =
- *Acer saccharinum - Ulmus americana - (Populus deltoides)* Forest (Thomson et al. 1999) =
- *Acer saccharinum* Floodplain Forest (Vanderhorst 2000b) =
- Silver Maple Floodplain Forest (Podniesinski and Wagner 2002) =

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Piedmont Central Appalachian Silver Maple Floodplain Forest is sometimes referred to simply as Silver Maple Floodplain Forest.
George Washington Memorial Parkway Classification Comments: Piedmont Central Appalachian Silver Maple Floodplain Forest (sometimes referred to simply as Silver Maple Floodplain Forest) is unlikely to be confused with other bottomland forests because of its habitat on riverbanks and low floodplains close to the shore, and the strong overstory dominance by large *Acer saccharinum* (silver maple). It commonly co-occurs with Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073), which occupies a slightly higher position in the floodplain, has an overstory dominated by *Platanus occidentalis* (American sycamore) or mesophytic trees, and has a lush vernal herb layer dominated by spring ephemerals. At some places along boundaries between these types, there can be a mixture of trees from one type with the herbaceous flora of the other. These ecotones, however, are very narrow, usually occur at the top of sloping riverbank zones.

It is distinguished from Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest (CEGL006548) by occurring on more well-drained soils without deeper sloughs that are common in the swamp forest. The herbaceous layer of Piedmont-Central Appalachian Silver Maple Floodplain Forest is also dominated by mid- to late-season floodplain forbs, rather than hydrophytic herbs, such as *Saururus cernuus* (lizard's-tail).
George Washington Memorial Parkway Other Comments: Exotic plants were recorded in all 11 plots of this type. Wind damage to overstory trees (primarily from Hurricane Isabel in September 2003) was recorded in five plots, and obvious herbivory on herbaceous plants was recorded in two plots. In addition, beaver cuttings on *Acer negundo* (box-elder) were present in one plot, and the riverbank in one plot had suffered major erosion during recent floods. Moist, fertile soils that are regularly disturbed by flooding and subject to constant dispersal of propagules from upstream plant populations make this community especially prone to the establishment of exotics. Frequent flooding and the dominance of coarse, perennial native herbs, however, appear to constrain the invasiveness of most exotics except *Urtica dioica ssp. dioica* (stinging nettle). Nevertheless, 37 exotic plant taxa were recorded in plots, and each plot contained an average of nine exotics with a mean aggregate cover of 30%. The most constant and problematic species are *Microstegium vimineum* (Nepalese browntop) (10 plots), *Urtica dioica ssp. dioica* (stinging nettle) (9 plots, 10-25% mean cover), *Alliaria petiolata* (garlic mustard) (7 plots, 5-10% mean cover), *Glechoma hederacea* (ground ivy) (7 plots), *Artemisia annua* (sweet sagewort) (7 plots), and *Perilla frutescens* (beefsteakplant) (6 plots).

Acer saccharinum (silver maple) exceeds all other species in the number of very large trees among 215 plots sampled on the Virginia side of the Potomac Gorge (Fleming 2007), accounting for 9 of 25 individuals >100 cm dbh. Great size, however, does not necessarily equate with great age, as this species is reported to rarely live more than 125 years (Fowells 1965). Among floodplain trees, *Acer saccharinum* (silver maple) appears to be relatively shade-tolerant, produces large numbers of seedlings, grows very fast, and recruits well in gaps. Perhaps because its distribution is concentrated along the lower-gradient river reaches in the gorge, this community also appears to be relatively resistant to flood damage. However, large numbers of medium-sized *Acer saccharinum* (silver maple) in the upper Riverbend floodplain were blown down by high winds during Hurricane Isabel in September 2003. It is difficult to discern any clear successional patterns in this forest, other than the continued dominance of *Acer saccharinum* (silver maple) and *Acer negundo* (box-elder). *Ulmus americana* (American elm) was once a more important overstory associate in this association, but many large individuals along the Potomac succumbed to Dutch elm disease (*Ophiostoma ulmi* and *Ophiostoma novo-ulmi*) in the 1970s (G. Fleming pers. obs.). *Ulmus americana* (American elm) remains common as an understory tree in this and other floodplain communities of the gorge.
Harpers Ferry National Historical Park Classification Comments: Piedmont Central Appalachian Silver Maple Floodplain Forest (sometimes referred to simply as Silver Maple Floodplain Forest) is unlikely to be confused with other bottomland forests because of its habitat on riverbanks and low floodplains close to the shore, and the strong dominance of its overstory by large *Acer saccharinum* (silver maple). It commonly co-occurs with Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073), which occupies a slightly higher position in the floodplain, has an overstory dominated by *Platanus occidentalis* (American sycamore) or mesophytic trees, and has a lush vernal herb layer dominated by spring ephemerals. At some places along boundaries between these types, there can be a mixture of trees from one type with the herbaceous flora of the other. These ecotones, however, are very narrow, usually occurring at the top of sloping riverbank zones.

Piedmont-Central Appalachian Silver Maple Floodplain Forest is distinguished from Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest (CEGL006548) by occurring on better-drained soils without the deeper sloughs that are common in the latter type. The herbaceous layer of Piedmont-Central Appalachian Silver Maple Floodplain Forest is also dominated by mid- to late-season mesophytic forbs, rather than hydrophytic herbs, such as *Saururus cernuus* (lizard's-tail).

Harpers Ferry National Historical Park Other Comments: Moist, fertile soils that are regularly disturbed by flooding and subject to constant dispersal of propagules from upstream plant populations make this community especially prone to the establishment of exotics. Frequent flooding and the dominance of coarse, perennial native herbs, however, appear to constrain the invasiveness of most exotics except *Urtica dioica ssp. dioica* (stinging nettle).
Monocacy National Battlefield Classification Comments: Piedmont Central Appalachian Silver Maple Floodplain Forest is sometimes referred to simply as Silver Maple Floodplain Forest.
National Capital Parks-East Classification Comments: Piedmont Central Appalachian Silver Maple Floodplain Forest is sometimes referred to simply as Silver Maple Floodplain Forest.
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

Chesapeake & Ohio Canal National Historical Park Range: This community occurs on the floodplains of the Potomac River, the length of the Chesapeake & Ohio Canal.
George Washington Memorial Parkway Range: Piedmont-Central Appalachian Silver Maple Floodplain Forest has a very limited distribution in the Potomac Gorge portion of George Washington Memorial Parkway, where it is confined to the larger floodplains in the western portion of Turkey Run Park. It is absent from Great Falls Park and from the mouth of Turkey Run downstream, where the floodplain is narrow and elevated, or locally absent. South of Chain Bridge, it occurs in multiple stands on Roosevelt Island, at Jones Point Park, and along the shores of the Potomac near Mount Vernon.
Harpers Ferry National Historical Park Range: Piedmont-Central Appalachian Silver Maple Floodplain Forest occurs along the entire reach of the Potomac River in the park, as well as in a few scattered stands along the Shenandoah River.
Monocacy National Battlefield Range: Piedmont-Central Appalachian Silver Maple Floodplain Forest is very common on the terrace floodplain of the Monocacy River.
National Capital Parks-East Range: Piedmont-Central Appalachian Silver Maple Floodplain Forest appears to be restricted to the floodplains of the Potomac and Anacostia rivers. Stands were observed or mapped at Piscataway, Oxon Hill Farm, and in the central area (along the Anacostia River).
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:SNR, MA:SNR, MD:SNR, NJ:SNR, NY:SNR, PA:SNR, VA:S4, WV:S2
TNC Ecoregions: 52:C, 58:C, 59:C, 61:C
USFS Ecoregions (2007): 221Dd:CCC, 221De:CCC, 223Db:CCC, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ad:CCC, 232Ha:CC?, 232Je:C??, M221Aa:CCP, 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

Chesapeake & Ohio Canal National Historical Park Plots: (17 plots): POTO_012.07, POTO_014.04, POTO_018.01, POTO_018.05, POTO_019.01, POTO_020.03, POTO_023.01, POTO_026.02, POTO_027.02, POTO_027.07, POTO_029.03, POTO_041.02, POTO_041.04, POTO_045.02, POTO_049.02, POTO_049.03, POTO_049.04.
George Washington Memorial Parkway Plots: TURK_034, TURK_036.
Harpers Ferry National Historical Park Plots: HAFE.5.
Monocacy National Battlefield Plots: None.
National Capital Parks-East Plots: None.
Chesapeake & Ohio Canal National Historical Park Description Author(s): G.P. Fleming and C.W. Nordman
George Washington Memorial Parkway Description Author(s): G.P. Fleming and K. Taverna
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Monocacy National Battlefield Description Author(s): S. Perles
National Capital Parks-East Description Author(s): M. Pyne

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 Taverna 2006, Fleming and Taverna 2006*, Fleming et al. 2017, 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, Vanderhorst 2000b, WVNHP unpubl. data

A3699 *Betula nigra - Platanus occidentalis* Appalachian-Piedmont Floodplain Forest Alliance

These forests are dominated by *Betula nigra* (river birch) and *Platanus occidentalis* (American sycamore) with a variety of other canopy species, including *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Celtis laevigata* (sugarberry), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Populus deltoides* (eastern cottonwood), and *Salix nigra* (black willow). The subcanopy or tall-shrub strata may include *Cornus florida* (flowering dogwood) and *Carpinus caroliniana* (American hornbeam), along with *Acer rubrum* (red maple), *Carya* (hickory) spp., *Ilex opaca* (American holly), *Prunus serotina* (black cherry), and *Ulmus alata* (winged elm). The shrub layer is often sparse with such species as *Asimina triloba* (pawpaw), *Crataegus marshallii* (parsley hawthorn), *Crataegus viridis* (green hawthorn), and *Lindera benzoin* (northern spicebush) present. Vines include *Berchemia scandens* (Alabama supplejack), *Bignonia capreolata* (crossvine), *Campsis radicans* (trumpet creeper), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), and *Vitis rotundifolia* (muscadine). Herbaceous species include *Arundinaria gigantea* (giant cane), *Boehmeria cylindrica* (small-spike false nettle), *Chasmanthium latifolium* (Indian woodoats), *Elymus hystrix* (eastern bottlebrush grass), *Impatiens capensis* (orange jewelweed), *Pilea pumila* (Canadian clearweed), *Podophyllum peltatum* (mayapple), and *Stellaria pubera* (star chickweed). 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.

[CEGL007312] *Betula nigra - Platanus occidentalis / Alnus serrulata / Boehmeria cylindrica* Floodplain Forest

Translated Name: **River Birch - American Sycamore / Hazel Alder / Small-spike False Nettle Floodplain Forest**
Common Name: **River Birch Levee Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	East-Central Floodplain Forest (G673)
Alliance	*Betula nigra - Platanus occidentalis* Appalachian-Piedmont Floodplain Forest Alliance (A3699)

ELEMENT CONCEPT

Global Summary: This riverfront forest, dominated by *Betula nigra* (river birch) and *Platanus occidentalis* (American sycamore), occurs primarily on levees along small rivers and streams. It also is found along flowages of larger rivers ("artificial oxbows"). It ranges from Virginia to southern Georgia in the Piedmont and Coastal Plain (and into the southern and lower-elevation parts of the Southern Blue Ridge, excluding the highest elevations of the Mountains) and west to eastern Texas, and the Cumberland Plateau of Tennessee and possibly northern Alabama. No effort has been made to subdivide this type into northern and southern, or Coastal Plain and Interior variants, although there are undoubtedly some floristic differences between these extremes, at least in the lower strata. *Betula nigra* (river birch) contributes at least 50%, and often more, of the tree density of stands of this community. *Platanus occidentalis* (American sycamore) may be codominant, or at least prominent, with large individuals overtopping the *Betula* (birch), which tends to have a greater number of stems, but *Platanus occidentalis* (American sycamore) may be more conspicuous because of its larger size. Other canopy associates include *Liriodendron tulipifera* (tuliptree), *Liquidambar styraciflua* (sweetgum), *Acer rubrum* (red maple), *Acer negundo* (box-elder), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Celtis* (hackberry) spp., and *Quercus* (oak) spp.

ENVIRONMENTAL DESCRIPTION

Prince William Forest Park Environment: At Prince William Forest Park, this early-successional floodplain forest is known only from disturbed, recently deposited alluvium at the upper end of the Breckenridge Reservoir impoundment on Chopawamsic Creek. This vegetation has been reclassified since the NCR vegetation classification and mapping project. It was originally classified and mapped as *Betula nigra - Platanus occidentalis* Forest (CEGL002086).

Global Environment: *Betula nigra* (river birch) requires soils with moisture near field capacity throughout the year but is relatively intolerant of flooding; *Platanus occidentalis* (American sycamore) also is intolerant of flooding during the growing season and will die if the entire tree is inundated for more than two weeks. The absence of this community in the lower Mississippi River Alluvial Plain is attributed to this intolerance, as is its most common location on levees of smaller rivers. The community usually is found on the natural levee of the watercourse and, therefore, is slightly elevated from the flats behind the levee. The community is more common along small streams and blackwater streams than along alluvial floodplains, mostly because of the higher sustained flow rates of these larger rivers. It also is found along flowages of larger rivers ("artificial oxbows") in southeast Kentucky. In the Upper East Gulf Coastal Plain (Shiloh National Military Park, Hardin County, Tennessee), this association occurs along small stream floodplains.

VEGETATION DESCRIPTION

Prince William Forest Park Vegetation: River Birch - Sycamore Small River Floodplain Forest is a young, open, even-aged forest dominated by *Platanus occidentalis* (American sycamore), usually with *Betula nigra* (river birch) codominant. Many of the trees originated from coppice sprouts and now grow in multi-boled clumps. *Carpinus caroliniana* (American hornbeam) is a frequent shrub associate, and some areas have significant cover of climbing and scrambling *Smilax rotundifolia. Verbesina alternifolia*, *Thelypteris noveboracensis* (New York fern), and *Microstegium vimineum* (Nepalese browntop) are locally abundant herbs. This vegetation has been reclassified since the NCR vegetation classification and mapping project. It was originally classified and mapped as *Betula nigra - Platanus occidentalis* Forest (CEGL002086).

Global Vegetation: *Betula nigra* (river birch) contributes at least 50%, and often more, of the tree density of stands of this community. *Platanus occidentalis* (American sycamore) may be codominant, or at least prominent, with large individuals overtopping the *Betula* (birch), which tends to have a greater number of stems, but *Platanus occidentalis* (American sycamore) may be more conspicuous because of its larger size. Other canopy associates include *Liriodendron tulipifera* (tuliptree), *Liquidambar styraciflua* (sweetgum), *Acer rubrum* (red maple), *Acer negundo* (box-elder), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Celtis* (hackberry) spp., and *Quercus* (oak) spp. *Pinus echinata* (shortleaf pine), *Pinus strobus* (eastern white pine), or *Pinus virginiana* (Virginia pine) may be found in some montane or submontane examples. The subcanopy or tall-shrub strata may include *Cornus florida* (flowering dogwood) and *Carpinus caroliniana* (American hornbeam), along with *Acer rubrum* (red maple), *Ilex opaca* (American holly), *Ulmus alata* (winged elm), *Prunus serotina* (black cherry), and *Carya* (hickory) spp. Shrubs and woody vines may include *Alnus serrulata* (hazel alder), *Euonymus americanus* (bursting-heart), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), and *Vitis rotundifolia* (muscadine). Herbs may include *Boehmeria cylindrica* (small-spike false nettle), *Polygonum virginianum* (jumpseed), *Rudbeckia laciniata* (cutleaf coneflower), *Sanicula* (sanicle) sp., *Symphyotrichum lateriflorum* (calico aster), *Thalictrum dioicum* (early meadowrue), *Viola sororia* (common blue violet), *Polystichum acrostichoides* (Christmas fern), *Woodwardia areolata* (netted chainfern), *Botrychium dissectum* (cutleaf grapefern), *Botrychium virginianum* (rattlesnake fern), and *Impatiens capensis* (orange jewelweed). The exotics *Ligustrum sinense* (Chinese privet), *Lonicera japonica* (Japanese honeysuckle), *Microstegium vimineum* (Nepalese browntop), and *Rosa multiflora* (multiflora rose) may spread into disturbed examples of this community. No effort has been made to subdivide this type into northern and southern, or Coastal Plain and Interior variants, although there are undoubtedly some floristic differences between these extremes, at least in the lower strata.

Global Dynamics: These forests occur on riverfronts in areas with repeated, frequent, natural disturbance in the form of flooding. Occurrences of this type may have a rather high percentage of standing dead trees, including remnant snags from earlier successional communities. A layer of sand is often deposited at the surface of the soil when streams overflow their banks during flash floods. Little or no clay is present in the upper strata of soils. Flooding is seasonal and/or occasional and shallow but never prolonged. Most of this short-duration flooding takes place in early spring.

This is a Zone IV community. Zone IV communities experience seasonal inundation or groundwater saturation for approximately 12.5-25% of the year, usually during spring and early summer with a frequency of 51-100%.

This community often succeeds riverfront forests dominated by *Salix* (willow) spp. and *Populus* (cottonwood) spp. It probably succeeds to forests dominated by *Celtis* (hackberry) spp., *Ulmus* (elm) spp., *Fraxinus pennsylvanica* (green ash), and *Liquidambar styraciflua* (sweetgum).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula nigra* (river birch), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore), *Populus* spp.
Tree subcanopy	Broad-leaved deciduous tree	*Alnus serrulata* (hazel alder), *Carpinus caroliniana* (American hornbeam), *Salix nigra* (black willow)
Shrub/sapling (tall & short)	Liana	*Berchemia scandens* (Alabama supplejack), *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison-ivy), *Vitis riparia* (riverbank grape)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Asimina parviflora* (smallflower pawpaw)
Herb (field)	Flowering forb	*Boehmeria cylindrica* (small-spike false nettle), *Geranium maculatum* (spotted geranium), *Impatiens capensis* (orange jewelweed), *Laportea canadensis* (Canadian woodnettle)

CHARACTERISTIC SPECIES

Prince William Forest Park: *Betula nigra* (river birch), *Carpinus caroliniana* (American hornbeam), *Platanus occidentalis* (American sycamore), *Smilax rotundifolia* (roundleaf greenbrier), *Thelypteris noveboracensis* (New York fern), *Verbesina alternifolia* (wingstem)
Global: *Alnus serrulata* (hazel alder), *Betula nigra* (river birch), *Boehmeria cylindrica* (small-spike false nettle), *Platanus occidentalis* (American sycamore)

OTHER NOTEWORTHY SPECIES

Prince William Forest Park: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)
Global: Vulnerable Plants: *Spiraea virginiana* (Virginia meadowsweet, G2); **Invasive/Exotic Plants**: *Ligustrum sinense* (Chinese privet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (13-Feb-2009). This is a widespread, variable, and dynamic association. The principal threats to it come from hydrologic alterations. In addition, stands do not typically contain valuable timber species and are not particularly vulnerable to logging. Stands receive some protection from "streamside management zones" in relation to forestry operations where "best management practices" are employed.

RELATED CONCEPTS

Global Similar Types:
- *Betula nigra - Acer rubrum - (Liquidambar styraciflua) / Microstegium vimineum* Ruderal Floodplain Forest (CEGL006976)
- *Betula nigra - Platanus occidentalis* Floodplain Forest (CEGL002086)
- *Betula nigra - Quercus laurifolia - Taxodium (distichum, ascendens) / Crataegus aestivalis* Riparian Forest (CEGL004282)

Global Related Concepts:
- Eutrophic Seasonally Flooded Forest (Rawinski 1992) **?**
- IIA7b. River Birch - Sycamore Riverfront Forest (Allard 1990) **>**
- River Birch - Sycamore (72) (USFS 1988) **?**

- River Birch - Sycamore: 61 (Eyre 1980) >
- River Birch Type (Schmalzer and DeSelm 1982) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Prince William Forest Park Classification Comments: This vegetation has been reclassified since the NCR vegetation classification and mapping project. It was originally classified and mapped as *Betula nigra - Platanus occidentalis* Forest (CEGL002086), also referred to as River Birch - Sycamore Small River Floodplain Forest.
Global Classification Comments: Under the new classification hierarchy, this association may require subdivision into three components: one for the coastal plains and adjacent Piedmont from Virginia to Mississippi; one for the Mississippi River Alluvial Plain and West Gulf coastal plains from Arkansas and Louisiana west to Texas; and one from the Appalachian and interior regions. To do this well, some more detailed information may be needed about the floristic differences among these types. No effort has been made to subdivide this type into northern and southern, or Coastal Plain and Interior variants, although there are undoubtedly some floristic differences between these extremes, at least in the lower strata. This includes the 'Sycamore - River Birch - Silver Maple' forests of the Pearl River in Louisiana mentioned by K. Ribbeck. Additional species from the shrub and herb strata need to be added to make more apparent the differences between this association and ~*Betula nigra - Platanus occidentalis* Floodplain Forest (CEGL002086)$$, which is a more northern forest. In Kentucky, this association (CEGL007312) would be found on the southern part of the Daniel Boone National Forest, in contrast to CEGL002086, which is more northern. In Virginia, related vegetation is treated as ~*Betula nigra - Platanus occidentalis* Floodplain Forest (CEGL002086)$$.

ELEMENT DISTRIBUTION

Prince William Forest Park Range: This vegetation is found at the upper end of the Breckenridge Reservoir impoundment on Chopawamsic Creek. It has been reclassified since the NCR vegetation classification and mapping project. It was originally classified and mapped as *Betula nigra - Platanus occidentalis* Forest (CEGL002086), also called River Birch - Sycamore Small River Floodplain Forest.
Global Range: This riverfront association ranges from Virginia to southern Georgia in the Piedmont and Coastal Plain (and into the southern and lower elevations of the Southern Blue Ridge, excluding the highest elevations of the mountains), west to eastern Texas and the Cumberland Plateau of Tennessee and possibly northern Alabama.
Nations: US
States/Provinces: AL:SNR, AR:SNR, GA:SNR, KY:SNR, LA:SNR, MS:SNR, NC:SNR, SC:SNR, TN:SNR, TX:SNR, VA:SNA
TNC Ecoregions: 32:P, 40:P, 41:C, 42:C, 43:C, 44:C, 50:C, 51:C, 52:C, 53:C, 56:C, 57:C, 58:?
USFS Ecoregions (2007): 221Hc:CCC, 221He:CC?, 223Eg:CCC, 231Ab:CCC, 231Ba:CCC, 231Bd:CCC, 231Bk:CCC, 231Cd:CCC, 231Eo:CC?, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232B:CC, 232C:CC, 232D:CC, 232F:CC, 234Aa:CCC, 234Ad:CCC, 234Cb:CCC, 234Cc:CCC, 234Da:CCC, 234Dc:CCC, 234Do:CCC, 234Ea:CCC, 255:C, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: BIA (Eastern Band of Cherokee); DOD (Fort Benning); NPS (Big South Fork, Blue Ridge Parkway, Chattahoochee River, Horseshoe Bend, Natchez Trace, Obed River, Prince William, Shiloh); USFS (Bankhead?, Bienville?, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Daniel Boone, De Soto?, Delta, Francis Marion?, Holly Springs?, Kisatchie, Oconee?, Pisgah, St. Francis?, Sumter, Sumter (Mountains), Sumter (Piedmont), Talladega (Oakmulgee)?, Tombigbee?, Tuskegee?); USFWS (Hatchie?, Little River)

ELEMENT SOURCES

Prince William Forest Park Plots: None.
Prince William Forest Park Description Author(s): G. Fleming
Global Description Author(s): S. Landaal and C.W. Nordman
References: Allard 1990, Burns and Honkala 1990b, Campbell 1988, Campbell 1989a, Clark and Benforado 1981, Dickson and Segelquist 1978, Duever and Brinson 1984b, Evans et al. 2009, Eyre 1980, Faulkner and Patrick n.d., Flinchum 1977, GNHP unpubl. data 2018, Gettman 1974, Kartesz 1999, Klimas et al. 1981, LNHP 2009, MSNHP 2006, McWilliams and Rosson 1990, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Nordman et al. 2011, Palmer-Ball et al. 1988, Peet et al. unpubl. data, Putnam 1951, Putnam et al. 1960, Rawinski 1992,

Schafale 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d.*, USFS 1988, Wharton 1978, Wharton et al. 1982

[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	East-Central 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* (American sycamore) and *Betula nigra* (river birch). *Salix caroliniana* (coastal plain willow) and *Salix nigra* (black willow) are dominant or codominant in a minority of stands. Other floodplain trees, particularly *Acer saccharinum* and *Fraxinus pennsylvanica* (green ash), may occur as minor associates. Shrub associates include *Cornus amomum* (silky dogwood), *Salix sericea* (silky willow), *Alnus serrulata* (hazel alder), and sometimes *Cephalanthus occidentalis* (common buttonbush) or *Physocarpus opulifolius* (common ninebark). The herbaceous layer ranges from sparse to moderately dense. Characteristic herbs include *Apocynum cannabinum* (Indianhemp), *Polygonum virginianum* (jumpseed), *Polygonum hydropiper* (marshpepper knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Asclepias incarnata* (swamp milkweed), *Pilea pumila* (Canadian clearweed), *Hypericum* (St. John's-wort) spp., *Bidens* (beggarticks) spp., *Phalaris arundinacea* (reed canarygrass), *Dichanthelium clandestinum* (deertongue), *Leersia virginica* (whitegrass), *Panicum virgatum* (switchgrass), and *Justicia americana* (American water-willow). Vines such as *Vitis riparia* (riverbank grape) and *Toxicodendron radicans* (eastern poison-ivy) are often found throughout this association. Exotics such as *Lythrum salicaria* (purple loosestrife), *Microstegium vimineum* (Nepalese browntop), *Fallopia japonica var. japonica* (Japanese knotweed), *Securigera varia* (purple crownvetch), and *Rosa multiflora* (multiflora rose) are frequent invaders.

Environmental Description

Antietam National Battlefield Environment: This association occurs on low cobbly or sandy depositional bars and vegetation is strongly influenced by flooding.

Chesapeake & Ohio Canal National Historical Park Environment: This sycamore - river birch forest was sampled in plots at 28 locations in the park. Sites are flat to gently undulating alluvial plains, stream terraces and shorelines that may be temporarily, seasonally, intermittently or semipermanently flooded. Soils are poorly to well-drained sand. The variable unvegetated surface is dominated by small rocks (10-95% cover) and bare sand (1-68%) with some exposed bedrock (0-12%), large rocks (0-70%), leaf litter (0-25%), wood (0-5%), standing water (0-5%), and bivalve shells (0-30%). Evidence of disturbance includes regular flooding and scouring (including ice scouring) and the abundant of exotic species.

George Washington Memorial Parkway Environment: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest occurs on coarse-textured depositional bars along the higher-gradient sections of the Potomac River and Difficult Run. Most plots have >60% surface cover of boulders, cobbles, and gravel in variable proportions. One site occurs partly on a bedrock outcrop that extends onto the channel shelf. According to Lea (2000), habitats supporting this community flood an average of five to eight times a year. Although these stony bars are relatively stable, large and powerful floods can remove or alter large portions of the substrate. Soils are predominantly coarse sands with very high fertility. However, low areas and areas around tree roots may contain silty or mucky deposits. At most sites, the sandy soils are densely packed in the interstitial areas between cobbles and difficult to extract.

Harpers Ferry National Historical Park Environment: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest occurs on coarse-textured depositional bars along the higher-gradient sections of the Potomac and Shenandoah rivers. Most sites have >60% surface cover of boulders, cobbles, and gravel in variable proportions. Habitats supporting this community flood an average of five to eight times a year. Although these stony bars are relatively stable, large and powerful floods can remove or alter large portions of the substrate. Soils are predominantly coarse sands with very high fertility. However, low areas and areas around tree roots may contain silty or mucky deposits. At most sites, the sandy soils are densely packed in the interstitial areas between cobbles and difficult to extract.
Manassas National Battlefield Park Environment: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest occurs on coarse-textured depositional bars within the stream channel of Bull Run. Most stands have sand and silt substrates, interspersed with cobbles and gravel in variable proportions, and occasionally some exposed bedrock. Habitats supporting this community flood an average of 5-8 times a year. Although these stony bars are relatively stable, large and powerful floods can remove or alter large portions of the substrate. Soils are predominantly coarse sands with very high fertility. However, low areas and areas around tree roots may contain silty or mucky deposits.
Monocacy National Battlefield Environment: This riparian association occurs on low cobbly or sandy depositional bars along riverbanks or the edges of islands. Typical soil is a hygric, well-drained coarse sand and gravel with occasional pockets of silty clay loam in the depressions. This association is strongly influenced by frequent flooding and ice-scouring that prevents the woody species from developing into full-statured canopy trees.
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

Antietam National Battlefield Vegetation: Tall shrubs or flood-battered stunted trees less than 6 m in height are dominant. *Platanus occidentalis* (American sycamore), *Betula nigra* (river birch), and/or *Salix* (willow) spp. are the dominant species.
Chesapeake & Ohio Canal National Historical Park Vegetation: The structure of the sparse to moderate (20-60% cover) tree canopy is quite variable with stands of 20-35 m, 10-20 m, 6-10 m and 1-6 m. The canopy and very sparse (<5-20%) subcanopy (10-20 m) and tall-shrub layers, when present, are dominated by *Acer saccharinum* (silver maple), *Betula nigra* (river birch), and *Platanus occidentalis* (American sycamore). The sparse to moderate (20-60%) short-shrub (1-6 m) layer is dominated by canopy species and may include *Asimina triloba* (pawpaw), *Diospyros virginiana* (common persimmon), *Fraxinus pennsylvanica* (green ash), *Lindera benzoin* (northern spicebush), *Salix caroliniana* (coastal plain willow) (Maryland state-vulnerable), and *Salix exigua* (narrowleaf willow) (state-critically imperiled). Common and/or dominant species in the herbaceous layer (20-80+%) include *Acalypha rhomboidea* (common threeseed mercury), *Amaranthus spinosus* (spiny amaranth), *Apocynum cannabinum* (Indianhemp), *Bidens frondosa* (devil's beggarticks), *Boehmeria cylindrica* (small-spike false nettle), *Carex emoryi* (Emory's sedge) (state-imperiled), *Cyperus strigosus* (strawcolored flatsedge), *Eupatorium serotinum* (lateflowering thoroughwort), *Leersia virginica* (whitegrass), *Lindernia dubia* (yellowseed false pimpernel), *Oxalis stricta* (common yellow oxalis), *Pilea pumila* (Canadian clearweed), *Polygonum lapathifolium* (curlytop knotweed), and *Vitis riparia* (riverbank grape). More than 60 exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Hasteola suaveolens* (false Indian plantain), *Paspalum fluitans* (horsetail paspalum), *Ruellia strepens* (limestone wild petunia), and *Rumex altissimus* (pale dock) and three state-vulnerable species.
George Washington Memorial Parkway Vegetation: Stand physiognomy is highly variable, depending on the stability of the substrate and the impacts of past flooding. Stands exposed to frequent high-velocity scouring usually have a shrubland stature, while those that are somewhat more protected are open woodlands; mean cover of all woody plants is about 60%. Maximum canopy height (usually achieved by just one or two trees in a stand) ranges from 5 to 24 m (16-79 feet) and most of the larger stems are <30 cm (12 inches) dbh. In two exceptionally mature stands, the larger canopy trees range from 43 to 54 cm (17-21 inches) dbh. In all stands, at least some trees are

heavily flood-trained, with leaning or horizontal trunks and numerous vertical, adventitious sprouts. *Platanus occidentalis* (American sycamore) is the most abundant and important tree, accounting for 64% of total stem density. *Betula nigra* (river birch) is a constant associate that achieves significant cover (>25%) in some stands. *Acer saccharinum* (silver maple) and *Fraxinus pennsylvanica* (green ash) are also constant but very minor associates, while *Diospyros virginiana* (common persimmon) and *Ulmus americana* (American elm) are inconstant but occasionally important. *Salix* (willow) spp. are infrequent and unimportant in the Virginia-side stands of this community.

The herb layer is rather sparse (14% mean stratum cover) but moderately diverse with a number of typical riparian and ruderal herbs. High rock cover and densely packed, seasonally dry soils keep herbaceous cover down, but many of the species typical of the type are both flood- and drought-tolerant. *Apocynum cannabinum* (Indianhemp) and *Eupatorium serotinum* (lateflowering thoroughwort) occur in every plot and are the only herbaceous species to achieve a mean cover >2% across all plots. Other constant and characteristic native herbs are *Acalypha rhomboidea* (common threeseed mercury), *Solanum carolinense* (Carolina horsenettle), *Phyla lanceolata* (lanceleaf fogfruit), *Polygonum lapathifolium* (curlytop knotweed), *Xanthium strumarium* (rough cocklebur), *Cyperus odoratus* (fragrant flatsedge), *Polygonum punctatum* (dotted smartweed), *Eclipta prostrata* (false daisy), *Leersia virginica* (whitegrass), *Ipomoea lacunosa* (whitestar), *Cyperus strigosus* (strawcolored flatsedge), and *Bidens frondosa* (devil's beggarticks). The introduced *Artemisia annua* (sweet sagewort) and midwestern U.S. native *Chamaesyce humistrata* (spreading sandmat) are also constant in the type. Total species richness ranges from 36 to 84 taxa/plot.

Harpers Ferry National Historical Park Vegetation: Stand physiognomy is highly variable, depending on the stability of the substrate and the impacts of past flooding. Stands exposed to frequent high-velocity scouring usually have a shrubland stature, while those that are somewhat more protected are open woodlands; mean cover of all woody plants is about 60%. Maximum canopy height (usually achieved by just one or two trees in a stand) ranges from 5 to 15m (16-49 feet) and most of the stems are <2.5 cm (12 inches) dbh. Some trees are heavily flood-trained, with leaning or horizontal trunks and numerous vertical, adventitious sprouts. *Platanus occidentalis* (American sycamore) is the most abundant and important tree. *Betula nigra* (river birch), *Acer saccharinum* (silver maple) and *Fraxinus pennsylvanica* (green ash) are frequent, often minor, associates. *Cephalanthus occidentalis* (common buttonbush) and *Salix nigra* (black willow) are often present as unimportant associates in stands of this community. The woody liana *Toxicodendron radicans* (eastern poison-ivy) can be abundant in the shrub/ low-tree layer.

The herb layer is rather sparse but moderately diverse with a number of typical riparian and ruderal herbs. High rock cover and densely packed, seasonally dry soils keep herbaceous cover down, but many of the species typical of the type are both flood- and drought-tolerant. The most abundant herbs that occur in every sampled plot include *Acalypha rhomboidea* (common threeseed mercury), *Apocynum cannabinum* (Indianhemp), *Eupatorium serotinum* (lateflowering thoroughwort), *Justicia americana* (American water-willow), *Hibiscus laevis* (halberdleaf rosemallow), *Conoclinium coelestinum* (blue mistflower), and *Polygonum punctatum* (dotted smartweed). Other characteristic native herbs are *Cyperus strigosus* (strawcolored flatsedge), *Leersia virginica* (whitegrass), *Boehmeria cylindrica* (small-spike false nettle), *Lindernia dubia var. dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox), *Bidens tripartita* (threelobe beggarticks), *Mimulus alatus* (sharpwing monkeyflower), and *Cyperus odoratus* (fragrant flatsedge). The introduced *Artemisia annua* (sweet sagewort) and midwestern U.S. native *Chamaesyce humistrata* (spreading sandmat) are also common.

Manassas National Battlefield Park Vegetation: Stand physiognomy is highly variable, depending on the stability of the substrate and the impacts of past flooding. Stands exposed to frequent scouring usually have a shrubland stature, while those that are somewhat more protected are open woodlands; mean cover of all woody plants is about 60%. Maximum canopy height (usually achieved by just one or two trees in a stand) ranges from 5 to 20 m (16-65 feet). In all stands, at least some trees are heavily flood-trained, with leaning or horizontal trunks and numerous vertical, adventitious sprouts. *Platanus occidentalis* (American sycamore) and/or *Betula nigra* (river birch) are typically the most abundant trees, while *Acer negundo* (box-elder) and *Celtis occidentalis* (common hackberry) are common associates. The herb layer is rather sparse but moderately diverse with a number of typical riparian and ruderal herbs. Rock cover and densely packed, seasonally dry soils keep herbaceous cover down, but many of the species typical of the type are both flood- and drought-tolerant. Exotics species, such as *Lonicera japonica* (Japanese honeysuckle), *Microstegium vimineum* (Nepalese browntop), and *Polygonum cespitosum var. longisetum* (oriental ladysthumb), are often prevalent. Characteristic native herbs are *Verbesina alternifolia* (wingstem), *Elymus virginicus* (Virginia wildrye), *Dichanthelium clandestinum* (deertongue), *Carex laxiflora var. laxiflora* (broad looseflower sedge), *Boehmeria cylindrica* (small-spike false nettle), *Polygonum punctatum* (dotted smartweed), *Agrostis perennans* (upland bentgrass), and *Leersia virginica* (whitegrass). *Toxicodendron radicans* (eastern poison-ivy) can also have high cover as a low shrub (25-50% in one stand).

Monocacy National Battlefield Vegetation: Tall shrubs or flood-battered stunted trees less than 6 m in height are characteristic of this association. *Platanus occidentalis* (American sycamore) is often the dominant species, though *Betula nigra* (river birch) and/or *Salix* (willow) spp. can be common as well. This tall-shrub layer is typically moderately dense (50-75% cover). Due to the frequent disturbances, the herbaceous layer can be highly variable. *Polygonum* (knotweed) spp. such as *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum persicaria* (spotted ladysthumb), *Polygonum perfoliatum* (Asiatic tearthumb), *Polygonum pensylvanicum* (Pennsylvania smartweed), and *Polygonum sagittatum* (arrowleaf tearthumb) can be common. Other typical species include *Leersia virginica* (whitegrass), *Mimulus ringens* (Allegheny monkeyflower), *Acalypha rhomboidea* (common threeseed mercury), *Pilea pumila* (Canadian clearweed), *Setaria* (bristlegrass) spp., *Echinochloa* (cockspur grass) spp., and *Brassica nigra* (black mustard).
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* (American sycamore) and *Betula nigra* (river birch). *Salix caroliniana* (coastal plain willow) and *Salix nigra* (black willow) are dominant or codominant in a minority of stands. Other floodplain trees, particularly *Acer saccharinum* (silver maple) and *Fraxinus pennsylvanica* (green ash), may occur as minor associates. Shrub associates include *Cornus amomum* (silky dogwood), *Salix sericea* (silky willow), *Alnus serrulata* (hazel alder), and sometimes *Cephalanthus occidentalis* (common buttonbush) or *Physocarpus opulifolius* (common ninebark). The herbaceous layer ranges from sparse to moderately dense. Characteristic herbs include *Apocynum cannabinum* (Indianhemp), *Polygonum virginianum* (jumpseed), *Polygonum hydropiper* (marshpepper knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Asclepias incarnata* (swamp milkweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Hypericum* (St. John's-wort) spp., *Bidens* (beggarticks) spp., *Artemisia annua* (sweet sagewort), *Cyperus* (flatsedge) spp., *Boehmeria cylindrica* (small-spike false nettle), *Phyla lanceolata* (lanceleaf fogfruit), *Hibiscus laevis* (halberdleaf rosemallow), *Ipomoea lacunosa* (whitestar), *Acalypha rhomboidea* (common threeseed mercury), *Phalaris arundinacea* (reed canarygrass), *Dichanthelium clandestinum* (deertongue), *Leersia virginica* (whitegrass), *Panicum virgatum* (switchgrass), *Pilea pumila* (Canadian clearweed), and *Justicia americana* (American water-willow). Vines such as *Vitis riparia* (riverbank grape) and *Toxicodendron radicans* (eastern poison-ivy) are often found throughout this association. Exotics such as *Microstegium vimineum* (Nepalese browntop), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Lythrum salicaria* (purple loosestrife), *Securigera varia* (purple crownvetch), *Rosa multiflora* (multiflora rose), and *Fallopia japonica var. japonica* (Japanese knotweed) 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* (Indianhemp), *Cyperus strigosus* (strawcolored flatsedge), *Acalypha rhomboidea* (common threeseed mercury), and *Eupatorium serotinum* (lateflowering thoroughwort). The low-gradient variant has a variable herb layer that includes flood-tolerant species such as *Pilea pumila* (Canadian clearweed), *Leersia virginica* (whitegrass), *Leersia oryzoides* (rice cutgrass), *Scrophularia marilandica* (carpenter's square), annual species of *Polygonum* (knotweed) (*Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Polygonum punctatum* (dotted smartweed), *Polygonum sagittatum* (arrowleaf tearthumb)), *Mimulus alatus* (sharpwing monkeyflower), *Mimulus ringens* (Allegheny monkeyflower), *Carex lurida* (shallow sedge), *Carex frankii* (Frank's sedge), *Carex tribuloides* (blunt broom sedge), *Eupatorium perfoliatum* (common boneset), *Paspalum fluitans* (horsetail paspalum), *Verbena hastata* (swamp verbena), and *Scutellaria lateriflora* (blue skullcap). Exotics are common in both variants.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Betula nigra* (river birch), *Platanus occidentalis* (American sycamore)
Herb (field)	Liana	*Vitis riparia* (riverbank grape)
Herb (field)	Flowering forb	*Lythrum salicaria* (purple loosestrife), *Polygonum hydropiper* (marshpepper knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed)

Herb (field)	Graminoid	*Leersia virginica* (whitegrass), *Panicum virgatum* (switchgrass), *Phalaris arundinacea* (reed canarygrass)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Betula nigra* (river birch), *Platanus occidentalis* (American sycamore), *Salix* spp.
Chesapeake & Ohio Canal National Historical Park: *Betula nigra* (river birch), *Platanus occidentalis* (American sycamore), *Salix caroliniana* (coastal plain willow)
George Washington Memorial Parkway: *Apocynum cannabinum* (Indianhemp), *Betula nigra* (river birch), *Eupatorium serotinum* (lateflowering thoroughwort), *Platanus occidentalis* (American sycamore)
Harpers Ferry National Historical Park: *Acalypha rhomboidea* (common threeseed mercury), *Betula nigra* (river birch), *Eupatorium serotinum* (lateflowering thoroughwort), *Platanus occidentalis* (American sycamore)
Manassas National Battlefield Park: *Betula nigra* (river birch), *Celtis occidentalis* (common hackberry), *Dichanthelium clandestinum* (deertongue), *Platanus occidentalis* (American sycamore), *Verbesina alternifolia* (wingstem)
Monocacy National Battlefield: *Betula nigra* (river birch), *Platanus occidentalis* (American sycamore), *Salix* spp.
Global: *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Leersia virginica* (whitegrass), *Panicum virgatum* (switchgrass), *Phalaris arundinacea* (reed canarygrass), *Platanus occidentalis* (American sycamore), *Polygonum hydropiper* (marshpepper knotweed), *Salix nigra* (black willow)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Carex emoryi* (Emory's sedge, G5, MD-imperiled), *Hasteola suaveolens* (false Indian plantain, G4, MD-critically imperiled), *Hibiscus laevis* (halberdleaf rosemallow, G5, MD-vulnerable), *Paspalum fluitans* (horsetail paspalum, G5, MD-critically imperiled), *Ruellia strepens* (limestone wild petunia, G4G5, MD-critically imperiled), *Rumex altissimus* (pale dock, G5, MD-critically imperiled), *Salix caroliniana* (coastal plain willow, G5, MD-vulnerable), *Salix exigua* (G5, MD-critically imperiled), *Scutellaria incana* (hoary skullcap, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Abutilon theophrasti* (velvetleaf, Medium/Low), *Ailanthus altissima* (tree of heaven, Medium), *Albizia julibrissin* (silktree, High/Low), *Alliaria petiolata* (garlic mustard, High/Medium), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Arthraxon hispidus* (small carpgrass, Medium/Low), *Brassica nigra* (black mustard, High/Low), *Calystegia sepium* (hedge false bindweed), *Chelidonium majus* var. *majus* (celandine), *Chenopodium album* (lambsquarters), *Chenopodium album* var. *album* (lambsquarters), *Cirsium arvense* (Canada thistle, High/Medium), *Commelina communis* (Asiatic dayflower), *Cucurbita pepo* var. *pepo* (field pumpkin), *Datura stramonium* (jimsonweed, High/Low), *Daucus carota* (Queen Anne's lace, Low), *Digitaria ischaemum* (smooth crabgrass), *Echinochloa crus-galli* (barnyardgrass, Medium/Insignificant), *Eleusine indica* (Indian goosegrass), *Eragrostis cilianensis* (stinkgrass, Medium/Insignificant), *Eragrostis minor* (little lovegrass), *Fallopia japonica* var. *japonica* (Japanese knotweed, High/Medium), *Galinsoga quadriradiata* (shaggy-soldier), *Glechoma hederacea* (ground ivy, Low), *Glycine max* (soybean), *Humulus japonicus* (Japanese hop, Medium/Low), *Ipomoea hederacea* (ivyleaf morning-glory), *Kickxia elatine* (sharpleaf cancerwort), *Lespedeza cuneata* (sericea lespedeza, Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Lythrum salicaria* (purple loosestrife, High), *Mazus pumilus* (Japanese mazus), *Melilotus officinalis* (yellow sweetclover, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Morus alba* (white mulberry, High/Medium), *Nepeta cataria* (catnip), *Paulownia tomentosa* (princesstree, Medium/Low), *Perilla frutescens* (beefsteakplant, Low), *Plantago lanceolata* (narrowleaf plantain, High/Low), *Polygonum hydropiper* (marshpepper knotweed), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Polygonum persicaria* (spotted ladysthumb), *Rorippa sylvestris* (creeping yellowcress, Medium/Low), *Rumex crispus* (curly dock, Low/Insignificant), *Rumex obtusifolius* (bitter dock), *Setaria faberi* (Japanese bristlegrass), *Setaria pumila* (yellow foxtail, Low/Insignificant), *Silene latifolia* ssp. *alba* (bladder campion), *Solanum dulcamara* var. *dulcamara* (climbing nightshade), *Stellaria media* (common chickweed, Low), *Taraxacum officinale* (common dandelion), *Trifolium arvense* (rabbitfoot clover, Low), *Trifolium hybridum* (alsike clover, Medium/Low), *Trifolium pratense* (red clover, Low/Insignificant), *Trifolium repens* (white clover, Medium/Low), *Urtica dioica* ssp. *dioica* (stinging nettle), *Verbascum thapsus* (common mullein, Medium); **Other Plants**: *Amaranthus retroflexus* (redroot amaranth, G5), *Artemisia vulgaris* var. *vulgaris* (GUTU), *Dysphania ambrosioides* (Mexican tea, GNR)
George Washington Memorial Parkway: Vulnerable Plants: *Lipocarpha micrantha* (smallflower halfchaff sedge, G5, VA state-critically imperiled); **Invasive/Exotic Plants**: *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Lysimachia vulgaris* (garden yellow loosestrife), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb)

Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Murdannia keisak* (wartremoving herb, Medium/Low), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rorippa sylvestris* (creeping yellowcress, Medium/Low)
Monocacy National Battlefield: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Albizia julibrissin* (silktree, High/Low), *Brassica nigra* (black mustard, High/Low), *Calystegia sepium* (hedge false bindweed), *Commelina communis* (Asiatic dayflower), *Echinochloa crus-galli* (barnyardgrass, Medium/Insignificant), *Eleusine indica* (Indian goosegrass), *Humulus japonicus* (Japanese hop, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum hydropiper* (marshpepper knotweed), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Rorippa sylvestris* (creeping yellowcress, Medium/Low), *Setaria faberi* (Japanese bristlegrass); **Other Plants**: *Dysphania ambrosioides* (Mexican tea, GNR)
Global: Invasive/Exotic Plants: *Fallopia japonica* var. *japonica* (Japanese knotweed, High/Medium), *Lythrum salicaria* (purple loosestrife, High), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Polygonum hydropiper* (marshpepper knotweed)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (01-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)

Global Related Concepts:
- *Platanus occidentalis - Betula nigra - Salix (caroliniana, nigra) / Apocynum cannabinum* Wooded Herbaceous Vegetation (Lea 2003) =
- Black willow - mixed hardwood riverine shrubland (Perles et al. 2004) **?**
- Mixed Hardwood Floodplain Thicket (Zimmerman et al. 2012) =
- Mixed hardwood riverine shrubland (Perles et al. 2004) **?**
- River birch (sycamore) - mixed hardwood riverine shrubland (Perles et al. 2004) **?**
- River birch-willow thickets (CAP pers. comm. 1998) **?**
- Silver maple (river birch) - mixed hardwood riverine shrubland (Perles et al. 2004) **?**
- Sycamore - mixed hardwood riverine shrubland (Perles et al. 2004) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Antietam National Battlefield Classification Comments: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (sometimes referred to as Piedmont / Central Appalachian Sycamore - River Birch Scour Woodland) is the only association included in the River-scour Woodland Map Class (COMP_RSWO) in this park, along with other undescribed woody vegetation in this same environment. This map class occurs in patches too small to be captured in the vegetation map.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (sometimes referred to as Piedmont / Central Appalachian Sycamore - River Birch Scour Woodland) is distinguished by its rocky, depositional bar habitat; its scrubby or open woodland vegetation with leaning, flood-damaged trees; dominance by *Platanus occidentalis* (American sycamore), with *Betula nigra* (river birch) also important; and a rather sparse herbaceous flora. It is most similar to Central

Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), which occupies slightly higher, more stable habitats with greater local soil development. In addition, the latter has an open to semi-closed woodland physiognomy with a greater diversity of tree species and a comparatively dense, extremely species-rich herb layer. This association can occur in small patches not captured in the vegetation maps. Where mapped, it is included in the River-scour Woodland Map Class (COMP_RSWO), a map class including three associations at this park, Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), and Piedmont-Central Appalachian Riverscour Forest (CEGL006218), along with other undescribed woody vegetation in this same environment.

George Washington Memorial Parkway Classification Comments: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (sometimes referred to as Piedmont / Central Appalachian Sycamore - River Birch Scour Woodland) is distinguished by its rocky, depositional bar habitat; its scrubby or open woodland vegetation with leaning, flood-damaged trees; dominance by *Platanus occidentalis* (American sycamore), with *Betula nigra* (river birch) also important; and a rather sparse herbaceous flora. It is most similar to Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), which occupies slightly higher, more stable habitats with greater local soil development. In addition, the latter has an open to semi-closed woodland physiognomy with a greater diversity of tree species and a comparatively dense, extremely species-rich herb layer. This association can occur in small patches not captured in the vegetation maps. Where mapped, it is included in the River-scour Woodland Map Class (COMP_RSWO), a map class including three associations, Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), and Piedmont-Central Appalachian Riverscour Forest (CEGL006218), along with other undescribed woody vegetation in this same environment.

Harpers Ferry National Historical Park Classification Comments: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (sometimes referred to as Piedmont / Central Appalachian Sycamore - River Birch Scour Woodland) is distinguished by its rocky, depositional bar habitat; its scrubby or open woodland vegetation with leaning, flood-damaged trees; dominance by *Platanus occidentalis* (American sycamore); and a rather sparse herbaceous flora. It is most similar to Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), which occupies slightly higher, more stable habitats with greater local soil development. In addition, it has an open to semi-closed woodland physiognomy with a greater diversity of tree species and a comparatively dense, extremely species-rich herb layer. This association can occur in small patches not captured in the vegetation maps. Where mapped, it is included in the River-scour Woodland Map Class (COMP_RSWO), a map class including two associations in this park, Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476) and Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), along with other undescribed woody vegetation in this same environment.

Manassas National Battlefield Park Classification Comments: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (sometimes referred to as Piedmont / Central Appalachian Sycamore - River Birch Scour Woodland) is distinguished by its rocky, depositional bar habitat; its scrubby or open woodland vegetation with leaning, flood-damaged trees; dominance by *Platanus occidentalis* (American sycamore) and/or *Betula nigra* (river birch); and a rather sparse herbaceous flora. This association can occur in small patches not captured in the vegetation maps. Where mapped, it is included in the River-scour Woodland Map Class (COMP_RSWO), a map class including only this association at this park, along with other undescribed woody vegetation in this same environment.

Monocacy National Battlefield Classification Comments: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (sometimes referred to as Piedmont / Central Appalachian Sycamore - River Birch Scour Woodland) is distinguished by its rocky, depositional bar habitat; its scrubby or open woodland vegetation with leaning, flood-damaged trees; and its dominance by *Platanus occidentalis* (American sycamore). This association can occur in small patches not captured in the vegetation maps. Where mapped, it is included in the River-scour Woodland Map Class (COMP_RSWO), a map class including only this association at this park, along with any other undescribed woody vegetation in this same environment.

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* (sandbar willow), a former nominal in the type, is listed as "rare" in Maryland and Virginia (Kartesz 1999).

ELEMENT DISTRIBUTION

Antietam National Battlefield Range: This association occurs in small patches along Antietam Creek. These were too small to map in the ANTI vegetation map.

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled near Mountain Lock, Antietam Creek, Watts Branch, Fairplay, Little Orleans South, Mason Island, the mouth of Catoctin Creek, Brunswick and Dam #3, Great Falls, and Cabin John. The River-scour Woodland Map Class (COMP_RSWO) is mapped along the Potomac River, the length of the Chesapeake & Ohio Canal.
George Washington Memorial Parkway Range: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest occurs along the higher-gradient sections of the Potomac River and Difficult Run. Plot-sampled stands were all in the river reach from just above Great Falls to the mouth of Turkey Run. Occurrences on the islands and Maryland shore of the gorge are no doubt more extensive than those in Virginia.
Harpers Ferry National Historical Park Range: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest occurs along the higher-gradient sections of the Potomac and Shenandoah rivers throughout the park.
Manassas National Battlefield Park Range: Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest occurs as small patches within the stream channel of Bull Run.
Monocacy National Battlefield Range: This association occurs on low cobbly or sandy depositional bars of the Monocacy River.
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:SNR, NJ:SNR, NY:SNR, PA:S4, VA:S3, WV:S1
TNC Ecoregions: 49:C, 52:C, 59:C, 60:C, 61:C
USFS Ecoregions (2007): 211Fa:CCP, 211Fb:CCC, 211Fc:CCC, 211Fd:CCP, 211Ga:CCC, 211Gb:CCC, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Ea:CCP, 221Fa:CCC, 231:C, 232Ac:CCP, M221Aa:CCP, 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

Antietam National Battlefield Plots: None.
Chesapeake & Ohio Canal National Historical Park Plots: (28 plots): CHOH.083, CHOH.084, CHOH.085, CHOH.086, CHOH.088, CHOH.093, CHOH.098, CHOH.099, CHOH.101, CHOH.104, CHOH.105, CHOH.218, CHOH.522, CHOH.534, CHOH.637, CHOH.640, CHOH.648, CHOH.649, CHOH.651, POTO_006.04, POTO_012.01, POTO_012.06, POTO_016.01, POTO_028.05, POTO_030.03, POTO_037.02, POTO_037.04, POTO_049.07.
George Washington Memorial Parkway Plots: GFNP_048, GFNP_051, GFNP_052, TURK_033, TURK_051.
Harpers Ferry National Historical Park Plots: HAFE.118, HAFE.121, HAFE.122.
Manassas National Battlefield Park Plots: MANA.41, MANA.44.
Monocacy National Battlefield Plots: (1 plot): MONO.8.
Antietam National Battlefield Description Author(s): S. Perles
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Harpers Ferry National Historical Park Description Author(s): G. Fleming and K. Taverna
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
Monocacy National Battlefield Description Author(s): S. Perles and M. Russo
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. 2014a, Fike 1999, Fleming 2002b, Fleming 2007, Fleming and Patterson 2003, Fleming and Taverna 2006, Fleming et al. 2017, 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, WVNHP unpubl. data, Zimmerman 2011e, Zimmerman et al. 2012

A3701 *Platanus occidentalis - Fraxinus pennsylvanica - Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance

Stands are typically dominated by *Fraxinus pennsylvanica* (green ash) and *Platanus occidentalis* (American sycamore) with *Liquidambar styraciflua* (sweetgum) and/or *Liriodendron tulipifera* (tuliptree). Other canopy and understory species that may be present include *Acer rubrum* (red maple), *Aesculus sylvatica* (painted buckeye) (within its range), *Alnus serrulata* (hazel alder), *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), and *Ulmus americana* (American elm), in the non-montane part of the distribution. Species present in the montane occurrences include *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Liriodendron tulipifera* (tuliptree), and *Platanus occidentalis* (American sycamore), with *Betula nigra* (river birch), *Carpinus caroliniana* (American hornbeam), *Fraxinus americana* (white ash), *Hamamelis virginiana* (American witch-hazel), *Liquidambar styraciflua* (sweetgum), *Pinus strobus* (eastern white pine), *Pinus virginiana* (Virginia pine), and *Tsuga canadensis* (eastern hemlock). *Euonymus americanus* (bursting-heart) is a typical shrub species in the lower elevation occurrences, while *Leucothoe fontanesiana* (highland doghobble) and *Rhododendron maximum* (great laurel) 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.

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

Translated Name: **Sugar Maple - White Ash / American Hornbeam / Mayapple Forest**
Common Name: **Mid-Atlantic High Terrace 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	East-Central Floodplain Forest (G673)
Alliance	*Platanus occidentalis - Fraxinus pennsylvanica - Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance (A3701)

Element Concept

Global Summary: These rich floodplain forests are found on slightly elevated alluvial terraces along 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* (sugar maple), *Fraxinus americana* (white ash), and sometimes *Carya cordiformis* (bitternut hickory). 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), and *Fagus grandifolia* (American beech) along with *Platanus occidentalis* which may reach noticeable cover in some stands. *Carpinus caroliniana* (American hornbeam) is often present as a small tree, along with *Acer saccharum* (sugar maple). *Lindera benzoin* (northern spicebush) is the most common shrub; *Asimina triloba* (pawpaw) is characteristic in the southern portion of this type's range. Vines such as *Toxicodendron radicans* (eastern poison-ivy) and *Parthenocissus quinquefolia* (Virginia creeper) are frequent but usually at low cover. The herb layer usually features spring ephemerals, including *Claytonia virginica* (Virginia springbeauty), *Dicentra canadensis* (squirrel corn), and *Erythronium americanum* (dogtooth violet), followed by a mixture of ferns, forbs and graminoids. Characteristic species include *Arisaema triphyllum* (Jack in the pulpit), *Caulophyllum thalictroides* (blue cohosh), *Carex laxiculmis* (spreading sedge), *Deparia acrostichoides* (silver false spleenwort), *Elymus virginicus* (Virginia wildrye), *Elymus riparius* (riverbank wildrye), *Onoclea sensibilis* (sensitive fern), and *Podophyllum peltatum* (mayapple). Exotic species, such as *Microstegium vimineum* (Nepalese browntop), *Glechoma hederacea* (ground ivy), and *Alliaria petiolata* (garlic mustard), 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)$$, but distinguished by the reduced importance of *Acer saccharinum* (silver maple) and *Platanus occidentalis* (American sycamore); they differ from enriched upland hardwood forests, e.g., *~Acer saccharum - Tilia americana / Asimina triloba / Jeffersonia diphylla - Caulophyllum thalictroides* Forest (CEGL008412)$$, in their alluvial soils and flooding regime.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This sugar maple - ash forest, Mid-Atlantic High Terrace Hardwood Floodplain Forest, was sampled in plots at 15 locations in the park. The typical sites are found on flat slightly elevated alluvial terraces with moderately well-drained soils. These 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. 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. The unvegetated surface is dominated by leaf litter (98% cover) with some bare soil (2%). Evidence of disturbance includes occasional flooding and the presence of exotic species.Evidence of disturbance includes occasional flooding and the presence of exotic species.
George Washington Memorial Parkway Environment: Mid-Atlantic High Terrace Hardwood Floodplain Forest is a rare community in the Potomac Gorge section of George Washington Memorial Parkway, known from only a few small patches probably covering less than 1 ha (6 acres) in aggregate. There are two occurrences at Turkey Run Park, both on built-up alluvial fans flanking the mouths of tributary streams on the inner part of the river floodplain. Similar occurrences on the Maryland side of the river have an average flood-return interval of 15 to 30 years and a 3 to 7% annual probability of flooding (Lea 2000). Soils are very well-drained but samples collected from plots have significantly lower mean pH, calcium, and total base saturation than those of the two major floodplain forests.
Monocacy National Battlefield Environment: Mid-Atlantic High Terrace Hardwood Floodplain Forest is mapped in two locations on moderately well-drained soils on infrequently flooded alluvial terraces along the Monocacy River.
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

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderate (60+% cover) tree canopy, 20-35 m tall, and the sparse (20%) subcanopy (10-20 m) are dominated by *Acer saccharum var. saccharum* (sugar maple) and *Fraxinus americana* (white ash), along with *Carya cordiformis* (bitternut hickory), and *Celtis occidentalis* (common hackberry). Other trees include *Liriodendron tulipifera* (tuliptree) and *Tilia americana* (American basswood), *Fagus grandifolia* (American beech), *Acer negundo* (box-elder), *Juglans nigra* (black walnut), *Platanus occidentalis* (American sycamore), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Ulmus americana.* Tall shrubs include *Cornus florida* (flowering dogwood), *Cercis canadensis* (eastern redbud), as well as tree saplings. The sparse to moderate (40-50%) short-shrub layer (1-6 m) is dominated by *Asimina triloba* and *Lindera benzoin* (northern spicebush). The dense herbaceous layer (80+%) is characterized by *Podophyllum peltatum* (mayapple), along with lesser amounts of *Cardamine concatenata* (cutleaf toothwort), *Caulophyllum thalictroides* (blue cohosh), *Erythronium americanum ssp. americanum* (dogtooth violet), *Claytonia virginica* (Virginia springbeauty), *Festuca subverticillata* (nodding fescue), *Mertensia virginica* (Virginia bluebells), and *Viola pubescens var. pubescens* (downy yellow violet). Many other herbaceous species and numerous exotic species were reported from sampled stands. This community also supports one Maryland state-vulnerable species.
George Washington Memorial Parkway Vegetation: The three known stands of this community on the Virginia side of the Potomac Gorge have open canopies (about 70% mean canopy cover) with variable mixtures of tall (mean canopy height = 34 m [112 feet]) *Acer saccharum var. saccharum* (sugar maple), *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Carya cordiformis* (bitternut hickory), *Fagus grandifolia* (American beech), and *Ulmus rubra* (slippery elm). *Platanus occidentalis* (American sycamore) is a very minor and inconstant tree, but scattered individuals are present. Climbing lianas of *Vitis vulpina* (frost grape) are common on the overstory trees. The subcanopy tree layers are well-developed and contain *Fagus grandifolia* (American beech), *Acer negundo*

(box-elder), *Acer saccharum var. saccharum* (sugar maple), *Asimina triloba* (pawpaw), and, in one stand, *Acer nigrum* (black maple). *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush) dominate the shrub layer, with *Carpinus caroliniana* (American hornbeam) also a characteristic species.

The herb layer is similar to that of Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073), with high cover of spring ephemerals during the early season, transitioning to a more depauperate herbaceous flora of summer-green forbs and ferns. The most constant and abundant species in the lush vernal assemblages are the patch-dominants *Asarum canadense* (Canadian wildginger), *Mertensia virginica* (Virginia bluebells), *Cystopteris protrusa* (lowland bladderfern), *Claytonia virginica* (Virginia springbeauty), and *Hydrophyllum canadense* (bluntleaf waterleaf). Also constant, but occurring at lower cover, are *Dicentra canadensis* (squirrel corn), *Erythronium americanum ssp. americanum* (dogtooth violet), *Arisaema triphyllum* (Jack in the pulpit), *Cardamine concatenata* (cutleaf toothwort), *Podophyllum peltatum* (mayapple), *Polygonatum biflorum var. commutatum* (smooth Solomon's seal), and *Trillium sessile* (toadshade). However, the vernal herb layer of each plot is conspicuously dominated by different species. *Asarum canadense* (Canadian wildginger) and *Floerkea proserpinacoides* (false mermaidweed) form extensive mats in one plot, while *Mertensia virginica* (Virginia bluebells) and *Matteuccia struthiopteris* (ostrich fern) are prevalent in another. The third plot is overwhelmingly dominated by a large clone of *Allium tricoccum* (ramp) that covers several hundred square meters. Total species richness ranges from 37 to 56 taxa per 400 square meters.

Monocacy National Battlefield Vegetation: The canopy may be dominated or co-dominated by *Fraxinus Americana* (white ash) with *Carya cordiformis* (bitternut hickory) characteristic. Other trees include *Liriodendron tulipifera* (tuliptree) and *Tilia americana* (American basswood), *Fagus grandifolia* (American beech), and *Acer negundo.* The shrub layer may be dense with *Asimina triloba.* The dense herbaceous layer is characterized by *Caulophyllum thalictroides* (blue cohosh), *Cardamine concatenata* (cutleaf toothwort), *Claytonia virginica* (Virginia springbeauty), *Festuca subverticillata* (nodding fescue), *Mertensia virginica* (Virginia bluebells), and . Many other herbaceous species and numerous exotic species were reported from sampled stands.

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* (sugar maple), *Fraxinus americana* (white ash), and sometimes *Carya cordiformis* (bitternut hickory). 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), *Celtis occidentalis* (common hackberry), and *Fagus grandifolia* (American beech). *Carpinus caroliniana* (American hornbeam) is often present as a small tree, along with *Acer saccharum* (sugar maple) and *Acer negundo* (box-elder). *Lindera benzoin* (northern spicebush) is the most common shrub; *Asimina triloba* (pawpaw) is characteristic in the southern portion of this type's range. Vines such as *Toxicodendron radicans* (eastern poison-ivy) and *Parthenocissus quinquefolia* (Virginia creeper) are frequent but usually at low cover. The herb layer usually features spring ephemerals, including *Claytonia virginica* (Virginia springbeauty), *Dicentra canadensis* (squirrel corn), and *Erythronium americanum* (dogtooth violet), followed by a mixture of ferns, forbs and graminoids. Characteristic species include *Arisaema triphyllum* (Jack in the pulpit), *Caulophyllum thalictroides* (blue cohosh), *Carex laxiculmis* (spreading sedge), *Deparia acrostichoides* (silver false spleenwort), *Elymus virginicus* (Virginia wildrye), *Elymus riparius* (riverbank wildrye), *Onoclea sensibilis* (sensitive fern), and *Podophyllum peltatum* (mayapple). *Matteuccia struthiopteris* (ostrich fern) may form local dominance patches in this type along the Potomac River in Maryland and Virginia. Exotic species, such as *Microstegium vimineum* (Nepalese browntop), *Glechoma hederacea* (ground ivy), and *Alliaria petiolata* (garlic mustard), may be abundant, especially in disturbed areas.

MOST ABUNDANT SPECIES

Global

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

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Acer saccharum* var. *saccharum* (sugar maple), *Asimina triloba* (pawpaw), *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Podophyllum peltatum* (mayapple)
George Washington Memorial Parkway: *Acer saccharum* var. *saccharum* (sugar maple), *Lindera benzoin* (northern spicebush)
Monocacy National Battlefield: *Acer nigrum* (black maple), *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash)
Global: *Acer saccharum* (sugar maple), *Arisaema triphyllum* (Jack in the pulpit), *Fraxinus americana* (white ash), *Lindera benzoin* (northern spicebush), *Onoclea sensibilis* (sensitive fern), *Podophyllum peltatum* (mayapple)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Castanea dentata* (American chestnut, G3, MD-vulnerable); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Berberis thunbergii* (Japanese barberry, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Euonymus alatus* (burningbush, Low), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Ligustrum vulgare* (European privet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Ornithogalum nutans* (drooping star of Bethlehem, Insignificant), *Perilla frutescens* (beefsteakplant, Low), *Poa pratensis* (Kentucky bluegrass, Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Stellaria media* (common chickweed, Low), *Urtica dioica* (stinging nettle), *Veronica hederifolia* (ivyleaf speedwell), *Vinca minor* (common periwinkle, Low)
George Washington Memorial Parkway: Vulnerable Plants: *Erigenia bulbosa* (harbinger of spring, G5, VA state-vulnerable), *Floerkea proserpinacoides* (false mermaidweed, G5, VA state-vulnerable), *Matteuccia struthiopteris* (ostrich fern, G5, VA state-critically imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Veronica hederifolia* (ivyleaf speedwell)
Monocacy National Battlefield: Vulnerable Plants: *Erigenia bulbosa* (harbinger of spring, G5, MD state-vulnerable); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* (oriental ladysthumb), *Stellaria media* (common chickweed, Low), *Veronica hederifolia* (ivyleaf speedwell)
Global: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Microstegium vimineum* (Nepalese browntop, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (05-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)

Global Related Concepts:
- *Acer saccharum / Ptelea trifoliata / Uniola latifolia* Association (Rawinski et al. 1996) =
- Sugar Maple - Basswood: 26 (Eyre 1980) >

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

Chesapeake & Ohio Canal National Historical Park Classification Comments: Mid-Atlantic High Terrace Hardwood Floodplain Forest is also referred to simply as Terrace Hardwood Floodplain Forest.
George Washington Memorial Parkway Classification Comments: Mid-Atlantic High Terrace Hardwood Floodplain Forest was poorly distinguished in analysis from Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073) and Central Appalachian-Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Blue Cohosh Type) (CEGL008412), and co-occurs with both on the landscape. It is also referred to simply as Terrace Hardwood Floodplain Forest. It has an herb layer similar to that of the former and an overstory of upland trees similar to that of the latter. It is most likely to be confused with Piedmont-Central Appalachian Rich Floodplain Forest, from which it is distinguished by its position on rarely flooded, exceptionally high floodplain berms and alluvial fans; its overstory of *Acer saccharum var. saccharum* (sugar maple), *Fagus grandifolia* (American beech), and other trees of upland forests; and the absence or unimportance of *Platanus occidentalis* (American sycamore). The dominance of *Acer saccharum var. saccharum* (sugar maple) in the understory of one plot of Piedmont-Central Appalachian Rich Floodplain Forest suggests a potential successional relationship between that type and Mid-Atlantic High Terrace Hardwood Floodplain Forest on sites that remain undisturbed by flooding for extended periods.
George Washington Memorial Parkway Other Comments: Exotic plants occur in all three plots, with *Alliaria petiolata* (garlic mustard) and *Veronica hederifolia* (ivyleaf speedwell) the most constant and abundant species. The mean cover of these exotics, however, is considerably less than it is in Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073).

The few occurrences of this community on the Virginia side of the Potomac Gorge probably occupy comparable relative floodplain elevations as the Maryland-side stands. However, they do not occupy alluvial fill overlying terraces, as reported by Lea (2000). Instead, two of the three stands occupy "toes" at the inner edge of the floodplain where alluvial fans have built up at the mouths of tributary streams. The other stand may occupy a relict area of floodplain persisting from an earlier erosional cycle because of erosion along a deep adjacent slough. Overall floristic composition appears to be similar on both sides of the river.
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

Chesapeake & Ohio Canal National Historical Park Range: Mid-Atlantic High Terrace Hardwood Floodplain Forest occurs in the Potomac River floodplain in the Outer Piedmont below Great Falls (Canal mile 9-13), in the Hagerstown Valley at Dargan Bend (Canal mile 64) and Four Locks (Canal mile 108-112) and in the Ridge and Valley at Berkeley Springs (Canal mile 131) and Green Ridge (Canal mile 148-156).
George Washington Memorial Parkway Range: Mid-Atlantic High Terrace Hardwood Floodplain Forest is a rare community in George Washington Memorial Parkway, known from only two small stands at Turkey Run Park covering less than two ha (4.7 acres).

First recognized by Lea (2000) from the Potomac Gorge in Maryland, Mid Atlantic High - Terrace Hardwood Floodplain Forest has been found at scattered sites along major streams from the Delaware River in New Jersey and Pennsylvania to the James River in west central Virginia. It appears to be an uncommon community with very specific environmental requirements, but further inventory is needed to determine its full geographic range and the compositional variation across that range.
Monocacy National Battlefield Range: Mid-Atlantic High Terrace Hardwood Floodplain Forest occurs on terraces along the Monocacy River in two locations, one near the Thomas Farm and another near Brooks Hill.
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:SNR, NJ:S2S3, NY:SNR, PA:SNR, VA:S1
TNC Ecoregions: 59:C, 60:C, 61:C
USFS Ecoregions (2007): 211Fc:CCC, 221Bd:CCP, 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

Chesapeake & Ohio Canal National Historical Park Plots: (15 plots): CHOH.606, POTO_018.06, POTO_020.06, POTO_024.02, POTO_026.07, POTO_026.08, POTO_026.09, POTO_027.04, POTO_028.02, POTO_028.04, POTO_030.01, POTO_031.01, POTO_031.03, POTO_031.08, POTO_031.11.
George Washington Memorial Parkway Plots: TURK_006, TURK_054.
Monocacy National Battlefield Plots: MONO_545

Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Monocacy National Battlefield Description Author(s): J. Teague
Global Description Author(s): S.C. Gawler and G.P. Fleming
References: Eastern Ecology Working Group n.d.*, Edinger et al. 2014a, Eyre 1980, Fleming 2007, Fleming and Coulling 2001, Fleming and Patterson 2009b, Fleming and Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Harrison and Stango 2003, Lea 2000, Perles et al. 2007, Perles et al. 2008, Rawinski et al. 1996, Thomson et al. 1999

[CEGL006492] *Liriodendron tulipifera - Acer negundo - (Platanus occidentalis) / Carpinus caroliniana / Polygonum virginianum* Floodplain Forest

Translated Name: **Tuliptree - Box-elder - (American Sycamore) / American Hornbeam / Jumpseed Floodplain Forest**
Common Name: **Northern Piedmont Small Stream Floodplain Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	East-Central Floodplain Forest (G673)
Alliance	*Platanus occidentalis - Fraxinus pennsylvanica - Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance (A3701)

Element Concept

Global Summary: This community occupies floodplains and terraces of medium-sized streams (large streams and small rivers) in the Piedmont of Maryland and Virginia. These floodplains are moderately extensive and subject to frequent overflow, but topographically fairly homogeneous. In these habitats, the alluvial landforms (e.g., levees, backswamps) are poorly developed or occur at very small scales. Hydrologic regime is temporarily flooded. Soils are generally alluvial silt loams and sands washed from various metamorphic and igneous rocks. This association is a closed forest with consistent overstory codominance by *Liriodendron tulipifera* (tuliptree) in variable combinations with other trees. *Acer negundo* (box-elder), *Acer rubrum* (red maple), or both are characteristic in the overstory or understory. *Platanus occidentalis* (American sycamore) varies from codominant to absent. Other trees that may be important in some stands include *Juglans nigra* (black walnut), *Fraxinus pennsylvanica* (green ash), *Fraxinus americana* (white ash), *Carya cordiformis* (bitternut hickory), *Ulmus americana* (American elm), *Betula nigra* (river birch), and *Quercus palustris* (pin oak). *Lindera benzoin* (northern spicebush), *Carpinus caroliniana* (American hornbeam), and, less constantly, *Asimina triloba* (pawpaw) and/or *Viburnum prunifolium* (blackhaw) dominate the shrub layer. Vines of *Toxicodendron radicans* (eastern poison-ivy) and other species may occur. Relatively diverse herb layers are composed of both mesophytic and hydrophytic species. Common herbs include *Arisaema triphyllum* (Jack in the pulpit), *Geum canadense* (white avens), *Polygonum virginianum* (jumpseed), *Carex amphibola* (eastern narrowleaf sedge), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Verbesina alternifolia* (wingstem), *Carex radiata* (eastern star sedge), *Carex blanda* (eastern woodland sedge), *Impatiens capensis* (orange jewelweed), *Boehmeria cylindrica* (small-spike false nettle), *Viola sororia* (common blue violet), and *Symphyotrichum lateriflorum* (calico aster). Although less constant, *Elymus virginicus* (Virginia wildrye), *Claytonia virginica* (Virginia springbeauty), and *Erythronium americanum* (dogtooth violet) form dominance patches in some stands. Because land-use effects (agriculture, grazing, utility corridors in and near the floodplain, excessively frequent flooding and sediment deposition following watershed development) frequently disturb the habitat, the herb layer is often weedy and is commonly dominated by the exotic grass *Microstegium vimineum* (Nepalese browntop).

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This tuliptree - red maple forest was sampled at three locations in the park. Sites are flat alluvial plaints with moderately well- to well-drained sand, silty clay, and clay loam soil. The unvegetated surface is dominated by leaf litter (18-89% cover) or bare soil (1-80%), with wood (2-20%). Evidence of disturbance includes the presence of exotic species.
George Washington Memorial Parkway Environment: Northern Piedmont Small Stream Floodplain Forest has a very limited distribution in the Potomac Gorge section of the George Washington Memorial Parkway due to poor floodplain development along the relatively high-gradient, lower-order streams draining the area. Most occurrences are on the peripheries of the gorge proper along the larger tributaries. Sites for this community probably vary in

flooding regime, with some areas overflowed several times annually and others overflowed only rarely. There is some marginal development of levee and slough microtopography along the larger streams such as Difficult Run and Dead Run, but not enough to generate significant within-stand variation in vegetation composition. Soils collected from plots differ strongly from those of the Potomac River floodplains in their low pH (mean = 4.8), moderate to low base cation status, relatively low sand content, and high clay content (mean = 21.5%).

Manassas National Battlefield Park Environment: Northern Piedmont Small Stream Floodplain Forest occupies active alluvial floodplains along well-defined stream channels throughout the park. It primarily occurs along Youngs Branch and a few other secondary streams. Sites are moderately well-drained and probably inundated by temporary but major floods every 1-3 years. Soils are acidic, reddish-brown, alluvial silt loams.

Rock Creek Park Environment: This floodplain forest is found alongside creeks and tributaries on land that is temporarily flooded when those waterways overflow their banks. This forest may be flooded as often as multiple times a year, or only at intervals greater than several years, depending on its position in the floodplain landscape. The floodplain supports many different landscape positions, such as the floodway, depositional bars, natural levee, and the floodplain terrace. On larger rivers, each of these landscape positions may form large enough areas to support individual communities, but on smaller rivers and creeks, such as Rock Creek, these are all often encompassed within a single community, e.g., *~Liriodendron tulipifera - Acer (rubrum*, *negundo) - (Platanus occidentalis) / Carpinus caroliniana / Polygonum virginianum* Forest (CEGL006492)$$. Riverbanks many be sandy and stony, but the soils on the floodplains beyond them are fine-textured and nutrient-rich. Soils vary greatly within this community. On floodplain terraces, soils are fertile silt loams, enriched with fine-textured alluvium, i.e., nutrient-rich sediment deposited by slowly receding floodwaters. Fast-moving floodwaters along the floodway dump much coarser, heavier alluvial sediments, by contrast, making shifting sand, gravel and cobble bars a common feature of this landscape. These bars are present as islands in the active stream channel, and along the banks as crescent-shaped areas (called point bars) on the inside of stream bends. Here the sediments deposited sometimes form small natural levees, altering the path of the water's flow. Soils associated with floodplains may fluctuate between flooded, saturated and dry.

Wolf Trap National Park for the Performing Arts Environment: Northern Piedmont Small Stream Floodplain Forest occurs on the floodplain of Wolftrap Creek and along other small drainages in the park. This habitat probably overflows only briefly in major flood events. Soils are recently deposited alluvium that lacks profile development and varies from sandy to silty, with locally abundant gravel.

Global Environment: This community occupies floodplains and terraces of medium-sized streams (large streams and small rivers). These floodplains are moderately extensive and subject to frequent overflow, but topographically fairly homogeneous. In these habitats, the alluvial landforms (e.g., levees, backswamps) are poorly developed or occur at very small scales. Hydrologic regime is temporarily flooded, and the mean flood return interval is thought to be roughly once or twice a year but may vary with stream order and position in the watershed. Soils are generally alluvial silt loams and sands washed from various metamorphic and igneous rocks. Samples collected from plots have moderately high calcium, magnesium, and total base saturation levels.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: There may be a sparse to moderate (10-60% cover) emergent canopy, >35 m tall, that may include *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore), and *Quercus velutina* (black oak). The sparse to very dense (20-80+%) tree canopy (20-35 m) includes *Acer rubrum* (red maple), *Carya ovata* (shagbark hickory), and *Quercus michauxii* (swamp chestnut oak), among others. The sparse (20-40%) subcanopy (10-20 m) includes *Betula nigra* (river birch) and *Carpinus caroliniana* (American hornbeam). The sparse (20-40%) tall-shrub layer (6-10 m) and short-shrub (1-6 m) layers are dominated by *Asimina triloba Lindera benzoin*, and *Carpinus caroliniana* (American hornbeam). The herbaceous layer (<5-80+%) is dominated by exotic species *Alliaria petiolata* (garlic mustard), *Glechoma hederacea* (ground ivy), *Microstegium vimineum* (Nepalese browntop), and *Polygonum cespitosum var. longisetum* (oriental ladysthumb). A total of 11 exotic species were reported from sampled stands. This community also supports two Maryland state-vulnerable species.

George Washington Memorial Parkway Vegetation: The vegetation represents tall (mean canopy height 35 m [115 feet]), closed-canopy forests. *Liriodendron tulipifera* (tuliptree) and *Acer rubrum* (red maple) are the leading overstory dominants, with *Fraxinus pennsylvanica* (green ash) and *Ulmus americana* (American elm) occurring as constant associates. *Populus deltoides ssp. deltoides* (eastern cottonwood) and *Juglans nigra* (black walnut) are minor overstory trees in one stand each. Climbing lianas of *Vitis vulpina* (frost grape) and *Toxicodendron radicans* (eastern poison-ivy) are common. *Acer rubrum* (red maple), *Carpinus caroliniana* (American hornbeam), and *Asimina triloba* (pawpaw) are the most characteristic subcanopy trees, while *Acer negundo* (box-elder) and *Fraxinus*

americana (white ash) are important in the understory at one site each. *Fagus grandifolia* (American beech) is also a constant but minor small tree on better-drained hummocks and berms. The shrub layer is open (32% mean stratum cover) and mixed, with *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Viburnum prunifolium* (blackhaw), and *Lindera benzoin* (northern spicebush) variably important. The herb layer is quite dense (66% mean stratum cover), containing a mixture of spring ephemerals, sedges, summer-green forbs, and low plants of *Toxicodendron radicans* (eastern poison-ivy) and *Lonicera japonica* (Japanese honeysuckle). *Erythronium americanum ssp. americanum* (dogtooth violet) and *Claytonia virginica* (Virginia springbeauty) are the most constant and abundant early-flowering ephemerals. Other more-or-less constant and characteristic herbs include *Polygonum virginianum* (jumpseed), *Carex radiata* (eastern star sedge), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Arisaema triphyllum* (Jack in the pulpit), *Carex amphibola* (eastern narrowleaf sedge), *Impatiens capensis* (orange jewelweed), *Geum canadense* (white avens), and *Carex laxiculmis var. copulata* (spreading sedge). *Sedum ternatum* (woodland stonecrop) and *Packera aurea* (golden ragwort) each have high cover in one plot. Total species richness ranges from 45 to 61 taxa per 400 square meters.

Manassas National Battlefield Park Vegetation: The forest canopy is dominated by *Platanus occidentalis* (American sycamore), *Liriodendron tulipifera* (tuliptree), and *Juglans nigra* (black walnut), and common associates are *Ulmus rubra* (slippery elm) and *Carya cordiformis* (bitternut hickory). *Acer negundo* (box-elder) often dominates the subcanopy. Additional subcanopy species include *Celtis occidentalis* (common hackberry), *Asimina triloba* (pawpaw), and *Fraxinus pennsylvanica* (green ash). Vines such as *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax rotundifolia* (roundleaf greenbrier) are often present and can reach up into the canopy. The shrub layer is often sparse, and the most common shrub species are *Carpinus caroliniana* (American hornbeam), *Lindera benzoin* (northern spicebush), and *Asimina triloba* (pawpaw). The herb stratum of this community is dense, with a diversity of forbs and grasses in less disturbed stands. Herb species that often have high cover and are indicative of this community include *Amphicarpaea bracteata* (American hogpeanut), *Carex amphibola* (eastern narrowleaf sedge), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Dichanthelium clandestinum* (deertongue), *Elymus virginicus* (Virginia wildrye), *Elymus riparius* (riverbank wildrye), *Elymus villosus* (hairy wildrye), *Festuca subverticillata* (nodding fescue), *Geum canadense* (white avens), *Polygonum virginianum* (jumpseed), *Verbesina alternifolia* (wingstem), and *Vernonia noveboracensis* (New York ironweed). The herb layer of disturbed stands, or of stands near forest edges, is often dominated by the exotic *Microstegium vimineum* (Nepalese browntop).

Rock Creek Park Vegetation: This community is a mosaic of a forest matrix with smaller non-forested areas occurring alongside the natural streams and tributaries at Rock Creek Park. Open, flood-scoured sand or gravel bars with grasses and sedges can occur in and near stream channels. Clustered at the water's edge in places may be smooth alder shrubs. Forests of the floodplain terrace are characterized by deciduous hardwood trees suited to growing in sometimes flooded soils. You can expect to see some combination of *Platanus occidentalis* (American sycamore), *Betula nigra* (river birch), *Acer negundo* (box-elder), *Fraxinus pennsylvanica* (green ash), and *Ulmus americana. Liriodendron tulipifera*, though not tolerant of waterlogged soil, is also common here, but found on better drained parts of the landscape, along with an occasional *Fraxinus americana. Acer rubrum*, *Acer negundo* (box-elder), and *Carpinus caroliniana* (American hornbeam) are generally the most common trees in the understory of this natural community. *Lindera benzoin* (northern spicebush) is common in the shrub layer, and *Staphylea trifolia* (American bladdernut) and *Asimina triloba* (pawpaw) are occasionally present. The field layer is dominated by herbaceous plants. Spring ephemerals, such as *Claytonia virginica* (Virginia springbeauty), *Erythronium americanum* (dogtooth violet), *Mertensia virginica* (Virginia bluebells), and *Dicentra cucullaria* (Dutchman's breeches), can cover large patches of ground. At Rock Creek Park, the field layer of this community is often dominated by the invasive exotic plant *Ranunculus ficaria* (fig buttercup). A few scattered *Symplocarpus foetidus* (skunk-cabbage) plants can be found growing here and there along the creek in spring, disappearing by mid-summer. Throughout the spring, summer and fall, many other native herbs, such as *Laportea canadensis* (Canadian woodnettle), *Impatiens capensis* (orange jewelweed), and *Arisaema triphyllum* (Jack in the pulpit), bloom.

Wolf Trap National Park for the Performing Arts Vegetation: This temporarily flooded forest has a mixed canopy and typically occurs in Wolf Trap National Park as a disturbed forest with high cover of exotic species. Common canopy species include *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore), and *Quercus alba* (white oak). A distinct subcanopy is not always present, but subcanopy species include *Acer rubrum* (red maple), *Betula nigra* (river birch), and *Carpinus caroliniana* (American hornbeam). Vines such as *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax rotundifolia* (roundleaf greenbrier) are common and can reach up into the subcanopy or canopy. The most abundant shrub species are *Carpinus caroliniana* (American

hornbeam), *Lindera benzoin* (northern spicebush), and *Lonicera japonica* (Japanese honeysuckle). The herb stratum of this community is very diverse with no one dominant species. Herb species that often have high cover include *Thelypteris noveboracensis* (New York fern), *Boehmeria cylindrica* (small-spike false nettle), *Microstegium vimineum* (Nepalese browntop), and *Carex* (sedge) spp. Other herbaceous species indicative of this community include *Leersia virginica* (whitegrass), *Impatiens capensis* (orange jewelweed), *Osmunda cinnamomea* (cinnamon fern), and *Cinna arundinacea* (sweet woodreed). Additional common exotic species include *Alliaria petiolata* (garlic mustard), *Fallopia japonica var. japonica* (Japanese knotweed), and *Celastrus orbiculatus* (oriental bittersweet). Disturbed stands, or stands near forest edges, tend to have cover of additional exotic species such as *Rosa multiflora* (multiflora rose). In areas where woody exotic vines (e.g., *Lonicera japonica* (Japanese honeysuckle)) dominate, herb cover and diversity will be lower.

Global Vegetation: This association is a closed forest with consistent overstory codominance by *Liriodendron tulipifera* (tuliptree) in variable combinations with other trees. *Acer negundo* (box-elder), *Acer rubrum* (red maple), or both are characteristic in the overstory or understory. *Platanus occidentalis* (American sycamore) varies from codominant to absent. Other trees that may be important in some stands include *Juglans nigra* (black walnut), *Fraxinus pennsylvanica* (green ash), *Fraxinus americana* (white ash), *Carya cordiformis* (bitternut hickory), *Ulmus americana* (American elm), *Betula nigra* (river birch), and *Quercus palustris* (pin oak). *Lindera benzoin* (northern spicebush), *Carpinus caroliniana* (American hornbeam), and, less constantly, *Asimina triloba* (pawpaw) and/or *Viburnum prunifolium* (blackhaw) dominate the shrub layer. Vines of *Toxicodendron radicans* (eastern poison-ivy) and other species may occur. Relatively diverse herb layers are composed of both mesophytic and hydrophytic species. The most constant herbs in 15 Virginia and Maryland plot samples were *Arisaema triphyllum* (Jack in the pulpit), *Geum canadense* (white avens), *Polygonum virginianum* (jumpseed), *Carex amphibola* (eastern narrowleaf sedge), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Verbesina alternifolia* (wingstem), *Carex radiata* (eastern star sedge), *Carex blanda* (eastern woodland sedge), *Impatiens capensis* (orange jewelweed), *Boehmeria cylindrica* (small-spike false nettle), *Viola sororia* (common blue violet), and *Symphyotrichum lateriflorum* (calico aster). Although less constant, *Elymus virginicus* (Virginia wildrye), *Claytonia virginica* (Virginia springbeauty), and *Erythronium americanum* (dogtooth violet) form dominance patches in some stands. Because land-use effects (agriculture, grazing, utility corridors in and near the floodplain, excessively frequent flooding and sediment deposition following watershed development) frequently disturb the habitat, the herb layer is often weedy and is commonly dominated by the exotic grass *Microstegium vimineum* (Nepalese browntop).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera* (tuliptree)
Tree subcanopy	Broad-leaved deciduous tree	*Acer negundo* (box-elder), *Acer rubrum* (red maple)
Shrub/sapling (tall & short)	Liana	*Toxicodendron radicans* (eastern poison-ivy)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Carpinus caroliniana* (American hornbeam), *Lindera benzoin* (northern spicebush)
Herb (field)	Flowering forb	*Arisaema triphyllum* (Jack in the pulpit), *Boehmeria cylindrica* (small-spike false nettle), *Circaea lutetiana* ssp. *canadensis* (broadleaf enchanter's nightshade), *Geum canadense* (white avens), *Impatiens capensis* (orange jewelweed), *Polygonum virginianum* (jumpseed), *Symphyotrichum lateriflorum* (calico aster), *Verbesina alternifolia* (wingstem), *Viola sororia* (common blue violet)
Herb (field)	Graminoid	*Carex amphibola* (eastern narrowleaf sedge), *Carex blanda* (eastern woodland sedge), *Carex radiata* (eastern star sedge)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Acer rubrum* (red maple), *Carpinus caroliniana* (American hornbeam), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore)

George Washington Memorial Parkway: *Acer rubrum* (red maple), *Carex amphibola* (eastern narrowleaf sedge), *Carex radiata* (eastern star sedge), *Carpinus caroliniana* (American hornbeam), *Liriodendron tulipifera* (tuliptree), *Polygonum virginianum* (jumpseed)
Manassas National Battlefield Park: *Acer negundo* (box-elder), *Elymus virginicus* (Virginia wildrye), *Juglans nigra* (black walnut), *Platanus occidentalis* (American sycamore), *Verbesina alternifolia* (wingstem), *Vernonia noveboracensis* (New York ironweed)
Rock Creek Park: *Acer negundo* (box-elder), *Betula nigra* (river birch), *Fraxinus pennsylvanica* (green ash), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore), *Ulmus americana* (American elm)
Wolf Trap National Park for the Performing Arts: *Carpinus caroliniana* (American hornbeam), *Fraxinus pennsylvanica* (green ash), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore)
Global: *Betula nigra* (river birch), *Carpinus caroliniana* (American hornbeam), *Carya cordiformis* (bitternut hickory), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), *Lindera benzoin* (northern spicebush), *Quercus palustris* (pin oak), *Ulmus americana* (American elm)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Carex hirtifolia* (pubescent sedge, G5, MD-vulnerable), *Galium concinnum* (shining bedstraw, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Berberis vulgaris* (common barberry, Medium/Low), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
George Washington Memorial Parkway: Vulnerable Plants: *Phacelia covillei* (Coville's phacelia, G3, VA state-critically imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low), *Veronica hederifolia* (ivyleaf speedwell)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Poa trivialis* (rough bluegrass, Medium/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Stellaria media* (common chickweed, Low)
Rock Creek Park: Invasive/Exotic Plants: *Acer palmatum* (Japanese maple, Low/Insignificant), *Acer platanoides* (Norway maple, High/Medium), *Ailanthus altissima* (tree of heaven, Medium), *Albizia julibrissin* (silktree, High/Low), *Alliaria petiolata* (garlic mustard, High/Medium), *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Berberis thunbergii* (Japanese barberry, High/Medium), *Berberis vulgaris* (common barberry, Medium/Low), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Euonymus alatus* (burningbush, Low), *Euonymus fortunei* (winter creeper, High/Medium), *Fallopia japonica* var. *japonica* (Japanese knotweed, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Humulus japonicus* (Japanese hop, Medium/Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Paulownia tomentosa* (princesstree, Medium/Low), *Perilla frutescens* (beefsteakplant, Low), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Prunus subhirtella* (winter-flowering cherry), *Ranunculus ficaria* (fig buttercup, Medium/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Viburnum dilatatum* (linden arrow-wood), *Viburnum plicatum* (Japanese snowball), *Vinca minor* (common periwinkle, Low), *Wisteria sinensis* (Chinese wisteria, Medium)
Wolf Trap National Park for the Performing Arts: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Global: Vulnerable Plants: *Phacelia covillei* (Coville's phacelia, G3); **Invasive/Exotic Plants**: *Microstegium vimineum* (Nepalese browntop, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (16-Apr-2007). More information is needed to rank this community.

RELATED CONCEPTS

Global Similar Types:

- *Fraxinus pennsylvanica - Platanus occidentalis - Celtis laevigata / Chasmanthium latifolium* Piedmont Floodplain Forest (CEGL007013)
- *Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin / Arisaema triphyllum* Floodplain Forest (CEGL004418) on average occurs on smaller-order streams and floodplains with more nutrient-poor soils; its distribution in the mid-Atlantic states is more coastal and southern.
- *Liriodendron tulipifera - Acer negundo* Ruderal Forest (CEGL007184) a more southern successional forest developing on formerly cleared floodplains and uplands.
- *Platanus occidentalis - Acer negundo - Juglans nigra / Asimina triloba / Mertensia virginica* Floodplain Forest (CEGL004073) occurs on larger streams with more calcareous soils.
- *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Floodplain Forest (CEGL006458)
- *Platanus occidentalis - Fraxinus pennsylvanica* Floodplain Forest (CEGL006036)
- *Platanus occidentalis - Liquidambar styraciflua / Carpinus caroliniana - Asimina triloba* Floodplain Forest (CEGL007340) southern Piedmont analogue of CEGL006492; habitats and composition are similar, but austral species such as *Liquidambar styraciflua* (sweetgum), *Quercus phellos* (willow oak), *Ilex decidua* (possum-haw), *Aesculus sylvatica* (painted buckeye), and *Arundinaria gigantea* (giant cane) are prominent.

Global Related Concepts:

- *Liriodendron tulipifera - Acer (rubrum, negundo) - (Platanus occidentalis) / Carpinus caroliniana / Polygonum virginianum* Forest (Lea 2004) =
- *Liriodendron tulipifera - Fraxinus pennsylvanica - (Platanus occidentalis) / Carpinus caroliniana - Lindera benzoin / Geum canadense* Forest (Fleming and Patterson 2003) =

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Chesapeake & Ohio Canal National Historical Park Classification Comments: Northern Piedmont Small Stream Floodplain Forest is sometimes referred to as Tuliptree Small-Stream Floodplain Forest.

George Washington Memorial Parkway Classification Comments: Northern Piedmont Small Stream Floodplain Forest, also referred to as Tuliptree Small-Stream Floodplain Forest, differs from other floodplain forests of the area by its occurrence on smaller-stream floodplains at higher topographic positions and by the dominance or codominance of *Acer rubrum* (red maple) in the overstory (this species is rare in the large river floodplains along the Potomac). It can be distinguished from Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest (CEGL006406), which is also dominated by *Acer rubrum* (red maple), by its better-drained floodplain habitats and its mesophytic herbaceous flora. The seepage swamp forest occupies saturated, seasonally wet habitats and has an herbaceous flora dominated by obligate wetland species such as *Symplocarpus foetidus* (skunk-cabbage) and *Saururus cernuus* (lizard's-tail).

This community was classified during the National Capital Region (NCR) parks vegetation mapping project, and more inventory and plot data are needed to make its circumscription more robust. *Platanus occidentalis* (American sycamore), which is nearly absent from the Potomac Gorge stands, appears to be more important in western Piedmont floodplains that have coarser-textured soils.

George Washington Memorial Parkway Other Comments: This community has not been reported from the Maryland / District of Columbia side of the Potomac Gorge but probably occurs along some of the larger tributaries (e.g., Cabin John Creek, Rock Run, Carroll Branch) on the periphery of the area.

Manassas National Battlefield Park Classification Comments: The overstory of this type, Northern Piedmont Small Stream Floodplain Forest, is similar to Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073), and both types occur along active alluvial floodplains in the park. This type is distinguished by a lack of spring ephemerals and an herb layer dominated by *Microstegium vimineum* (Nepalese browntop) and/or summer-green forbs and grasses. In addition, while *Asimina triloba* (pawpaw) is often present in the shrub layer, it does not form dense colonies. Piedmont-Central Appalachian Rich Floodplain Forest is confined to well-drained levees along Bull Run and contains dense colonies of *Asimina triloba* (pawpaw) and spring ephemerals.

Rock Creek Park Classification Comments: Diagnostic features of this community include *Platanus occidentalis* (American sycamore) in the canopy, along with *Acer negundo* (box-elder), *Betula nigra* (river birch), *Fraxinus pennsylvanica* (green ash), and *Ulmus americana* (American elm). Fragrant *Lindera benzoin* (northern spicebush) is a typical shrub. *Laportea canadensis* (Canadian woodnettle) may be common in the field layer. Showy

spring wildflowers are common in this community as is, unfortunately, the invasive exotic *Ranunculus ficaria* (fig buttercup), most obvious in early spring. Rock Creek's Northern Piedmont Small Stream Floodplain Forest (CEGL006492), also referred to as Tuliptree Small-Stream Floodplain Forest, can be distinguished from all of the other forest communities in Rock Creek Park by its unique assemblage of plant species that can tolerate both wet and dry soil conditions and lack of species that can't (such as *Fagus grandifolia* (American beech) that is so common elsewhere in the park).

Rock Creek Park Other Comments: The Rock Creek watershed and other nearby watersheds have been altered over time by human use. Ever-increasing volumes of stormwater must flow across pavement into storm drains that empty directly into creeks. Excess stormwater runoff not only carries chemical contaminants and other pollutants from urban and agricultural sources, but produces more frequent and damaging floods, as well as a host of longer-term changes to the floodplain that threaten to degrade Northern Piedmont Small Stream Floodplain Forest (CEGL006492). Non-native invasive plants are particularly abundant pests. During floods, seeds or other reproducing parts (such as bulbs) of ornamental or weedy non-native invasive plants may be washed into the creek from residential areas and woods upstream, along with species native to the floodplain. As floodwaters recede, these reproductive plant parts are deposited in the floodplains and may take root. Historically, a distinctive and beautiful display of native spring wildflowers bloomed on the spacious floodplain along the banks of Rock Creek near Boundary Bridge (at the northern boundary of the park). But now they have largely been displaced by a carpet of *Ranunculus ficaria* (fig buttercup), an aggressive non-native plant that emerges green early in spring and flowers yellow along many of Rock Creek's floodplains. After several weeks it goes dormant and remains underground until early spring the next year. Many other species of rampant invasives also plague this community.

Wolf Trap National Park for the Performing Arts Classification Comments: Northern Piedmont Small Stream Floodplain Forest, also referred to as Tuliptree Small-Stream Floodplain Forest, can be recognized by its occurrence on floodplains and stream terraces, its mixed canopy composition, and its temporarily flooded hydrology.

Wolf Trap National Park for the Performing Arts Other Comments: Northern Piedmont Small Stream Floodplain Forest is often quite disturbed in Wolf Trap National Park and occurs in the same landscape position as Northern Coastal Plain Ruderal Floodplain Forest (CEGL006976). It can be distinguished primarily based on its mixed canopy composition (not solely dominated by *Betula nigra* (river birch) and *Acer rubrum* (red maple) as in CEGL006976).

Global Classification Comments: Classification of this type is supported by 15 Virginia and Maryland plot samples analyzed during the Nation Capital Region vegetation mapping project, plus additional observational data. The collection of additional data from across the full range would assist in refining the description of this type and its full range of compositional variation. However, the smaller floodplains supporting this type are typically low priorities for sampling or research, in part because they are highly disturbed and good examples are hard to locate.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled at Wattle Branch and Muddy Branch Park, Pennyfield (Canal mile 18-21) and just below Great Falls (Canal mile 12).

George Washington Memorial Parkway Range: Northern Piedmont Small Stream Floodplain Forest is known from several sites in George Washington Memorial Parkway: along Difficult Run and a tributary of Mine Run in Great Falls Park; along upper Dead Run in Turkey Run Park; and along Pimmit Run above Chain Bridge. This type is also represented along stream-laced portions of the high bedrock terrace downstream from the picnic area at Great Falls Park, where it occurs in patch-mosaics with more poorly drained swamp forests.

Manassas National Battlefield Park Range: Northern Piedmont Small Stream Floodplain Forest occurs primarily along Youngs Branch and its tributaries, with a few scattered examples on secondary streams of Bull Run.

Rock Creek Park Range: This natural community is common at Rock Creek Park. The largest example in Rock Creek Park is near its northwestern boundary, on the fairly broad, flat floodplain of Rock Creek along the Valley Trail, between Boundary Bridge and West Beach Drive. Smaller and more typically narrow examples of this floodplain community can be found downstream (to the south), where Rock Creek enters a narrow gorge shortly beyond Fenwick Branch. From here south, the narrowed valley confines this community to less extensive sites alongside the creek or its unchannelized tributaries. Another good example of this community is in the southern end of Battery Kemble Park, along Battery Kemble Run, a waterway not connected with Rock Creek.

Wolf Trap National Park for the Performing Arts Range: Northern Piedmont Small Stream Floodplain Forest occurs on the floodplain along Wolf trap Creek, which runs along the outer periphery of the park.

Global Range: This association is known from the Piedmont of Maryland and Virginia. In Virginia, it is the principal small floodplain forest in the northern and western Piedmont.

Nations: US

States/Provinces: DC:SNR, MD:SNR, VA:S3?
TNC Ecoregions: 52:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, 221Dd:CCC, 221De:CCC, 231Ib:CCC
Federal Lands: NPS (Appomattox Court House, Booker T. Washington, C&O Canal, George Washington Parkway, Manassas, Rock Creek, Wolf Trap)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (3 plots): CHOH.221, CHOH.231, CHOH.236.
George Washington Memorial Parkway Plots: GFNP_038, TURK_045, TURK_053.
Manassas National Battlefield Park Plots: MANA.39, MANA.40.
Rock Creek Park Plots: ROCR.3.
Wolf Trap National Park for the Performing Arts Plots: None.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
Rock Creek Park Description Author(s): J. Teague
Wolf Trap National Park for the Performing Arts Description Author(s): K. Taverna
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d., Fleming 2007, Fleming and Patterson 2003, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2004, Lea 2004*, NRCS 2006b, Patterson 2008a, Patterson 2008b

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[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	East-Central 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* (tuliptree) is generally a constant codominant, while *Platanus occidentalis* (American sycamore) is usually scattered and occasionally abundant. Other species that are important in some stands include *Acer negundo* (box-elder), *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Betula nigra* (river birch), *Carya cordiformis* (bitternut hickory), *Carya ovata* (shagbark hickory), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Tilia americana* (American basswood), *Tsuga canadensis* (eastern hemlock), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). The understory contains saplings of the overstory species, along with *Asimina triloba*

(pawpaw), *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), *Corylus* (hazelnut) spp., *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush), *Ostrya virginiana* (hophornbeam), and *Viburnum prunifolium* (blackhaw). The herb layer is very diverse and dominated by numerous upland mesophytic species. Wet microhabitats typically support *Impatiens capensis* (orange jewelweed), *Carex intumescens* (greater bladder sedge), *Carex tribuloides* (blunt broom sedge), *Glyceria striata* (fowl mannagrass), *Thalictrum pubescens* (king-of-the-meadow), *Viola cucullata* (marsh blue violet), and few other wetland plants.

Environmental Description

Catoctin Mountain Park Environment: This forest type occupies linear stretches of watercourse floodplains on alluvial soils. It occurs most frequently on the Catoctin Formation, where it is situated downslope from High Allegheny Rich Red Oak - Sugar Maple Forest (CEGL006125) and Ruderal Tuliptree Forest (Rich Type) (CEGL007220), and in one location, adjacent to Hemlock - Transitional Northern Hardwood Forest (CEGL006639) (formerly classified as Hemlock - Northern Hardwood Forest, CEGL006109). It also occurs downslope from Central Appalachian Hemlock - Chestnut Oak Forest (CEGL006923) in one location in the southeastern portion of the park on the Weverton and Harpers formations. On broader flats adjacent to the floodplain, Central Appalachian Basic Seepage Swamp Forest (CEGL008416) stands may be in close association with or transitional to Northern Blue Ridge Montane Alluvial Forest (CEGL006255). The substrate is usually rocky, and soils are moderately well-drained sand, gravel, or loam or silt loam with mottling noted near the surface, indicating periodic inundation. Mineral soil is often exposed on the surface, and exposed boulders and rocks are evident on flood-scoured banks beneath terraces of several meters in height. Flood-deposited debris can be seen on tree trunks 1.5 m from the ground surface.

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

Catoctin Mountain Park Vegetation: *Liriodendron tulipifera* (tuliptree) is the most frequent and, in some cases, the only tree in the canopy. *Platanus occidentalis* (American sycamore), *Fraxinus americana* (white ash), *Acer rubrum* (red maple), *Carya ovata* (shagbark hickory), and *Quercus rubra* (northern red oak) are frequent canopy associates. *Tsuga canadensis* (eastern hemlock) may be present where Hemlock - Transitional Northern Hardwood Forest (CEGL006639) or Central Appalachian Hemlock - Chestnut Oak Forest (CEGL006923) are found on the adjacent slopes. The subcanopy is variable in composition, including *Betula lenta* (sweet birch), *Tilia americana* (American basswood), and *Carpinus caroliniana* (American hornbeam). The shrub layer may be poorly developed and, when present, is characterized by *Lindera benzoin* (northern spicebush) and, less commonly, *Hamamelis virginiana* (American witch-hazel). The herbaceous layer is similarly variable in composition, but *Arisaema triphyllum* (Jack in the pulpit) and *Impatiens capensis* (orange jewelweed) are almost always present. Frequent associates include *Circaea lutetiana* (broadleaf enchanter's nightshade), *Erythronium americanum* (dogtooth violet), *Eurybia divaricata* (white wood aster), *Polystichum acrostichoides* (Christmas fern), *Symplocarpus foetidus* (skunk-cabbage), and *Toxicodendron radicans* (eastern poison-ivy). Other herbs that may be found are *Allium vineale* (wild garlic), *Amphicarpaea bracteata* (American hogpeanut), *Boehmeria cylindrica* (small-spike false nettle), *Brachyelytrum erectum* (bearded shorthusk), *Cardamine concatenata* (cutleaf toothwort), *Conopholis americana* (American cancer-root), *Dioscorea quaternata* (fourleaf yam), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Leersia virginica* (whitegrass), *Onoclea sensibilis* (sensitive fern), *Osmunda cinnamomea* (cinnamon fern), *Ranunculus recurvatus* (blisterwort), *Thalictrum pubescens* (king-of-the-meadow), *Thelypteris noveboracensis* (New York fern), and *Viola pubescens* (downy yellow violet). Invasive exotic sepecies may occur as well, including *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop) (which may be dominant), and *Polygonum cespitosum var. longisetum* (oriental ladysthumb).

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* (tuliptree) is generally a constant

codominant, while *Platanus occidentalis* (American sycamore) is usually scattered and occasionally abundant. Other species that are important in some stands include *Acer negundo* (box-elder), *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Betula nigra* (river birch), *Carya cordiformis* (bitternut hickory), *Carya ovata* (shagbark hickory), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak), *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Tilia americana* (American basswood), *Tsuga canadensis* (eastern hemlock), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). The understory contains saplings of the overstory species, along with *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), *Corylus* (hazelnut) spp., *Hamamelis virginiana* (American witch-hazel), *Lindera benzoin* (northern spicebush), *Ostrya virginiana* (hophornbeam), and *Viburnum prunifolium* (blackhaw). The herb layer is very diverse and dominated by numerous upland mesophytic species. Wet microhabitats typically support Impatiens capensis, *Carex intumescens* (greater bladder sedge), *Carex tribuloides* (blunt broom sedge), *Glyceria striata* (fowl mannagrass), *Thalictrum pubescens* (king-of-the-meadow), *Viola cucullata* (marsh blue violet), 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* (Nepalese browntop).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin* (northern spicebush)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Acer rubrum* (red maple), *Arisaema triphyllum* (Jack in the pulpit), *Betula lenta* (sweet birch), *Carpinus caroliniana* (American hornbeam), *Carya ovata* (shagbark hickory), *Circaea lutetiana* ssp. *canadensis* (broadleaf enchanter's nightshade), *Claytonia virginica* (Virginia springbeauty), *Erythronium americanum* (dogtooth violet), *Eurybia divaricata* (white wood aster), *Impatiens capensis* (orange jewelweed), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore), *Polystichum acrostichoides* (Christmas fern), *Quercus rubra* (northern red oak), *Symplocarpus foetidus* (skunk-cabbage), *Toxicodendron radicans* (eastern poison-ivy)
Global: *Amphicarpaea bracteata* (American hogpeanut), *Arisaema triphyllum* (Jack in the pulpit), *Betula lenta* (sweet birch), *Carpinus caroliniana* (American hornbeam), *Circaea lutetiana* ssp. *canadensis* (broadleaf enchanter's nightshade), *Impatiens capensis* (orange jewelweed), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore), *Polystichum acrostichoides* (Christmas fern), *Thelypteris noveboracensis* (New York fern), *Toxicodendron radicans* (eastern poison-ivy)

OTHER NOTEWORTHY SPECIES

Catoctin Mountain Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (05-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: 2 - Moderate
Catoctin Mountain Park Classification Comments: Northern Blue Ridge Montane Alluvial Forest is sometimes referred to simply as Montane Alluvial Forest. Where this association co-occurs with Central Appalachian Basic Seepage Swamp Forest (CEGL008416), distinguishing the two associations from each other may be difficult.
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

Catoctin Mountain Park Range: This community is found along many of the park's streams and creeks including Big Hunting Creek and Owens Creek.
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:SNR, VA:S3
TNC Ecoregions: 59:C
USFS Ecoregions (2007): 221Da:???, 221De:???, 231Ib:???, M221Ab:C??, M221Ad:C??, M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway, Catoctin Mountain, Shenandoah)

ELEMENT SOURCES

Catoctin Mountain Park Plots: CATO.009, CATO.012, CATO.47.
Catoctin Mountain Park Description Author(s): L. Sneddon
Global Description Author(s): G. Fleming
References: Eastern Ecology Working Group n.d.*, Fleming and Coulling 2001, Fleming and Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, 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	East-Central 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* (American sycamore), *Juglans nigra* (black walnut), *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Ulmus americana* (American elm), and, locally, *Fraxinus pennsylvanica* (green ash), *Liriodendron tulipifera* (tuliptree), and *Quercus shumardii* (Shumard oak). *Acer saccharinum* (silver maple) is codominant in a minority of stands but absent or unimportant in many others. *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. The herb layer is rich in spring ephemerals and other nutrient-demanding species, including *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), *Erythronium americanum* (dogtooth violet), *Dicentra canadensis* (squirrel corn), *Sanicula odorata* (clustered blacksnakeroot),

Packera aurea (golden ragwort), *Claytonia virginica* (Virginia springbeauty), *Festuca subverticillata* (nodding fescue), *Carex jamesii* (James' sedge), *Carex grisea* (inflated narrowleaf sedge), *Floerkea proserpinacoides* (false mermaidweed), *Osmorhiza longistylis* (longstyle sweetroot), and *Ranunculus abortivus* (littleleaf buttercup). Invasive exotics, especially *Alliaria petiolata* (garlic mustard), *Veronica hederifolia* (ivyleaf speedwell), *Duchesnea indica* (Indian strawberry), *Urtica dioica ssp. dioica* (stinging nettle), *Microstegium vimineum* (Nepalese browntop), and *Glechoma hederacea* (ground ivy), are usually abundant.

ENVIRONMENTAL DESCRIPTION

Antietam National Battlefield Environment: Riparian woodland or forest that occurs in the floodplain or on the banks of Antietam Creek or its tributaries.

Chesapeake & Ohio Canal National Historical Park Environment: This association occupies flat areas of floodplains, floodplain berms, and low terraces of the Potomac River. 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. The unvegetated surface is dominated by leaf litter (63% cover) with some exposed bedrock (2%), wood (30%), and bare soil (5%). Evidence of disturbance includes the presence of exotic species.

George Washington Memorial Parkway Environment: Piedmont-Central Appalachian Rich Floodplain Forest is the principal alluvial forest in the Potomac Gorge section of the George Washington Memorial Parkway, occupying slightly elevated floodplains both above Great Falls and below Mather Gorge. Most of these habitats are quite narrow, or even locally absent where cliffs and steep bluffs subtend the river. Where the type co-occurs with Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217), it generally occurs farther from the channel edges at elevations that have an average flood-return interval of 1.7 to 14 years and a 5 to 58% annual probability of flooding (Lea 2000). The majority of soils collected from plots are sandy loams, but a few are silt loams; all have moderately high to high calcium levels and 80-100% total base saturation, indicative of very high fertility.

Harpers Ferry National Historical Park Environment: Piedmont-Central Appalachian Rich Floodplain Forest is the principal alluvial forest in the park, occupying slightly elevated floodplains along the Potomac and Shenandoah rivers. Most of these habitats are quite narrow, or even locally absent where cliffs and steep bluffs subtend the river. Where the type co-occurs with Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217), it generally occurs farther from the channel edges at elevations that have an average flood-return interval of 1.7 to 14 years (Lea 2000). The majority of soils are sandy loams, and all have moderately high to high calcium levels, indicative of very high fertility.

Manassas National Battlefield Park Environment: Habitats of Piedmont-Central Appalachian Rich Floodplain Forest are elevated floodplain levees and terraces bordering Bull Run. These sites are probably completely inundated by temporary but major floods every 1-3 years but are otherwise moderately well-drained to well-drained. Soils from plot-sampling sites are very strongly acidic, reddish-brown, alluvial silt loams with moderately high calcium and magnesium levels and high manganese levels.

Monocacy National Battlefield Environment: This riparian woodland or forest occurs in the floodplain or on the banks of the Monocacy River. Vegetation is strongly influenced by periodic flooding. Soils are moderately well-drained loams and sandy loams. The unvegetated surface is dominated by leaf litter with small amounts of downed wood and bare soil.

National Capital Parks-East Environment: This association is found in the higher terraces of floodplains and similar situations, generally above and landward of the riverfront forests dominated by *Acer saccharinum* (silver maple) (Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217)). Examples at NACE are apparently restricted to a narrow zone adjacent to the Potomac River and along Piscataway Creek where they join at Fort Washington. Its polygons appear to be located in sediments deposited on the Cretaceous Potomac Formation.

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

Antietam National Battlefield Vegetation: Vegetation is strongly influenced by periodic flooding. *Platanus occidentalis* (American sycamore) is the dominant canopy species with *Acer saccharum* (sugar maple) as occasionally codominant. Typical associates include *Carya cordiformis* (bitternut hickory), *Ulmus americana* (American elm), *Fraxinus* (ash) spp., *Juglans nigra* (black walnut), and *Celtis occidentalis* (common hackberry). *Acer negundo* (box-elder) can be strongly dominant in the subcanopy. *Asimina triloba* (pawpaw) and/or *Lindera benzoin* (northern spicebush) dominate a moderately dense to dense shrub layer. The herb layer can be rich in spring ephemerals. Common herbaceous species include *Impatiens* (touch-me-not) spp., *Urtica dioica* (stinging nettle), *Asarum canadense* (Canadian wildginger), *Ranunculus* (buttercup) spp., *Viola* (violet) spp., and *Angelica atropurpurea* (purplestem angelica).

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderate to closed (40-75%) canopy (20-35 m) is made up of *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Fagus grandifolia* (American beech), *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), and *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm), . Some stands have a very dense (80+% cover), emergent canopy, >35 m tall, dominated by *Quercus shumardii* (Shumard oak) (Maryland state-imperiled). The moderate to very dense (40 -80+%) subcanopy (10-20 m) is dominated by *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), and *Celtis occidentalis* (common hackberry). The moderate (60%) tall-shrub (6-10 m) and short-shrub (1-6 m) layers are dominated by *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush). The dense herbaceous layer (80+%) is dominated by *Claytonia virginica* (Virginia springbeauty), *Erythronium americanum ssp. americanum* (dogtooth violet), *Floerkea proserpinacoides* (false mermaidweed), *Festuca subverticillata* (nodding fescue), *Galium aparine* (stickywilly), *Hydrophyllum canadense* (bluntleaf waterleaf), *Mertensia virginica* (Virginia bluebells), *Podophyllum peltatum* (mayapple), *Ranunculus ficaria* (fig buttercup) (exotic), and *Veronica hederifolia* (ivyleaf speedwell) (exotic). Over a dozen exotic species were reported from sampled stands. This community also supports Maryland state-imperiled *Erythronium albidum* (white fawnlily).

George Washington Memorial Parkway Vegetation: This community is a tall, closed-canopy forest with the largest trees generally >65 cm (26 inches) dbh and the tallest averaging 36 m (118 feet) in height. *Platanus occidentalis* (American sycamore) is the leading overstory dominant in 12 plots, contributing more than half of the large-tree density. *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tuliptree), *Carya cordiformis* (bitternut hickory), *Populus deltoides ssp. deltoides* (eastern cottonwood) and, above Great Falls, *Quercus shumardii* (Shumard oak) are the most characteristic overstory associates, any of which can assume codominance over small areas. *Celtis occidentalis* (common hackberry), *Ulmus americana* (American elm), and *Fraxinus pennsylvanica* (green ash) are inconstant, widely scattered canopy associates. Climbing lianas of *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), *Vitis vulpina* (frost grape), and *Campsis radicans* (trumpet creeper) are fairly common on the canopy trees. *Acer negundo* (box-elder) strongly dominates the subcanopy tree layers, with *Ulmus americana* (American elm) less important but constant. *Asimina triloba* (pawpaw) (>400 stems/ha) overwhelmingly dominates the shrub layer, occasionally reaching into the lowest (6-10 m) tree layer. *Lindera benzoin* (northern spicebush) is also characteristic of the shrub layer, while *Staphylea trifolia* (American bladdernut) and *Carpinus caroliniana* (American hornbeam) occur inconstantly.

During the early part of the growing season, the herb layer has >80% mean cover of spring ephemerals and other forbs. *Mertensia virginica* (Virginia bluebells), *Hydrophyllum canadense* (bluntleaf waterleaf), *Asarum canadense* (Canadian wildginger), *Claytonia virginica* (Virginia springbeauty), *Dicentra canadensis* (squirrel corn), *Phlox divaricata* (wild blue phlox), *Floerkea proserpinacoides* (false mermaidweed), and the exotics *Alliaria petiolata* (garlic mustard) and *Veronica hederifolia* (ivyleaf speedwell) are the most frequent patch-dominants. Other early-maturing species characteristic of study-area stands are *Erigenia bulbosa* (harbinger of spring), *Erythronium americanum ssp. americanum* (dogtooth violet), *Viola striata* (striped cream violet), and *Trillium sessile* (toadshade). In mid to late summer, herbaceous cover is reduced and the aspect is dominated by persistent *Hydrophyllum canadense* (bluntleaf waterleaf), *Sanicula odorata* (clustered blacksnakeroot), *Polygonatum biflorum var. commutatum* (smooth Solomon's seal), *Viola sororia* (common blue violet), *Osmorhiza* (sweet-cicely) spp., and the exotic *Urtica dioica ssp. dioica* (stinging nettle). *Matteuccia struthiopteris* (ostrich fern) and *Erythronium albidum* (white fawnlily), which are both on the periphery of their ranges in the Potomac Gorge, are locally important herbaceous components of this community. Total species richness of the plot-sampled stands varies widely from 25 to 71 taxa per 400 square meters.

Harpers Ferry National Historical Park Vegetation: This community is a tall, closed-canopy forest with the tallest trees averaging 36 m (118 feet) in height. The canopy is a mix of species, any of which can assume dominance over small areas. Characteristic species include *Platanus occidentalis* (American sycamore), *Juglans*

nigra (black walnut), *Liriodendron tulipifera* (tuliptree), *Carya cordiformis* (bitternut hickory), *Populus deltoides ssp. deltoides* (eastern cottonwood), and *Quercus shumardii* (Shumard oak). *Celtis occidentalis* (common hackberry), *Ulmus americana* (American elm), and *Fraxinus pennsylvanica* (green ash) are inconstant, widely scattered canopy associates. Along the Shenandoah River, unusual and possibly older-age stands with a heavy component of oaks, including *Quercus macrocarpa* (bur oak), *Quercus shumardii* (Shumard oak), and *Quercus muehlenbergii* (chinquapin oak), are embedded in typical stands dominated by *Platanus occidentalis* (American sycamore). Climbing lianas of *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), *Vitis vulpina* (frost grape), and *Campsis radicans* (trumpet creeper) are fairly common on the canopy trees. *Acer negundo* (box-elder) strongly dominates the subcanopy tree layers, with *Ulmus americana* (American elm) less important but constant. *Asimina triloba* (pawpaw) overwhelmingly dominates the shrub layer, occasionally reaching into the lowest (6-10 m) tree layer. *Lindera benzoin* (northern spicebush) is also characteristic of the shrub layer, while *Carpinus caroliniana* (American hornbeam) occurs inconstantly.

During the early part of the growing season, the herb layer has >80% mean cover of spring ephemerals and other forbs. *Mertensia virginica* (Virginia bluebells), *Hydrophyllum canadense* (bluntleaf waterleaf), *Asarum canadense* (Canadian wildginger), *Claytonia virginica* (Virginia springbeauty), *Dicentra canadensis* (squirrel corn), *Phlox divaricata* (wild blue phlox), *Floerkea proserpinacoides* (false mermaidweed), and the exotics *Alliaria petiolata* (garlic mustard) and *Veronica hederifolia* (ivyleaf speedwell) are the most frequent patch-dominants. Other early-maturing species characteristic of stands are *Erigenia bulbosa* (harbinger of spring), *Viola striata* (striped cream violet), and *Trillium sessile* (toadshade). In mid to late summer, herbaceous cover is reduced and the aspect is dominated by persistent *Hydrophyllum canadense* (bluntleaf waterleaf), *Sanicula odorata* (clustered blacksnakeroot), *Polygonatum biflorum var. commutatum* (smooth Solomon's seal), *Viola sororia* (common blue violet), *Osmorhiza* (sweet-cicely) spp., and the exotic *Urtica dioica ssp. dioica* (stinging nettle).

Manassas National Battlefield Park Vegetation: Plot data were collected from two relatively mature stands of this association along Bull Run. These sites have mixed overstories of *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tuliptree), *Quercus palustris* (pin oak), *Quercus shumardii* (Shumard oak), and *Ulmus americana* (American elm). Although not recorded in plot samples, *Platanus occidentalis* (American sycamore) is a frequent associate in these stands. *Acer negundo* (box-elder) is generally dominant in a subcanopy layer. Climbing lianas of *Toxicodendron radicans* (eastern poison-ivy) and *Vitis* (grape) spp. are common in the subcanopy and canopy. The shrub and small tree layers are moderately dense with *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), and *Lindera benzoin* (northern spicebush). The herb layer of this alluvial forest is lush with nutrient-demanding species such as *Asarum canadense* (Canadian wildginger), *Carex grisea* (inflated narrowleaf sedge), *Carex jamesii* (James' sedge), *Carex blanda* (eastern woodland sedge), *Cystopteris protrusa* (lowland bladderfern), *Festuca subverticillata* (nodding fescue), *Floerkea proserpinacoides* (false mermaidweed), *Laportea canadensis* (Canadian woodnettle), *Mertensia virginica* (Virginia bluebells), *Packera aurea* (golden ragwort), *Viola pubescens var. pubescens* (downy yellow violet), and *Viola striata* (striped cream violet). Many other herbs occur at low cover and/or constancy.

Monocacy National Battlefield Vegetation: The moderately dense (50-75% cover) canopy, 20-35m tall, is dominated by *Platanus occidentalis* (American sycamore); *Liriodendron tulipifera* (tuliptree) may codominate. The moderately dense (30-75%) subcanopy (10-20 m) includes *Juglans nigra* (black walnut), *Prunus serotina var. serotina* (black cherry), and *Ulmus americana* (American elm). Shrubs are somewhat sparse (up to 30%) and may include *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Lindera benzoin* (northern spicebush), and *Ulmus americana* (American elm). The herbaceous layer (up to 70%) though dominated by exotic species *Alliaria petiolata* (garlic mustard) and *Microstegium vimineum* (Nepalese browntop) often also includes a high diversity of native species at low cover. Native herbs may include *Allium tricoccum* (ramp), *Carex blanda* (eastern woodland sedge), *Claytonia virginica* (Virginia springbeauty), *Geum canadense* (white avens), *Laportea canadensis* (Canadian woodnettle), *Mertensia virginica* (Virginia bluebells), *Trillium sessile* (toadshade), *Viola pubescens* (downy yellow violet), and *Viola sororia* (common blue violet).

National Capital Parks-East Vegetation: The canopy contains *Platanus occidentalis* (American sycamore) (which is diagnostic and may be codominant), as well as *Carya cordiformis* (bitternut hickory), *Fraxinus pennsylvanica* (green ash), and *Juglans nigra* (black walnut). The understory is typically dominated by *Acer negundo* (box-elder) and may also contain *Prunus serotina var. serotina* (black cherry). Shrubs and vines include *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush) (either or both of which may be abundant), *Menispermum canadense* (common moonseed), and *Staphylea trifolia* (American bladdernut). Herbs include *Asarum canadense* (Canadian wildginger) (which may be abundant), *Botrychium dissectum* (cutleaf grapefern),

Carex grisea (inflated narrowleaf sedge), *Elymus virginicus* (Virginia wildrye), *Iris versicolor* (harlequin blueflag), *Leersia virginica* (whitegrass), the exotic *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Polygonum virginianum* (jumpseed), and *Sanicula canadensis* (Canadian blacksnakeroot).

Global Vegetation: This vegetation type is a closed forest with mixed overstory dominance by *Platanus occidentalis* (American sycamore), *Juglans nigra* (black walnut), *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Ulmus americana* (American elm), and, locally, *Fraxinus pennsylvanica* (green ash), *Liriodendron tulipifera* (tuliptree), and *Quercus shumardii* (Shumard oak). *Acer saccharinum* (silver maple) is codominant in a minority of stands but absent or unimportant in many others. *Acer negundo* (box-elder) is strongly dominant in the subcanopy. *Asimina triloba* (pawpaw) (usually on sites with coarser soil textures) and /or *Lindera benzoin* (northern spicebush) (on finer-textured substrates) dominate a moderately dense to dense shrub layer. Vines are common, with *Parthenocissus quinquefolia* (Virginia creeper), *Vitis vulpina* (frost grape), and *Toxicodendron radicans* (eastern poison-ivy) most frequent. The herb layer is rich in spring ephemerals and other nutrient-demanding species, including *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), *Erythronium americanum* (dogtooth violet), *Dicentra canadensis* (squirrel corn), *Sanicula odorata* (clustered blacksnakeroot), *Packera aurea* (golden ragwort), *Claytonia virginica* (Virginia springbeauty), *Festuca subverticillata* (nodding fescue), *Carex jamesii* (James' sedge), *Carex grisea* (inflated narrowleaf sedge), *Floerkea proserpinacoides* (false mermaidweed), *Osmorhiza longistylis* (longstyle sweetroot), and *Ranunculus abortivus* (littleleaf buttercup). Invasive exotics may be abundant and are represented by *Alliaria petiolata* (garlic mustard), *Veronica hederifolia* (ivyleaf speedwell), *Duchesnea indica* (Indian strawberry), *Urtica dioica ssp. dioica* (stinging nettle), *Microstegium vimineum* (Nepalese browntop), and *Glechoma hederacea* (ground ivy).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya cordiformis* (bitternut hickory), *Platanus occidentalis* (American sycamore), *Ulmus americana* (American elm)
Tree subcanopy	Broad-leaved deciduous tree	*Acer negundo* (box-elder), *Celtis occidentalis* (common hackberry), *Juglans nigra* (black walnut)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Asimina triloba* (pawpaw), *Lindera benzoin* (northern spicebush)
Herb (field)	Liana	*Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), *Vitis vulpina* (frost grape)
Herb (field)	Flowering forb	*Mertensia virginica* (Virginia bluebells)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Acer saccharum* (sugar maple), *Platanus occidentalis* (American sycamore)

Chesapeake & Ohio Canal National Historical Park: *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), *Juglans nigra* (black walnut)

George Washington Memorial Parkway: *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), *Hydrophyllum canadense* (bluntleaf waterleaf), *Mertensia virginica* (Virginia bluebells), *Platanus occidentalis* (American sycamore)

Harpers Ferry National Historical Park: *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), *Hydrophyllum canadense* (bluntleaf waterleaf), *Mertensia virginica* (Virginia bluebells), *Platanus occidentalis* (American sycamore)

Manassas National Battlefield Park: *Asarum canadense* (Canadian wildginger), *Asimina triloba* (pawpaw), *Carex jamesii* (James' sedge), *Carya cordiformis* (bitternut hickory), *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm)

Monocacy National Battlefield: *Asimina triloba* (pawpaw), *Juglans nigra* (black walnut), *Lindera benzoin* (northern spicebush), *Mertensia virginica* (Virginia bluebells), *Platanus occidentalis* (American sycamore)

Global: *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), *Juglans nigra* (black walnut), *Mertensia virginica* (Virginia bluebells), *Platanus occidentalis* (American sycamore), *Ulmus americana* (American elm)

OTHER NOTEWORTHY SPECIES

Antietam National Battlefield: Invasive/Exotic Plants: *Urtica dioica* (stinging nettle); **Other Plants**: *Angelica atropurpurea* (purplestem angelica, G5, MD state-historic (last seen in 1941); its presence here should be confirmed)

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Erythronium albidum* (white fawnlily, G5, MD-imperiled), *Quercus shumardii* (Shumard oak, G5, MD-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Euonymus alatus* (burningbush, Low), *Euonymus fortunei* (winter creeper, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Hemerocallis fulva* (orange daylily, Medium/Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Ranunculus ficaria* (fig buttercup, Medium/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Stellaria media* (common chickweed, Low), *Urtica dioica* (stinging nettle), *Veronica hederifolia* (ivyleaf speedwell)

George Washington Memorial Parkway: Vulnerable Plants: *Carex conjuncta* (soft fox sedge, G4G5, VA state-vulnerable), *Erigenia bulbosa* (harbinger of spring, G5, VA state-vulnerable), *Erythronium albidum* (white fawnlily, G5, VA state-imperiled), *Floerkea proserpinacoides* (false mermaidweed, G5, VA state-vulnerable), *Maianthemum stellatum* (starry false lily of the valley, G5, VA state-imperiled), *Matteuccia struthiopteris* (ostrich fern, G5, VA state-critically imperiled), *Phacelia covillei* (Coville's phacelia, G3, VA state-critically imperiled), *Sanicula trifoliata* (largefruit blacksnakeroot, G4, VA state-vulnerable), *Valeriana pauciflora* (largeflower valerian, G4, VA state-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Veronica hederifolia* (ivyleaf speedwell)

Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Urtica dioica* ssp. *dioica* (stinging nettle), *Veronica hederifolia* (ivyleaf speedwell)

Manassas National Battlefield Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Poa trivialis* (rough bluegrass, Medium/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Stellaria media* (common chickweed, Low)

Monocacy National Battlefield: Vulnerable Plants: *Carex sparganioides* (bur-reed sedge, G5, MD state-imperiled), *Erigenia bulbosa* (harbinger of spring, G5, MD state-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Festuca rubra* (red fescue, Unknown), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Ornithogalum nutans* (drooping star of Bethlehem, Insignificant), *Perilla frutescens* (beefsteakplant, Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Veronica hederifolia* (ivyleaf speedwell)

Global: Vulnerable Plants: *Phacelia covillei* (Coville's phacelia, G3); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Urtica dioica* ssp. *dioica* (stinging nettle), *Veronica hederifolia* (ivyleaf speedwell)

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)

Global Related Concepts:

- *Acer saccharinum - Acer negundo / Mertensia virginica* Association (Rawinski et al. 1996) =
- *Platanus occidentalis - Acer negundo - Juglans nigra - Celtis occidentalis / Asimina triloba / Mertensia virginica* Forest (Fleming and Patterson 2003) =

- *Platanus occidentalis - Acer negundo - Juglans nigra / Asimina triloba / Mertensia virginica* Forest (Fleming and Taverna 2006) =
- *Platanus occidentalis - Acer negundo / Asarum canadense* Forest (Thomson et al. 1999) =
- *Platanus occidentalis - Acer negundo / Asimina triloba - Lindera benzoin / Mertensia virginica - Asarum canadense* Forest (Fleming and Coulling 2001) =
- *Platanus occidentalis - Acer negundo / Asimina triloba / Asarum canadense* Forest (Lea 2000) <
- *Platanus occidentalis - Acer negundo / Asimina triloba / Carex jamesii* Forest (Lea 2000) <
- *Platanus occidentalis - Acer negundo / Asimina triloba / Mertensia virginica* Forest (Lea 2000) <
- *Platanus occidentalis - Acer negundo / Hydrophyllum canadense - Laportea canadensis* Forest (Lea 2000) <
- *Platanus occidentalis - Fraxinus pennsylvanica* Floodplain Forest (Vanderhorst 2000b) =
- *Ulmus americana - Acer negundo - (Platanus occidentalis) / Asimina triloba - Lindera benzoin / Asarum canadense* Forest (Fleming and Weber 2003) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Antietam National Battlefield Classification Comments: Piedmont-Central Appalachian Rich Floodplain Forest is sometimes referred to simply as Rich Floodplain Forest.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Piedmont-Central Appalachian Rich Floodplain Forest is sometimes referred to simply as Rich Floodplain Forest.
George Washington Memorial Parkway Classification Comments: Piedmont-Central Appalachian Rich Floodplain Forest (sometimes referred to simply as Rich Floodplain Forest) is generally distinguished by the importance of *Platanus occidentalis* (American sycamore), *Acer negundo* (box-elder), and *Asimina triloba* (pawpaw) in the woody layers, and the lush cover of spring ephemerals (especially *Mertensia virginica* (Virginia bluebells)) during the early part of the growing season. This community co-occurs with both Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217) and Mid-Atlantic High Terrace Hardwood Floodplain Forest (CEGL006459). The former occupies a lower position on the floodplain and riverbanks, has an overstory dominated by *Acer saccharinum* (silver maple), and lacks a lush vernal herb layer dominated by spring ephemerals. At some places along boundaries between these types, there can be a mixture of trees from one type with the herbaceous flora of the other. These ecotones, however, are very narrow, usually occurring at the top of sloping riverbank zones.

This community is most likely to be confused with the very similar Mid-Atlantic High Terrace Hardwood Floodplain Forest (CEGL006459), which occurs in small patches on exceptionally high floodplain berms and alluvial fans along the mouths of tributary ravines. It is a rare and poorly developed type on the Virginia side of the Potomac Gorge (in Turkey Run Park only) and has an herb layer similar to that of Piedmont-Central Appalachian Rich Floodplain Forest. It may be distinguished, however, by its overstory of *Acer saccharum var. saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), and other trees of rich upland forests. The dominance of *Acer saccharum var. saccharum* (sugar maple) in the understory of one plot of Piedmont-Central Appalachian Rich Floodplain Forest suggests a potential successional relationship between this type and Mid-Atlantic High Terrace Hardwood Floodplain Forest on sites that remain undisturbed by flooding for extended periods.
George Washington Memorial Parkway Other Comments: Exotic plants were recorded in all 12 plots of this type. The habitat of this community is very susceptible to invasion by shade-tolerant, nutrient-demanding exotics. *Alliaria petiolata* (garlic mustard) and *Veronica hederifolia* (ivyleaf speedwell) each occur in every plot with 10-25% mean cover. Twenty-four additional exotics occur at lower constancy and cover. Overall, each plot contained an average of eight exotic taxa with a mean aggregate cover of 35%. *Alliaria petiolata* (garlic mustard) is capable of rapid growth and high-volume seed production even under the reduced illumination of a closed forest canopy (Luken 2003). Pyle (1995) found that the spread of this species and the similarly adapted *Glechoma hederacea* (ground ivy) in Potomac River floodplains was inhibited by forest fragmentation, suggesting that reproduction was less successful in open habitats with many other weedy competitors.
Harpers Ferry National Historical Park Classification Comments: Piedmont-Central Appalachian Rich Floodplain Forest (sometimes referred to simply as Rich Floodplain Forest) is generally distinguished by the importance of *Platanus occidentalis* (American sycamore), *Acer negundo* (box-elder), and *Asimina triloba* (pawpaw) in the woody layers, and the lush cover of spring ephemerals (especially *Mertensia virginica* (Virginia bluebells)) during the early part of the growing season. This community co-occurs with Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217), which occupies a lower position on the floodplain and

riverbanks, has an overstory dominated by *Acer saccharinum* (silver maple), and lacks a lush vernal herb layer dominated by spring ephemerals. At some places along boundaries between these types, there can be a mixture of trees from one type with the herbaceous flora of the other. These ecotones, however, are very narrow, usually occurring at the top of sloping riverbank zones.

Manassas National Battlefield Park Classification Comments: Piedmont-Central Appalachian Rich Floodplain Forest is sometimes referred to simply as Rich Floodplain Forest. The relatively well-drained floodplain habitats, lush herb layer, and prevalence of alluvial-soil trees such as *Platanus occidentalis* (American sycamore) and *Acer negundo* (box-elder) make this community type distinctive within the park. It is most similar to, and shares a number of species with, Northern Piedmont Small Stream Floodplain Forest (CEGL006492). However, the latter is characterized by a lack of spring ephemerals and an herb layer dominated by *Microstegium vimineum* (Nepalese browntop) and/or summer-green forbs and grasses.

Manassas National Battlefield Park Other Comments: These fertile floodplain forests are more prone to invasion by exotic plant species than any other community type in the park. Abetted by fertile soils and continuous dispersal by floodwaters, shade-tolerant exotics such as *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop), *Stellaria media* (common chickweed), *Glechoma hederacea* (ground ivy), and *Poa trivialis* (rough bluegrass) are generally rampant even in mature, undisturbed stands.

Monocacy National Battlefield Classification Comments: Piedmont-Central Appalachian Rich Floodplain Forest is sometimes referred to simply as Rich Floodplain Forest.

National Capital Parks-East Classification Comments: Piedmont-Central Appalachian Rich Floodplain Forest is sometimes referred to simply as Rich Floodplain Forest.

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

Antietam National Battlefield Range: This association is common along the floodplain of Antietam Creek.

Chesapeake & Ohio Canal National Historical Park Range: This association occurs in floodplains along the Potomac River, the length of the Chesapeake & Ohio Canal.

George Washington Memorial Parkway Range: Piedmont-Central Appalachian Rich Floodplain Forest is the principal alluvial forest in the western portion of George Washington Memorial Parkway, occupying slightly elevated floodplains both above Great Falls and below Mather Gorge. The largest patches of this community are in Turkey Run Park, where Virginia-side floodplains reach maximal width.

Harpers Ferry National Historical Park Range: Piedmont-Central Appalachian Rich Floodplain Forest is the principal alluvial forest in the park, occupying slightly elevated floodplains on the Shenandoah and Potomac rivers. The largest patches of this community are on the Virginia side of the Potomac River, below Harpers Ferry, where the floodplains reach maximal width.

Manassas National Battlefield Park Range: Piedmont-Central Appalachian Rich Floodplain Forest occurs on elevated floodplain levees and terraces bordering Bull Run, both north and south of U.S. Route 29. The most mature and representative stands are located just south of U.S. Route 29.

Monocacy National Battlefield Range: This forest community is found along the Monocacy River in the Brooks Hill area.

National Capital Parks-East Range: This type is of limited distribution at NACE. All the known points and mapped polygons are found in the Fort Washington area of Prince Georges County, Maryland. This is where Piscataway Creek enters the Potomac River.

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:SNR, PA:SNR, VA:S3S4, WV:S2

TNC Ecoregions: 49:C, 52:C, 58:C, 59:C, 61:C

USFS Ecoregions (2007): 221Da:CCC, 221Dd:CCC, 221De:CCC, 221Ea:CCP, 231Aa:CCP, 231Ib:CPP, 231Ic:CPP, 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

National Capital Parks-East Inventory Notes: There are no actual plots for this at NACE; there are some rapid assessment points and some observation points, however.
Antietam National Battlefield Plots: None.
Chesapeake & Ohio Canal National Historical Park Plots: (33 plots): CHOH.211, POTO_012.02, POTO_012.04, POTO_012.05, POTO_013.01, POTO_013.02, POTO_014.01, POTO_014.02, POTO_014.03, POTO_014.05, POTO_018.03, POTO_019.02, POTO_019.03, POTO_019.04, POTO_020.01, POTO_020.02, POTO_026.03, POTO_026.04, POTO_027.08, POTO_031.09, POTO_033.13, POTO_040.01, POTO_04.02, POTO_041.01, POTO_041.03, POTO_045.01, POTO_045.03, POTO_045.04, POTO_045.05, POTO_045.06, POTO_049.01, POTO_049.05, POTO_049.06.
George Washington Memorial Parkway Plots: GFNP_002, GWMP_003, GWMP_004, TURK_002, TURK_004, TURK_007, TURK_009.
Harpers Ferry National Historical Park Plots: None.
Manassas National Battlefield Park Plots: MANA.2, MANA.29.
Monocacy National Battlefield Plots: (2 plots): MONO.544, MONO.546.
National Capital Parks-East Plots: None.
Antietam National Battlefield Description Author(s): S. Perles
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo and C.W. Nordman
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
Monocacy National Battlefield Description Author(s): M. Russo
National Capital Parks-East Description Author(s): M. Pyne
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 Taverna 2006, Fleming and Weber 2003, Fleming et al. 2017, 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, Vanderhorst 2000b, WVNHP unpubl. data, Zimmerman 2011l, Zimmerman 2011m, Zimmerman et al. 2012

[CEGL006476] *Platanus occidentalis - Acer saccharinum - Fraxinus pennsylvanica / Boehmeria cylindrica - Carex emoryi* Floodplain Forest

Translated Name: **American Sycamore - Silver Maple - Green Ash / Small-spike False Nettle - Emory's Sedge Floodplain Forest**
Common Name: **Central Appalachian-Piedmont Bedrock Floodplain Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	East-Central Floodplain Forest (G673)
Alliance	*Platanus occidentalis - Fraxinus pennsylvanica - Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance (A3701)

ELEMENT CONCEPT

Global Summary: This community is restricted to the Ridge and Valley and Piedmont sections of the Potomac River floodplain, where it occurs on scoured shorelines in high-gradient reaches where there is a combination of control by bedrock and alluvial processes. Stands are usually on the active channel shelf but have some aspects of depositional bars. Sites are flooded annually and inundated about 3 to 7% of the year, mostly during the dormant season, and often but probably irregularly in the early growing season. Surface substrate is variable, averaging >10% cover of bedrock and boulders in 14 plot samples. Two intergrading phases have been recognized and are described according to perceived differences in net rates of sediment erosion/accretion. In the eroding phase, the channel shelf surface is actively eroding along low channels often filled with cobbles and other coarse material, with finer soil being retained around tree bases. In the stable phase, vegetation holds finer sediments in place and provides an equilibrium between erosion and accretion. Stand physiognomy ranges from wooded herbaceous vegetation to nearly closed-canopy forest. In all expressions, some combination of *Platanus occidentalis* (American sycamore),

Acer saccharinum (silver maple), *Betula nigra* (river birch), and/or *Fraxinus pennsylvanica* (green ash) dominate as the uppermost woody layer, which tends to be a woodland to open forest in the species-rich eroding phase and woodland or wooded herbaceous vegetation in the stable phase. Less constant species include *Ulmus americana* (American elm), *Diospyros virginiana* (common persimmon), *Juglans nigra* (black walnut), *Quercus bicolor* (swamp white oak), *Populus deltoides* (eastern cottonwood), and *Salix nigra* (black willow). The shrub layer is absent to poorly developed, with battered individuals of *Cornus amomum* (silky dogwood), *Cephalanthus occidentalis* (common buttonbush), and *Salix caroliniana* (coastal plain willow) the most frequent true shrubs. Woody vines, including *Toxicodendron radicans* (eastern poison-ivy), *Campsis radicans* (trumpet creeper), and *Vitis riparia* (riverbank grape), are frequent. The herb layer is diverse and variable. The most constant and characteristic herbs in 14 plot samples are *Verbesina alternifolia* (wingstem), *Boehmeria cylindrica* (small-spike false nettle), *Polygonum punctatum* (dotted smartweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Leersia virginica* (whitegrass), *Dichanthelium clandestinum* (deertongue), *Carex emoryi* (Emory's sedge) (locally abundant in large clones), *Ambrosia artemisiifolia* (annual ragweed), *Polygonum virginianum* (jumpseed), *Teucrium canadense* (Canada germander), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Symphyotrichum lanceolatum var. lanceolatum* (white panicle aster), *Pilea pumila* (Canadian clearweed), *Chasmanthium latifolium* (Indian woodoats), and *Conoclinium coelestinum* (blue mistflower).

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This sycamore - silver maple - river birch forest was sampled at nine locations in the park. The sites are flat to gently undulating, temporarily flooded shorelines, levees, and stream terraces. Soils are somewhat poorly drained to moderately well-drained loam, loamy sand, sandy loam and sand. The variable unvegetated surface is made up of leaf litter (0-83% cover), bedrock (0-9%), large rocks (0-70%), small rocks (0-55%), wood (0-2%), bare soil (0-100%), and mosses and lichens (0-1%). Evidence of disturbance includes regular flooding and the abundant of exotic species.

George Washington Memorial Parkway Environment: Central Appalachian-Piedmont Bedrock Floodplain Forest occurs on scoured shorelines in high-gradient river reaches where there is at least partial bedrock control. Stands are usually on the active channel shelf, but they have some aspects of depositional bars. Three stands have been documented on the Virginia side of the Potomac Gorge. The total coverage of all three patches is probably <1.5 ha (3.7 acres). Sites for this community are flooded annually and inundated 3 to 7% of the year, mostly during the dormant season. The Virginia-side occurrences mostly represent habitats where the channel shelf surface is actively eroding along low channels often filled with cobbles and other coarse material, with finer soil being retained around tree bases. Examples of this type have very diverse plot-scale microtopography that includes cobble-filled channels, mucky pools, soil-covered berms, and rock outcrops. The bedrock shelf is mostly covered by boulders and alluvial deposits (mean total rock cover = 37%). Soil samples extracted from the more stable parts of these habitats are sandy loams with high pH and base status typical of Potomac River alluvial soils.

Harpers Ferry National Historical Park Environment: Central Appalachian-Piedmont Bedrock Floodplain Forest occurs on scoured shorelines in high-gradient river reaches where there is at least partial bedrock control. Stands are usually on the active channel shelf but have some aspects of depositional bars. Sites for this community are flooded annually and inundated 3 to 7% of the year, mostly during the dormant season (Lea 2004). Examples of this type have very diverse plot-scale microtopography that includes cobble-filled channels, mucky pools, soil-covered berms, and rock outcrops. The bedrock shelf is mostly covered by boulders and alluvial deposits. Soil samples extracted from the more stable parts of these habitats are sandy loams with base status typical of alluvial soils.

Global Environment: This association occurs on scoured shorelines of high-gradient, large-river reaches where there is a combination of control by bedrock and alluvial processes. Stands are usually on the active channel shelf but have some aspects of depositional bars. Sites are flooded annually and inundated from 3 to 7% of the year, mostly during the dormant season, and often but probably irregularly in the early growing season. Surface substrate is variable, averaging >10% cover of bedrock and boulders in 14 plot samples. Two intergrading phases have been recognized and are described according to perceived differences in net rates of sediment erosion/accretion. In the eroding phase, the channel shelf surface is actively eroding along low channels often filled with cobbles and other coarse material, with finer soil being retained around tree bases. In the stable phase, vegetation holds finer sediments in place and provides an equilibrium between erosion and accretion. Soils are sandy loams to sands, with coarser textures prevailing in the eroding phase, which also often has a surface layer of cobbles.

Vegetation Description

Chesapeake & Ohio Canal National Historical Park Vegetation: The structure of the sparse to moderate (20-60% cover) tree canopy is quite variable with stands of 20-35 m, 10-20 m and 6-10 m. The canopy and very

sparse to moderate (10-60%) subcanopy (10-20 m) may contain *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Diospyros virginiana* (common persimmon), *Platanus occidentalis* (American sycamore), and *Quercus rubra* (northern red oak). The sparse to moderate (20-60%) tall-shrub (6-10 m) and very sparse to sparse (<5-40%) short-shrub (1-6 m) layers include canopy species as well as *Carpinus caroliniana* (American hornbeam), *Cornus amomum* (silky dogwood), *Fraxinus pennsylvanica* (green ash), *Lindera benzoin* (northern spicebush), and *Salix caroliniana* (coastal plain willow) (Maryland state-vulnerable). Common and/or dominant species in the herbaceous layer (20-60%) include *Boehmeria cylindrica* (small-spike false nettle), *Carex emoryi* (Emory's sedge) (state-imperiled), *Chasmanthium latifolium* (Indian woodoats), *Elymus riparius* (riverbank wildrye), *Elymus villosus* (hairy wildrye), *Onoclea sensibilis* (sensitive fern), and *Polygonum punctatum* (dotted smartweed). A total of 35 exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Hasteola suaveolens* (false Indian plantain), *Ruellia strepens* (limestone wild petunia), *Rumex altissimus* (pale dock), and *Ranunculus hispidus var. nitidus* (bristly buttercup).

George Washington Memorial Parkway Vegetation: The vegetation of this type is a diverse woodland with about 40% mean cover of trees >6 m (20 feet) tall and 40% cover of shrubs and trees <6 m tall. Maximum canopy height ranges from 12 to 28 m (39-92 feet) and most stems are <35 cm (14 inches) dbh, although one or two larger-diameter trees are generally present in each stand. There is often considerable evidence of flood damage in the form of leaning boles and adventitious sprouts, but generally less than in ~Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896)$$. In Virginia plots, the tree layers are characterized by variable codominance of *Fraxinus pennsylvanica* (green ash) (usually most important), *Ulmus americana* (American elm), *Diospyros virginiana* (common persimmon), *Platanus occidentalis* (American sycamore), and *Acer saccharinum. Betula nigra*, *Acer negundo* (box-elder), *Quercus bicolor* (swamp white oak), *Quercus shumardii* (Shumard oak), *Salix nigra* (black willow), and *Carya cordiformis* (bitternut hickory) are minor, inconstant or low-cover associates. Climbing and scrambling vines of *Toxicodendron radicans* (eastern poison-ivy), *Campsis radicans* (trumpet creeper), *Parthenocissus quinquefolia* (Virginia creeper), *Vitis riparia* (riverbank grape), and *Vitis vulpina* (frost grape) are common. *Carpinus caroliniana* (American hornbeam), *Cornus obliqua* (silky dogwood), and *Cornus amomum* (silky dogwood) are the most frequent true shrubs, but none achieve high cover or are particularly characteristic.

The herb layer is patchy but locally dense and very species-rich. The most constant and abundant native species are *Eupatorium serotinum* (lateflowering thoroughwort), *Polygonum punctatum* (dotted smartweed), *Teucrium canadense* (Canada germander), *Boehmeria cylindrica* (small-spike false nettle), *Leersia virginica* (whitegrass), *Pilea pumila* (Canadian clearweed), *Acalypha rhomboidea* (common threeseed mercury), *Polygonum virginianum* (jumpseed), *Symphyotrichum lateriflorum* (calico aster), and *Verbesina alternifolia. Carex emoryi* is not quite as constant but forms locally large clones and is particularly diagnostic of this community. Other characteristic herbs include *Ageratina altissima var. altissima* (white snakeroot), *Dichanthelium clandestinum* (deertongue), *Conoclinium coelestinum* (blue mistflower), *Polygonum hydropiper* (marshpepper knotweed), *Apios americana* (groundnut), *Helianthus decapetalus* (thinleaf sunflower), *Impatiens capensis* (orange jewelweed), and *Rumex altissimus* (pale dock), but many other species occur. A drier variant at Great Falls Park contains a component of prairie species, including *Andropogon gerardii* (big bluestem), *Spartina pectinata* (prairie cordgrass), and *Baptisia australis var. australis* (blue wild indigo). Exotics are generally rampant and contribute approximately half the mean herbaceous cover. Total species richness ranges from 94 to 130 species per 400 square meters.

Harpers Ferry National Historical Park Vegetation: The vegetation is a diverse woodland with a variable cover of trees and shrubs. Maximum canopy height ranges from 12 to 28 m (39-92 feet) and most stems are <35 cm (14 inches) dbh. There is often considerable evidence of flood damage in the form of leaning boles and adventitious sprouts, but generally less than in ~Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896)$$. The tree layers are characterized by variable codominance of *Fraxinus pennsylvanica* (green ash) (usually most important), *Acer saccharinum* (silver maple), *Platanus occidentalis* (American sycamore), and *Ulmus americana* (American elm). In addition, *Betula nigra* (river birch), *Acer negundo* (box-elder), *Salix nigra* (black willow), *Populus deltoides* (eastern cottonwood), and *Juglans nigra* (black walnut) are minor, inconstant or low-cover associates. Climbing and scrambling vines of *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), *Vitis riparia* (riverbank grape), and *Vitis vulpina* (frost grape) are common. *Carpinus caroliniana* (American hornbeam), *Cephalanthus occidentalis* (common buttonbush), and *Cornus amomum* (silky dogwood) are the most frequent true shrubs, but none achieve high cover or are particularly characteristic.

The herb layer is patchy but locally dense and very species-rich. The most constant and abundant native species are *Eutrochium fistulosum* (trumpetweed), *Polygonum punctatum* (dotted smartweed), *Teucrium canadense* (Canada germander), *Boehmeria cylindrica* (small-spike false nettle), *Leersia virginica* (whitegrass), *Pilea pumila*

(Canadian clearweed), *Acalypha rhomboidea* (common threeseed mercury), *Polygonum virginianum* (jumpseed), *Symphyotrichum lateriflorum* (calico aster), and *Verbesina alternifolia. Carex emoryi* is not quite as constant but forms locally large clones and is particularly diagnostic of the community. Other characteristic herbs include *Solidago gigantea* (giant goldenrod), *Ageratina altissima var. altissima* (white snakeroot), *Dichanthelium clandestinum* (deertongue), *Conoclinium coelestinum* (blue mistflower), *Hasteola suaveolens* (false Indian plantain), *Apios americana* (groundnut), *Helianthus decapetalus* (thinleaf sunflower), *Impatiens capensis* (orange jewelweed), and *Rumex altissimus* (pale dock), but many other species occur. Exotics are generally rampant and can comprise half or more of the herbaceous cover in a stand.

Global Vegetation: Physiognomic and floristic expressions of this type are variable, with physiognomy ranging from wooded herbaceous vegetation to nearly closed-canopy forest. In all expressions, some combination of *Platanus occidentalis* (American sycamore), *Acer saccharinum* (silver maple), *Betula nigra* (river birch), and/or *Fraxinus pennsylvanica* (green ash) dominates the uppermost woody layer, which tends to be a woodland to open forest in the eroding phase and woodland or wooded herbaceous vegetation in the stable phase. Less constant species include *Ulmus americana* (American elm), *Diospyros virginiana* (common persimmon), *Juglans nigra* (black walnut), *Quercus bicolor* (swamp white oak), *Populus deltoides* (eastern cottonwood), and *Salix nigra* (black willow). The shrub layer is absent to poorly developed, with battered individuals of *Cornus amomum* (silky dogwood), *Cephalanthus occidentalis* (common buttonbush), and *Salix caroliniana* (coastal plain willow) the most frequent true shrubs. Woody vines, including *Toxicodendron radicans* (eastern poison-ivy), *Campsis radicans* (trumpet creeper), and *Vitis riparia* (riverbank grape), are frequent. The herb layer is diverse and variable. Characteristic herbs, in descending order of constancy in plot samples, include *Verbesina alternifolia* (wingstem), *Boehmeria cylindrica* (small-spike false nettle), *Polygonum punctatum* (dotted smartweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Leersia virginica* (whitegrass), *Dichanthelium clandestinum* (deertongue), *Carex emoryi* (Emory's sedge) (locally abundant in large clones), *Ambrosia artemisiifolia* (annual ragweed), *Polygonum virginianum* (jumpseed), *Teucrium canadense* (Canada germander), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Symphyotrichum lanceolatum var. lanceolatum* (white panicle aster), *Pilea pumila* (Canadian clearweed), *Chasmanthium latifolium* (Indian woodoats), *Conoclinium coelestinum* (blue mistflower), *Elymus riparius* (riverbank wildrye), *Solidago gigantea* (giant goldenrod), *Eupatorium perfoliatum var. perfoliatum* (common boneset), *Eutrochium fistulosum* (trumpetweed), and *Apocynum cannabinum* (Indianhemp). In drier expressions, *Panicum virgatum* (switchgrass), *Andropogon gerardii* (big bluestem), and other prairie species may be present. In the stable phase, rhizomatous species, primarily *Carex emoryi* (Emory's sedge) but also *Onoclea sensibilis* (sensitive fern), *Boehmeria cylindrica* (small-spike false nettle), *Dichanthelium clandestinum* (deertongue), and inconstantly *Spartina pectinata* (prairie cordgrass), exhibit patch dominance; in the eroding phase these species are less prominent, evidently because of higher rates of substrate disturbance which may select for fast-growing but less strongly rhizomatous species. Species richness is dramatically higher in the eroding phase (mean in 14 plots = 102 taxa vs. 44 taxa). Although relatively well-defined, the two "phases" nevertheless have a high degree of floristic similarity and should be considered variants of a single association. This type is prone to invasion by the exotics *Microstegium vimineum* (Nepalese browntop), *Fallopia japonica var. japonica* (Japanese knotweed), *Lysimachia nummularia* (creeping jenny), and *Phalaris arundinacea* (reed canarygrass).

MOST ABUNDANT SPECIES

Global Stratum	**Lifeform**	**Species**
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Boehmeria cylindrica* (small-spike false nettle), *Carex emoryi* (Emory's sedge), *Platanus occidentalis* (American sycamore)

George Washington Memorial Parkway: *Carex emoryi* (Emory's sedge), *Diospyros virginiana* (common persimmon), *Fraxinus pennsylvanica* (green ash), *Teucrium canadense* (Canada germander), *Ulmus americana* (American elm)

Harpers Ferry National Historical Park: *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Carex emoryi* (Emory's sedge), *Eutrochium fistulosum* (trumpetweed), *Fraxinus pennsylvanica* (green ash)

Global: *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Boehmeria cylindrica* (small-spike false nettle), *Carex emoryi* (Emory's sedge), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Carex emoryi* (Emory's sedge, G5, MD-imperiled), *Hasteola suaveolens* (false Indian plantain, G4, MD-critically imperiled), *Ranunculus hispidus* var. *nitidus* (bristly buttercup, G5T5, MD-critically imperiled), *Ruellia strepens* (limestone wild petunia, G4G5, MD-critically imperiled), *Rumex altissimus* (pale dock, G5, MD-critically imperiled), *Salix caroliniana* (coastal plain willow, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Arthraxon hispidus* (small carpgrass, Medium/Low), *Brassica nigra* (black mustard, High/Low), *Calystegia sepium* (hedge false bindweed), *Commelina communis* (Asiatic dayflower), *Datura stramonium* (jimsonweed, High/Low), *Daucus carota* (Queen Anne's lace, Low), *Echinochloa crus-galli* (barnyardgrass, Medium/Insignificant), *Fallopia japonica* var. *japonica* (Japanese knotweed, High/Medium), *Galinsoga quadriradiata* (shaggy-soldier), *Glechoma hederacea* (ground ivy, Low), *Hibiscus syriacus* (rose of Sharon), *Kummerowia striata* (Japanese clover, Low), *Leonurus cardiaca* (common motherwort), *Lespedeza cuneata* (sericea lespedeza, Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Morus alba* (white mulberry, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Poa pratensis* (Kentucky bluegrass, Medium), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Polygonum persicaria* (spotted ladysthumb), *Rorippa sylvestris* (creeping yellowcress, Medium/Low), *Rumex obtusifolius* (bitter dock), *Setaria faberi* (Japanese bristlegrass), *Setaria pumila* (yellow foxtail, Low/Insignificant), *Solanum dulcamara* var. *dulcamara* (climbing nightshade), *Sorghum halepense* (Johnsongrass, High/Medium), *Taraxacum officinale* (common dandelion), *Trifolium pratense* (red clover, Low/Insignificant), *Verbascum blattaria* (moth mullein); **Other Plants**: *Dysphania ambrosioides* (Mexican tea, GNR)

George Washington Memorial Parkway: Vulnerable Plants: *Baptisia australis* var. *australis* (blue wild indigo, G5T3T4, VA state-vulnerable), *Cornus obliqua* (silky dogwood, G5, VA state-imperiled), *Desmodium cuspidatum* var. *cuspidatum* (largebract ticktrefoil, G5T5?, VA state-imperiled), *Eleocharis compressa* (flatstem spikerush, G4, VA state-imperiled), *Hasteola suaveolens* (false Indian plantain, G4, VA state-imperiled), *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?, VA state-critically imperiled), *Spartina pectinata* (prairie cordgrass, G5, VA state-imperiled); **Invasive/Exotic Plants**: *Arthraxon hispidus* (small carpgrass, Medium/Low), *Glechoma hederacea* (ground ivy, Low), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Lysimachia vulgaris* (garden yellow loosestrife), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb)

Harpers Ferry National Historical Park: Vulnerable Plants: *Hasteola suaveolens* (false Indian plantain, G4, VA state-imperiled); **Invasive/Exotic Plants**: *Arthraxon hispidus* (small carpgrass, Medium/Low), *Glechoma hederacea* (ground ivy, Low), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb)

Global: Vulnerable Plants: *Baptisia australis* var. *australis* (blue wild indigo, G5T3T4), *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?); **Invasive/Exotic Plants**: *Fallopia japonica* var. *japonica* (Japanese knotweed, High/Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Phalaris arundinacea* (reed canarygrass, High)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2? (05-Oct-2006). This community is restricted to very specific environmental conditions on high-gradient rivershores with a combination of control by bedrock and alluvial processes. Known examples occur in small patches and are restricted to and scattered along approximately 170 miles of the Potomac River. Although additional occurrences may be found within the Potomac drainage or along other rivers, these are unlikely to dramatically increase the acreage covered by the type.

RELATED CONCEPTS

Global Similar Types:

- *Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Floodplain Forest (CEGL006217)

- *Platanus occidentalis - Betula nigra - Salix (caroliniana, nigra)* Floodplain Forest (CEGL003896) a more common and wider-ranging woodland of less stable cobble and boulder bars on high- and low-gradient rivershores.

Global Related Concepts:

- *Betula nigra / Andropogon gerardii - Panicum virgatum - Carex emoryi* Woodland (Lea 2000) <
- *Platanus occidentalis - Acer saccharinum - Betula nigra - Fraxinus pennsylvanica / Eupatorium fistulosum - (Carex emoryi)* Woodland (Lea 2003) =
- *Ulmus americana - Betula nigra - Quercus bicolor / Eupatorium coelestinum* Woodland (Lea 2000) <

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Chesapeake & Ohio Canal National Historical Park Classification Comments: Central Appalachian-Piedmont Bedrock Floodplain Forest is sometimes referred to as Central Appalachian / Piedmont Bedrock Floodplain Woodland. Its diverse, species-rich woodland vegetation is distinct among the depositional bar and shoreline communities. The only other community that is even somewhat similar is Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), which occupies slightly lower, bouldery / cobbly depositional bars, is dominated by *Platanus occidentalis* (American sycamore) (sometimes with *Betula nigra* (river birch) codominant), and has a sparse herb layer and much lower species richness. This association is mapped as River-scour Woodland Map Class (COMP_RSWO), a map class including three associations at this park, Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), and Piedmont-Central Appalachian Riverscour Forest (CEGL006218).

George Washington Memorial Parkway Classification Comments: Central Appalachian-Piedmont Bedrock Floodplain Forest is sometimes referred to as Central Appalachian / Piedmont Bedrock Floodplain Woodland. Its diverse, species-rich woodland vegetation is distinct among the depositional bar and shoreline communities. The only other community that is even somewhat similar is Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), which occupies slightly lower, bouldery / cobbly depositional bars, is dominated by *Platanus occidentalis* (American sycamore) (sometimes with *Betula nigra* (river birch) codominant) and has a sparse herb layer and much lower species richness. This association is mapped as River-scour Woodland Map Class (COMP_RSWO), a map class including three associations at this park, Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), and Piedmont-Central Appalachian Riverscour Forest (CEGL006218).

George Washington Memorial Parkway Other Comments: Central Appalachian-Piedmont Bedrock Floodplain Forest is restricted to very specific environmental conditions and occurs in small, scattered patches along approximately 274 km (170 miles) of Potomac River floodplain. There are less than 20 known occurrences rangewide, and serious threats are posed to these occurrences by the potential alteration of flooding regimes and invasive exotic plants. Although additional occurrences may be found within the Potomac drainage or along other rivers, these are unlikely to dramatically increase the acreage covered by the type. Because of these factors, this woodland must be considered one of the rarest and most conservation-worthy natural communities of the Potomac Gorge.

Harpers Ferry National Historical Park Classification Comments: Central Appalachian-Piedmont Bedrock Floodplain Forest is sometimes referred to as Central Appalachian / Piedmont Bedrock Floodplain Woodland. Its diverse, species-rich woodland vegetation is distinct among the depositional bar and shoreline communities. The only other community that is even somewhat similar is Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), which occupies slightly lower, bouldery / cobbly depositional bars, is dominated by *Platanus occidentalis* (American sycamore) (sometimes with *Betula nigra* (river birch) codominant) and has a sparse herb layer and much lower species richness. This association is mapped as River-scour Woodland Map Class (COMP_RSWO), a map class including two associations at this park, Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476) and Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896).

Harpers Ferry National Historical Park Other Comments: There are less than 20 known occurrences rangewide, and serious threats are posed to these occurrences by the potential alteration of flooding regimes and invasive exotic plants. Although additional occurrences may be found within the Potomac drainage or along other rivers, these are unlikely to dramatically increase the acreage covered by the type.

Global Classification Comments: In the Delaware variant of this community, *Platanus occidentalis* (American sycamore), *Acer negundo* (box-elder), and *Fraxinus pennsylvanica* (green ash) dominate the low canopy. *Populus deltoides* (eastern cottonwood), *Salix nigra* (black willow), *Betula nigra* (river birch), *Acer saccharinum* (silver maple), and *Cephalanthus occidentalis* (common buttonbush) are found in the lower "understory." *Amorpha fruticosa* (false indigobush) dominates the shrub layer and is associated by *Sambucus nigra ssp. canadensis* (American black elderberry) with lesser amounts of *Ilex verticillata* (common winterberry) and *Viburnum prunifolium* (blackhaw). Vines are fairly common and include exotics *Lonicera japonica* (Japanese honeysuckle), *Celastrus orbiculatus* (oriental bittersweet), and *Wisteria sinensis* (Chinese wisteria). Many herbs are present but some of the more common ones are *Dichanthelium clandestinum* (deertongue), *Elymus riparius* (riverbank wildrye), *Elymus virginicus* (Virginia wildrye), *Perilla frutescens* (beefsteakplant), *Rudbeckia laciniata* (cutleaf coneflower), and *Eleocharis erythropoda* (bald spikerush) on rocks.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled near Blockhouse Point, Outdoor Club Uplands, Little Orleans South, Orleans Scourbar and Floodplain, Fairplay and Spring Gap Bottomland.

George Washington Memorial Parkway Range: Central Appalachian-Piedmont Bedrock Floodplain Forest is rare on the Virginia shore of the Potomac Gorge and restricted to several discrete areas where bedrock is present and underlies the channel shelf. Three stands have been documented on the Virginia side, two of them on George Washington Memorial Parkway lands. The largest of these is located at Great Falls Park, extending for about 0.6 km (0.37 mile) along the outer edge of the rocky floodplain just above the falls. Smaller occurrences are located at knickpoints in Turkey Run Park and Riverbend Park (Fairfax County Park Authority), where the floodplain is slightly constricted by subtending rocky bluffs and outcrops extending onto the channel shelf. The total coverage of all three patches is probably <1.5 ha (3.7 acres). The total coverage of this community on the Maryland / District of Columbia side of the gorge was estimated to be less than 25 ha (60 acres) (Lea 2000), small in absolute terms but much more extensive than the documented Virginia stands.

Harpers Ferry National Historical Park Range: Central Appalachian-Piedmont Bedrock Floodplain Forest is restricted to very specific environmental conditions and occurs in small, scattered patches along the shorelines of the Shenandoah and Potomac rivers. Stands occur on both shores of the rivers.

Global Range: The type is known from the higher gradient sections of the Potomac River, with well-documented stands concentrated in the fall-line (Potomac Gorge) and Ridge and Valley provinces. It may occur along the Shenandoah River but is unlikely to occur on the Monocacy River and other smaller tributaries. There is an unverified report of similar vegetation on the Susquehanna River below Conowingo Dam (C. Lea pers. comm. 2006).

Nations: US

States/Provinces: DC:SNR, DE:S1, MD:SNR, VA:S1, WV?:SNA

TNC Ecoregions: 52:C, 59:C, 61:C

USFS Ecoregions (2007): 221Db:CCC

Federal Lands: NPS (C&O Canal, George Washington Parkway, Harpers Ferry)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (9 plots): CHOH.217, CHOH.504, CHOH.508, CHOH.509, CHOH.514, CHOH.521, CHOH.524, CHOH.527, CHOH.636, POTO_013.03.

George Washington Memorial Parkway Plots: GFNP_021, GFNP_049, TURK_035.

Harpers Ferry National Historical Park Plots: HAFE.124.

Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo

George Washington Memorial Parkway Description Author(s): G.P. Fleming

Harpers Ferry National Historical Park Description Author(s): G. Fleming and K. Taverna

Global Description Author(s): C. Lea and G.P. Fleming

References: Coxe 2009, Eastern Ecology Working Group n.d., Fleming 2007, Fleming and Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2000, Lea 2003, Lea 2003*

[CEGL006475] *Platanus occidentalis - Fraxinus pennsylvanica - Acer negundo / Sanicula odorata - Elymus virginicus* Floodplain Forest

Translated Name: **American Sycamore - Green Ash - Box-elder / Clustered Black-snakeroot - Virginia Wildrye Floodplain**

Forest
Common Name: **Potomac Gorge Ice-Scour Floodplain Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	East-Central Floodplain Forest (G673)
Alliance	*Platanus occidentalis* - *Fraxinus pennsylvanica* - *Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance (A3701)

Element Concept

Global Summary: This association is restricted to a 50-hectare, high-gradient floodplain in the lower portion of the Potomac Gorge in Maryland and the District of Columbia. It is likely strongly influenced by infrequent, but catastrophic, ice jams which occur in this narrow section. It differs from other floodplain forests of the gorge in that many of the canopy trees exhibit obvious evidence of past mechanical damage by ice or flood. In addition, soils are shallower and there are scattered bedrock exposures. The vegetation is a somewhat open, even-aged forest codominated by *Platanus occidentalis* (American sycamore) and *Fraxinus pennsylvanica* (green ash). *Acer saccharinum* (silver maple), *Juglans nigra* (black walnut), and *Populus deltoides* (eastern cottonwood) are usually present but not dominant. The subcanopy is composed of *Acer negundo* (box-elder), with *Ulmus americana* (American elm) at lower cover. The shrub layer cover ranges from 5-40% and is composed primarily of *Lindera benzoin* (northern spicebush) and small *Acer negundo* (box-elder). Vine cover is generally greater than 8%. The most constant native herbs in 10 plot samples are *Elymus virginicus* (Virginia wildrye), *Sanicula odorata* (clustered blacksnakeroot), *Viola sororia* (common blue violet), *Verbesina alternifolia* (wingstem), *Hydrophyllum canadense* (bluntleaf waterleaf), *Carex blanda* (eastern woodland sedge), *Arisaema triphyllum* (Jack in the pulpit), *Poa pratensis* (Kentucky bluegrass), *Geum canadense* (white avens), *Amphicarpaea bracteata* (American hogpeanut), *Festuca subverticillata* (nodding fescue), *Carex jamesii* (James' sedge), and *Polygonum virginianum* (jumpseed). However, the exotics *Ranunculus ficaria* (fig buttercup) and *Microstegium vimineum* (Nepalese browntop) are rampant, each averaging 25-50% cover in these plots, and many additional exotics are present at lower constancy and mean cover.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This sycamore - ash forest was sampled at four locations in the park. The sites are flat to gently undulating alluvial plains that are seasonally/temporarily flooded. Soils are somewhat poorly to moderately well-drained clay loam. The unvegetated surface is dominated by leaf litter (70-96% cover) with some exposed bedrock (0-1%), large rocks (0-1%), wood (0-9%), and bare soil (0-27%). Evidence of disturbance includes grazing/browsing and the presence of exotic species.
George Washington Memorial Parkway Environment: This sycamore - ash forest was sampled at four locations in the park. The sites are flat to gently undulating alluvial plains that are seasonally/temporarily flooded. Soils are somewhat poorly to moderately well-drained clay loam. The unvegetated surface is dominated by leaf litter (70-96% cover) with some exposed bedrock (0-1%), large rocks (0-1%), wood (0-9%), and bare soil (0-27%). Evidence of disturbance includes grazing/browsing and the presence of exotic species.
Global Environment: This association is restricted to a 50-hectare, high-gradient floodplain in the lower portion of the Potomac Gorge in Maryland and the District of Columbia. It is likely strongly influenced by infrequent, but catastrophic, ice jams which occur in this narrow section. Many trees in this floodplain forest in this section have resprouted from stumps of those felled or broken off by ice jams and other flood damage. The mean flooding-recurrence interval for this type is 2.2 to 4.1 years (from Log Pearson III approximation) (1.4 to 3.9 years from 68 year record). Percent inundation (from 68 year record) is 0.10-0.25%, and annual probability of flooding (Log Pearson III approximation) is 25-45% (Lea 2000). Soils of this association (CEGL006475) coarse-textured (sandy loams; mean particle size (phi): 3.1 to 2.0), and some bedrock (generally less than 0.5% cover) is exposed. Soil depth is predominantly more than 30 cm, and soils would likely be classified as Entisols or Inceptisols. Occasional narrow linear swales (high water channels), which apparently follow joints in the underlying bedrock, are small-scale features within this type; soils in these are finer textured, more poorly drained, and are evidently wetland soils.

Vegetation Description

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderate to very dense (60-80+% cover) tree canopy, 20-35 m tall, is dominated by *Acer negundo* (box-elder), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore), and *Quercus bicolor* (swamp white oak), and the sparse to moderate (20-60%)

subcanopy (10-20 m) is dominated by *Acer negundo* (box-elder) and *Ulmus americana* (American elm). The sparse (10-20%) tall-shrub layer (6-10 m) is dominated by *Acer negundo* (box-elder), as is the sparse to very dense (20-80%) short-shrub layer (1-6 m) which also includes *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush). Common and abundant species in the herbaceous layer (40-80+%) include *Carex jamesii* (James' sedge), *Elymus virginicus* (Virginia wildrye), *Packera aurea* (golden ragwort), *Verbesina alternifolia* (wingstem), and exotics *Microstegium vimineum* (Nepalese browntop) and *Ranunculus ficaria* (fig buttercup). A total of 25 exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Ranunculus hispidus var. nitidus* (bristly buttercup), state-imperiled *Carex planispicata* (flat-spiked sedge), and three state-vulnerable species, as well as DC-critically imperiled *Carex jamesii* (James' sedge) and *Trillium sessile* (toadshade) and DC-imperiled *Arisaema dracontium* (green dragon), *Hydrophyllum canadense* (bluntleaf waterleaf), and *Zizia aurea* (golden zizia).

George Washington Memorial Parkway Vegetation: The moderate to very dense (60-80+% cover) tree canopy, 20-35 m tall, is dominated by *Acer negundo* (box-elder), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore), and *Quercus bicolor* (swamp white oak), and the sparse to moderate (20-60%) subcanopy (10-20 m) is dominated by *Acer negundo* (box-elder) and *Ulmus americana* (American elm). The sparse (10-20%) tall-shrub layer (6-10 m) is dominated by *Acer negundo* (box-elder), as is the sparse to very dense (20-80%) short-shrub layer (1-6 m) which also includes *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush). Common and abundant species in the herbaceous layer (40-80+%) include *Carex jamesii* (James' sedge), *Elymus virginicus* (Virginia wildrye), *Packera aurea* (golden ragwort), *Verbesina alternifolia* (wingstem), and exotics *Microstegium vimineum* (Nepalese browntop) and *Ranunculus ficaria* (fig buttercup). A total of 25 exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Ranunculus hispidus var. nitidus* (bristly buttercup), state-imperiled *Carex planispicata* (flat-spiked sedge), and three state-vulnerable species, as well as DC-critically imperiled *Carex jamesii* (James' sedge) and *Trillium sessile* (toadshade) and DC-imperiled *Arisaema dracontium* (green dragon), *Hydrophyllum canadense* (bluntleaf waterleaf), and *Zizia aurea* (golden zizia).

Global Vegetation: This is a somewhat open forest that appears relatively even-aged, with few large trees, most likely because of regeneration of a large proportion of trees following the catastrophic ice jam flood of 1948. *Platanus occidentalis* (American sycamore) and *Fraxinus pennsylvanica* (green ash) together comprise 40-60% of the tree canopy layer. *Acer saccharinum* (silver maple), *Juglans nigra* (black walnut), and *Populus deltoides* (eastern cottonwood) are usually present but not dominant. The subcanopy is composed of *Acer negundo* (box-elder), with *Ulmus americana* (American elm) at lower cover. The shrub layer cover ranges from 5-40% and is composed primarily of *Lindera benzoin* (northern spicebush) and small *Acer negundo* (box-elder). Vine cover is generally greater than 8%. *Amphicarpaea bracteata* (American hogpeanut) and *Lonicera japonica* (Japanese honeysuckle) are frequent on shrubs and herbaceous vegetation, and *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), and several species of *Vitis* (grape) are the most frequent tree climbers. The most constant native herbs in 10 plot samples are *Elymus virginicus* (Virginia wildrye), *Sanicula odorata* (clustered blacksnakeroot), *Viola sororia* (common blue violet), *Verbesina alternifolia* (wingstem), *Hydrophyllum canadense* (bluntleaf waterleaf), *Carex blanda* (eastern woodland sedge), *Arisaema triphyllum* (Jack in the pulpit), *Poa pratensis* (Kentucky bluegrass), *Geum canadense* (white avens), *Amphicarpaea bracteata* (American hogpeanut), *Festuca subverticillata* (nodding fescue), *Carex jamesii* (James' sedge), and *Polygonum virginianum* (jumpseed). However, the exotics *Ranunculus ficaria* (fig buttercup) and *Microstegium vimineum* (Nepalese browntop) are rampant, each averaging 25-50% cover in these plots, and many additional exotics are present at lower constancy and mean cover. Small-scale (1-3 m wide), linear swales (flow channels) within this type support hydric vegetation, including a number of *Carex* (sedge) spp., *Cardamine bulbosa* (bulbous bittercress), *Eleocharis acicularis* (needle spikerush), *Lysimachia nummularia* (creeping jenny), and others.

Global Dynamics: The catastrophic elimination of much woody biomass may give fast-growing, intolerant species and species better able to sprout and grow rapidly from adventitious buds a competitive advantage and may explain the relative infrequency of *Acer saccharinum* (silver maple) compared to more protected forests on floodplains along the Potomac. Slightly coarser textured, more shallow soils (bedrock is evidently nearer the soil surface), and patterns of seedling establishment following major disturbances are alternative explanations. In the absence of further catastrophic and widespread ice damage, this forest may, over a long period, succeed to *~Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Floodplain Forest (CEGL006217)$$, which occupies lower gradient floodplains at the same relative elevation upstream on the Potomac.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore)
Tree subcanopy	Broad-leaved deciduous tree	*Acer negundo* (box-elder)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Acer negundo* (box-elder), *Elymus virginicus* (Virginia wildrye), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore)
George Washington Memorial Parkway: *Acer negundo* (box-elder), *Elymus virginicus* (Virginia wildrye), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore)
Global: *Acer negundo* (box-elder), *Elymus virginicus* (Virginia wildrye), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore), *Sanicula odorata* (clustered blacksnakeroot)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Arisaema dracontium* (green dragon, G5, DC-imperiled), *Carex hirtifolia* (pubescent sedge, G5, MD-vulnerable), *Carex jamesii* (James' sedge, G5, MD-critically imperiled), *Carex planispicata* (flat-spiked sedge, G4Q, MD-imperiled), *Hydrophyllum canadense* (bluntleaf waterleaf, G5, MD-imperiled), *Juglans cinerea* (butternut, G3, MD-vulnerable), *Ranunculus hispidus* var. *nitidus* (bristly buttercup, G5T5, MD-critically imperiled), *Trillium sessile* (toadshade, G5, MD-critically imperiled), *Zizia aurea* (golden zizia, G5, DC-imperiled; MD-vulnerable); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Cardamine hirsuta* (hairy bittercress), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Ligustrum sinense* (Chinese privet, High/Medium), *Ligustrum vulgare* (European privet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera maackii* (Amur honeysuckle, High), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Narcissus pseudonarcissus* (daffodil), *Poa annua* (annual bluegrass, Medium/Insignificant), *Poa pratensis* (Kentucky bluegrass, Medium), *Poa trivialis* (rough bluegrass, Medium/Low), *Prunus subhirtella* (winter-flowering cherry), *Ranunculus ficaria* (fig buttercup, Medium/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Sorghum halepense* (Johnsongrass, High/Medium), *Stellaria media* (common chickweed, Low), *Urtica dioica* ssp. *dioica* (stinging nettle), *Veronica hederifolia* (ivyleaf speedwell); **Other Plants**: *Artemisia vulgaris* var. *vulgaris* (GUTU)
George Washington Memorial Parkway: Vulnerable Plants: *Arisaema dracontium* (green dragon, G5, DC-imperiled), *Carex hirtifolia* (pubescent sedge, G5, MD-vulnerable), *Carex jamesii* (James' sedge, G5, MD-critically imperiled), *Carex planispicata* (flat-spiked sedge, G4Q, MD-imperiled), *Hydrophyllum canadense* (bluntleaf waterleaf, G5, MD-imperiled), *Juglans cinerea* (butternut, G3, MD-vulnerable), *Ranunculus hispidus* var. *nitidus* (bristly buttercup, G5T5, MD-critically imperiled), *Trillium sessile* (toadshade, G5, MD-critically imperiled), *Zizia aurea* (golden zizia, G5, DC-imperiled, MD-vulnerable); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Cardamine hirsuta* (hairy bittercress), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Ligustrum sinense* (Chinese privet, High/Medium), *Ligustrum vulgare* (European privet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera maackii* (Amur honeysuckle, High), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Narcissus pseudonarcissus* (daffodil), *Poa annua* (annual bluegrass, Medium/Insignificant), *Poa pratensis* (Kentucky bluegrass, Medium), *Poa trivialis* (rough bluegrass, Medium/Low), *Prunus subhirtella* (winter-flowering cherry), *Ranunculus ficaria* (fig buttercup, Medium/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Sorghum halepense* (Johnsongrass, High/Medium), *Stellaria media* (common chickweed, Low), *Urtica dioica* ssp. *dioica* (stinging nettle), *Veronica hederifolia* (ivyleaf speedwell); **Other Plants**: *Artemisia vulgaris* var. *vulgaris* (GUTU)
Global: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Ranunculus ficaria* (fig buttercup, Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR. More information is needed to rank this association.

RELATED CONCEPTS

Global Similar Types:
- *Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Floodplain Forest (CEGL006217) is widespread on lower gradient Potomac River floodplains with the same relative elevation and flooding frequency and dominated by *Acer saccharinum* (silver maple).
- *Fraxinus pennsylvanica - Platanus occidentalis - Celtis laevigata / Chasmanthium latifolium* Piedmont Floodplain Forest (CEGL007013)

Global Related Concepts:
- *Platanus occidentalis - Fraxinus pennsylvanica - Acer negundo / Elymus (riparius, virginicus)* Forest (Lea 2000) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Chesapeake & Ohio Canal National Historical Park Classification Comments: Potomac Gorge Ice-Scour Floodplain Forest is also referred to as Ice-Scour Floodplain Forest.
Global Classification Comments: This vegetation type is supported by analysis of regional data for the NCR parks vegetation mapping project and is represented by 10 plots. However, it separates only weakly from the more widespread *~Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Floodplain Forest (CEGL006217)$$ in analysis and is known from only one 50-hectare site globally.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled at Chain Bridge Flats and in Washington, DC (Canal mile 3-6). This community occurs in an area where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.
George Washington Memorial Parkway Range: This community was sampled at Chain Bridge Flats and in Washington, DC (Canal mile 3-6). This community occurs in an area where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.
Global Range: The type is known only from a 50-hectare area of the Potomac River gorge in Maryland and the District of Columbia.
Nations: US
States/Provinces: DC:SNR
TNC Ecoregions: 61:C
USFS Ecoregions (2007): 221Db:CCC
Federal Lands: NPS (C&O Canal, George Washington Parkway)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (10 plots - shared with GWMP): CHOH.212, CHOH.229, CHOH.542, CHOH.543, POTO_004.01, POTO_004.02, POTO_004.03, POTO_005.06, POTO_007.02, POTO_008.01.
George Washington Memorial Parkway Plots: (10 plots - shared with CHOH): CHOH.212, CHOH.229, CHOH.542, CHOH.543, POTO_004.01, POTO_004.02, POTO_004.03, POTO_005.06, POTO_007.02, POTO_008.01.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): M.J. Russo
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d., Lea 2000, Lea 2000*

[CEGL006218] *Quercus bicolor - Fraxinus pennsylvanica - (Platanus occidentalis) / Chasmanthium latifolium - Zizia aurea* Floodplain Forest

Translated Name: **Swamp White Oak - Green Ash - (American Sycamore) / Indian Woodoats - Golden Alexanders**
Floodplain Forest
Common Name: **Piedmont-Central Appalachian Riverscour Forest**

USNVC CLASSIFICATION

Division Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)

Macrogroup Central Hardwood Floodplain Forest (M029)
Group East-Central Floodplain Forest (G673)
Alliance *Platanus occidentalis - Fraxinus pennsylvanica - Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance (A3701)

ELEMENT CONCEPT

Global Summary: This community type is restricted to the active channel shelves of large rivers, at localities where bedrock outcrops constrain flow and produce locally high water velocities during large floods. Average return interval of overbank flooding is less than one year to more than one year, and hydrologic regime is temporarily flooded. Woody vegetation is constantly subjected to mechanical damage from ice and other flood debris. Soils are shallow (7 to >30 cm deep) sandy loams or loamy sands, with many rock fragments and 2-20% of the surface composed of exposed bedrock or large boulders. Physiognomy is an open woodland of short-statured, flood-battered trees, with *Quercus bicolor* (swamp white oak) and *Fraxinus pennsylvanica* (green ash) the leading overstory dominants in mixed stands. *Acer negundo* (box-elder), *Diospyros virginiana* (common persimmon), *Juglans nigra* (black walnut), *Platanus occidentalis* (American sycamore), *Ulmus americana* (American elm), and other trees are locally important associates. The shrub layer is sparse or absent and consists of saplings of the nominal species and other flood-tolerant species. Vines, primarily *Vitis* (grape) spp., *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison-ivy), *Lonicera japonica* (Japanese honeysuckle), and *Amphicarpaea bracteata* (American hogpeanut), are frequent. The herb layer is characterized by dense, tall graminoids, with mixed, variable dominance by *Chasmanthium latifolium* (Indian woodoats), *Dichanthelium clandestinum* (deertongue), *Elymus riparius* (riverbank wildrye), and *Elymus virginicus* (Virginia wildrye). Many low-cover forbs and sedges are associated. This community type has high to exceptional species richness (90-130 species per 400 m2) but is threatened by invasive introduced weeds, particularly *Phalaris arundinacea* (reed canarygrass), *Poa pratensis* (Kentucky bluegrass), *Fallopia japonica var. japonica* (Japanese knotweed), *Microstegium vimineum* (Nepalese browntop), and *Ranunculus ficaria* (fig buttercup).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: See Global Environment.
George Washington Memorial Parkway Environment: See Global Environment.
Global Environment: This community type is restricted to the active channel shelves of large rivers, at localities where bedrock outcrops constrain flow and produce locally high water velocities during large floods. At Chain Bridge Flats along the Potomac River (District of Columbia and Maryland), stands are immediately channel-ward from the floodplain. Average return interval of overbank flooding is less than one year to more than one year, and hydrologic regime is temporarily flooded. Woody vegetation is constantly subjected to mechanical damage from ice and other flood debris. Soils are sandy loams or loamy sands, with many rock fragments and 2-20% of the surface composed of exposed bedrock or large boulders. Soil depth to bedrock ranges from 7 cm to more than 30 cm.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: See Global Vegetation.
George Washington Memorial Parkway Vegetation: See Global Vegetation.
Global Vegetation: Physiognomy is an open woodland of short-statured, flood-battered trees, with *Quercus bicolor* (swamp white oak) and *Fraxinus pennsylvanica* (green ash) the leading overstory dominants in mixed stands. *Acer negundo* (box-elder), *Diospyros virginiana* (common persimmon), *Juglans nigra* (black walnut), *Platanus occidentalis* (American sycamore), *Ulmus americana* (American elm), and other trees are locally important associates. The shrub layer is sparse or absent and consists of saplings of the nominal species and other flood-tolerant species. Vines, primarily *Vitis* (grape) spp., *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison-ivy), *Lonicera japonica* (Japanese honeysuckle), and *Amphicarpaea bracteata* (American hogpeanut), are frequent. The herb layer is characterized by dense, tall graminoids, with mixed, variable dominance by *Chasmanthium latifolium* (Indian woodoats), *Dichanthelium clandestinum* (deertongue), *Elymus riparius* (riverbank wildrye), and *Elymus virginicus* (Virginia wildrye). *Verbesina alternifolia* (wingstem) is a constant forb. Other characteristic herbs include *Zizia aurea* (golden zizia), *Thalictrum revolutum* (waxyleaf meadowrue), *Cerastium arvense* (field chickweed), *Cardamine bulbosa* (bulbous bittercress), *Tripsacum dactyloides* (eastern gamagrass), *Symphyotrichum lanceolatum* (white panicle aster), *Packera aurea* (golden ragwort), *Polygonum virginianum* (jumpseed), *Lysimachia ciliata* (fringed loosestrife), *Solidago gigantea* (giant goldenrod), *Desmodium perplexum* (perplexed ticktrefoil), *Ranunculus hispidus var. nitidus* (bristly buttercup), *Hasteola suaveolens* (false Indian plantain), and many species of *Carex* (sedge) (*Carex conjuncta* (soft fox sedge), *Carex grisea* (inflated narrowleaf sedge), *Carex blanda* (eastern woodland sedge), *Carex granularis* (limestone meadow sedge), *Carex*

vulpinoidea (fox sedge), *Carex tribuloides* (blunt broom sedge), *Carex jamesii* (James' sedge), *Carex radiata* (eastern star sedge), *Carex frankii* (Frank's sedge), *Carex shortiana* (Short's sedge), *Carex cristatella)*. This community type has high to exceptional species richness (90-130 species per 400 m2) due, in part, to regularly occurring, poorly drained linear swales (flood channels) that dissect higher, better-drained areas. *Phalaris arundinacea* (reed canarygrass), *Poa pratensis* (Kentucky bluegrass), *Fallopia japonica var. japonica* (Japanese knotweed), *Microstegium vimineum* (Nepalese browntop), and *Ranunculus ficaria* (fig buttercup) are introduced plants that have become rampantly invasive in parts of this community.

Global Dynamics: This community type is associated with a very restrictive set of environmental factors associated with high-gradient, bedrock-controlled floodplains. It was likely formerly more extensive or undisturbed on the Potomac River before interruption in hydrogeomorphic process by the construction of a tailrace for civic water supplies at Chain Bridge Flats (probably between 1920 and 1930). The spoil rock was placed in a ridge across the entire width of the floodplain and channel shelf, blocking frequent and scouring high water flows and allowing deeper sediment to accumulate on the downstream side of the levee. This apparently allowed fast-growing, weedy species less tolerant of shallow soils, such as *Platanus occidentalis* (American sycamore), *Acer saccharinum* (silver maple), and *Acer negundo* (box-elder), to become established downstream from the levee and to grow tall during relatively quiescent periods for major floods (1942-1972). Major floods, which topped the levee, would then have uprooted these trees which had not been "flood-trained." Currently, following other large floods in 1985 and 1996, much of the zone downstream from the levee, comparable in elevation to that supporting this community type upstream from the levee, is relatively treeless and dominated by weedy exotic herbaceous species, especially *Phalaris arundinacea* (reed canarygrass).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fraxinus pennsylvanica* (green ash), *Quercus bicolor* (swamp white oak)
Herb (field)	Graminoid	*Chasmanthium latifolium* (Indian woodoats)

CHARACTERISTIC SPECIES

Global: *Chasmanthium latifolium* (Indian woodoats), *Dichanthelium clandestinum* (deertongue), *Elymus riparius* (riverbank wildrye), *Elymus virginicus* (Virginia wildrye), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore), *Quercus bicolor* (swamp white oak), *Verbesina alternifolia* (wingstem), *Zizia aurea* (golden zizia)

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Fallopia japonica* var. *japonica* (Japanese knotweed, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Phalaris arundinacea* (reed canarygrass, High), *Poa pratensis* (Kentucky bluegrass, Medium), *Ranunculus ficaria* (fig buttercup, Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1G2 (25-Jan-2005). The type occurs in a limited geographic area and is restricted to special habitat conditions within high-gradient river stretches. The total known acreage of the type is probably less than 100 ha, and the integrity of all stands is threatened by invasive introduced weeds. However, all known occurrences are protected on National Park Service lands along the Potomac River and possibly the Shenandoah River at Harpers Ferry.

RELATED CONCEPTS

Global Similar Types:

- *Platanus occidentalis - Betula nigra / Cornus amomum / (Andropogon gerardii, Chasmanthium latifolium)* Floodplain Forest (CEGL003725) river-scour woodlands on the New River.

Global Related Concepts:

- *Acer negundo - Fraxinus pennsylvanica / Elymus (riparius, virginicus) - Panicum clandestinum* Woodland (Lea 2000) <
- *Quercus bicolor - Fraxinus pennsylvanica - Diospyros virginiana / Chasmanthium latifolium* Woodland (Lea 2000) <

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
Chesapeake & Ohio Canal National Historical Park Classification Comments: See Global Classification Comments. Piedmont-Central Appalachian Riverscour Forest is sometimes referred to as Piedmont / Central Appalachian Riverscour Woodland. This association is mapped as River-scour Woodland Map Class (COMP_RSWO), a map class including three associations at this park, Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), and Piedmont-Central Appalachian Riverscour Forest (CEGL006218).
George Washington Memorial Parkway Classification Comments: See Global Classification Comments. Piedmont-Central Appalachian Riverscour Forest is sometimes referred to as Piedmont / Central Appalachian Riverscour Woodland. This association is mapped as River-scour Woodland Map Class (COMP_RSWO), a map class including three associations at this park, Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), and Piedmont-Central Appalachian Riverscour Forest (CEGL006218).
Global Classification Comments: Classification of this type was based on analysis of 12 vegetation plots sampled by Lea (2000) along the Potomac River. Plot data from across the range of this vegetation are needed to better characterize the type.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: See Global Range.
George Washington Memorial Parkway Range: See Global Range.
Global Range: This community is documented only from high-gradient stretches of the Potomac River floodplain between Washington, DC and Great Falls, with marginal putative examples also observed along the Potomac and Shenandoah rivers at Harpers Ferry.
Nations: US
States/Provinces: DC:SNR, MD:SNR
TNC Ecoregions: 59:P, 61:C
USFS Ecoregions (2007): 221Db:CCC, 221De:CC?, M221Da:PPP
Federal Lands: NPS (C&O Canal, George Washington Parkway)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (12 plots shared with GWMP): POTO_005.01, POTO_005.02, POTO_005.03, POTO_005.05, POTO_005.07, POTO_005.10, POTO_005.12, POTO_006.01, POTO_006.03, POTO_006.07, POTO_006.08, POTO_028.03.
George Washington Memorial Parkway Plots: (12 plots shared with CHOH): POTO_005.01, POTO_005.02, POTO_005.03, POTO_005.05, POTO_005.07, POTO_005.10, POTO_005.12, POTO_006.01, POTO_006.03, POTO_006.07, POTO_006.08, POTO_028.03.
Chesapeake & Ohio Canal National Historical Park Description Author(s): G.P. Fleming and C.W. Nordman
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Global Description Author(s): G.P. Fleming and K.D. Patterson
References: Eastern Ecology Working Group n.d., Harrison 2004, Harrison 2011, Lea 2000, Lea 2000*

[CEGL006495] *Quercus rubra - Quercus shumardii / Cercis canadensis* Floodplain Forest

Translated Name: **Northern Red Oak - Shumard Oak / Eastern Redbud Floodplain Forest**
Common Name: **Potomac Gorge Bedrock Oak Floodplain Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	East-Central Floodplain Forest (G673)
Alliance	*Platanus occidentalis - Fraxinus pennsylvanica - Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance (A3701)

ELEMENT CONCEPT

Global Summary: This vegetation type is confined to bedrock floodplains near the knickpoint at the head of the Potomac River fall-line at Great Falls, where the floodplain is being rapidly incised by anastomosing channels and is

transitional to a strath terrace. Soils are sandy loams and are somewhat shallow with bedrock exposures. Average flood-return interval varies from 1-2 years or longer. Shorter return intervals appear to occur more often on the Maryland shoreline. The vegetation is an open forest to woodland with the tree canopy dominated by *Quercus rubra* (northern red oak), *Quercus shumardii* (Shumard oak), *Fraxinus americana* (white ash), and *Ulmus americana* (American elm). *Carya cordiformis* (bitternut hickory), *Juglans nigra* (black walnut), and *Celtis occidentalis* (common hackberry) also occur. The subcanopy and shrub layers range from very open to dense, with *Cercis canadensis* (eastern redbud) characteristic. *Quercus macrocarpa* (bur oak) is a Maryland state-rare species that occurs in this type. The herbaceous layer is also variable, differing greatly on opposite sides of the river. The Maryland stands are dominated by tall, weedy native species, primarily *Ageratina altissima* (white snakeroot) and *Teucrium canadense* (Canada germander); *Verbesina alternifolia* (wingstem) and *Symphyotrichum lateriflorum* (calico aster) also are frequent. The Virginia stands are dominated by graminoids, primarily *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Elymus villosus* (hairy wildrye), *Elymus virginicus* (Virginia wildrye), *Dichanthelium boscii* (Bosc's panicgrass), and *Chasmanthium latifolium* (Indian woodoats). The unusual combination of tall, disturbance-adapted herbs of low floodplains, upland herbs, and trees of higher floodplains and uplands is probably due to the combination of frequent flooding and seasonal dryness.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This community is confined to floodplains near the knickpoint at the head of the Potomac River fall-line at Great Falls, where the floodplain is being rapidly incised by anastomosing channels and is transitional to a strath terrace. Soils are fertile sandy loams and are somewhat shallow with bedrock exposures. Average flood-return interval is about 1 to 2 years (Lea 2000) on the Maryland side.

George Washington Memorial Parkway Environment: On the Virginia side of the river, Potomac Gorge Bedrock Oak Floodplain Forest occupies the higher, inner side of the floodplain bounded by the river and the old Patowmack Canal, just above Great Falls. This restricted, 1.7-ha (4-acre) area has the sublevel topography and alluvial soils characteristic of floodplains but is shallowly underlain by the massive beds of Mather Gorge schist and metagraywacke that form the high bedrock terrace downstream. Over the upstream to downstream length of the 1.5-ha area, substrate cover of low outcrops and large boulders increases from 0 to >20%. The general area supporting this community has the character of a gently convex berm, with a definite slope and several meters in elevation between the top of the berm and the river's channel shelf. The downstream portion is also incised by the channel of Mine Run, which cuts across the area and becomes increasingly braided as it approaches the river. Soils collected from plots are sandy loams with relatively high pH, calcium, and total base saturation. The mean flood-return interval of the analogous Maryland-side habitats is reported to be 1.2 to 2.1 years (Lea 2000), but it appears that flooding is less frequent in some of the Virginia habitat. Despite the floodplain setting, this site is susceptible to pronounced seasonal dryness during droughty periods.

Global Environment: This community is confined to floodplains near the knickpoint at the head of the Potomac River fall-line at Great Falls, where the floodplain is being rapidly incised by anastomosing channels and is transitional to a strath terrace. Soils are fertile sandy loams and are somewhat shallow with bedrock exposures. Average flood-return interval is about 1 to 2 years (Lea 2000) on the Maryland side; at least some of the Virginia habitat has a longer return interval.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: These are open forests to woodlands with the tree canopy dominated by *Quercus rubra* (northern red oak), *Quercus shumardii* (Shumard oak), *Fraxinus americana* (white ash), *Carya lacinosa*, and *Carya cordiformis* (bitternut hickory). Minor overstory associates include *Quercus alba* (white oak), *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), *Juglans nigra* (black walnut), *Ulmus rubra* (slippery elm), *Quercus bicolor* (swamp white oak), and *Celtis occidentalis. Quercus macrocarpa* is a Maryland state-rare species that occurs in this type. The subcanopy layers are poorly developed. The shrub layer is very open (on the Maryland side); *Cercis canadensis* (eastern redbud) is a constant and characteristic shrub throughout. The herbaceous layer is dominated by tall, weedy native species, primarily *Ageratina altissima* (white snakeroot) and *Teucrium canadense* (Canada germander), with *Eupatorium coelestinum*, *Eupatorium serotinum* (lateflowering thoroughwort), *Verbesina alternifolia* (wingstem), *Solidago juncea* (early goldenrod) and *Symphyotrichum lateriflorum* (calico aster) also common. The invasive introduced grass *Microstegium vimineum* (Nepalese browntop) is rampantly abundant in parts of this association, *Artemisia annua* (sweet sagewort) can also be common. Other native plants include *Allium canadense var. canadense* (meadow garlic), *Amaranthus spinosus* (spiny amaranth), *Boehmeria cylindrica* (small-spike false nettle), *Conyza canadensis* (Canadian horseweed), *Dichanthelium clandestinum* (deertongue), *Eupatorium serotinum* (lateflowering

thoroughwort), *Geum canadense* (white avens), *Helenium autumnale* (common sneezeweed), *Helianthus decapetalus* (thinleaf sunflower), *Leersia virginica* (whitegrass), *Muhlenbergia schreberi* (nimblewill), *Phlox divaricata* (wild blue phlox), *Polygonum lapathifolium* (curlytop knotweed), *Polygonum punctatum* (dotted smartweed), *Scrophularia marilandica* (carpenter's square), *Solidago canadensis var. scabra*, *Symphyotrichum cordifolium* (common blue wood aster), *Verbena urticifolia* (white vervain), and *Viola sororia* (common blue violet). Additional native plants found at trace amounts include *Bidens frondosa* (devil's beggarticks), *Carex frankii* (Frank's sedge), *Carex vulpinoidea* (fox sedge), *Dysphania ambrosioides* (Mexican tea), *Eupatorium fistulosum*, *Impatiens capensis* (orange jewelweed), *Juncus effusus* (common rush), *Juncus tenuis* (poverty rush), *Physalis heterophylla* (clammy groundcherry), *Potentilla simplex* (common cinquefoil), *Pseudognaphalium obtusifolium* (rabbit-tobacco), *Rudbeckia hirta* (blackeyed Susan), *Rumex altissimus* (pale dock), *Sanicula odorata* (clustered blacksnakeroot), *Verbena hastata* (swamp verbena), and *Vernonia noveboracensis* (New York ironweed). Additional non-native herbaceous plants include *Allium vineale* (wild garlic),

Artemisia annua (sweet sagewort), *Barbarea vulgaris* (garden yellowrocket), *Cardamine hirsuta* (hairy bittercress), *Datura stramonium* (jimsonweed), *Glechoma hederacea* (ground ivy), *Lamium purpureum* (purple deadnettle), *Leonurus marrubiastrum*, *Lespedeza cuneata* (sericea lespedeza), *Lysimachia nummularia* (creeping jenny), *Melilotus officinalis* (yellow sweetclover), *Ornithogalum nutans* (drooping star of Bethlehem), *Perilla frutescens* (beefsteakplant), *Rumex crispus* (curly dock), *Trifolium hybridum* (alsike clover), *Urtica dioica* (stinging nettle), and *Verbascum thapsus.* Mean species richness of the three plots is 54 taxa per 400 square meters.

George Washington Memorial Parkway Vegetation: The vegetation is an open-canopy forest with mean canopy height of 30 m (105 feet) and trees characteristic of both uplands and floodplains. *Fraxinus americana* (white ash) is the leading overstory dominant, but *Quercus rubra* (northern red oak) and *Quercus shumardii* (Shumard oak) are also consistently important. *Carya cordiformis* (bitternut hickory) is a minor but constant overstory associate, while *Quercus alba* (white oak), *Liriodendron tulipifera* (tuliptree), *Juglans nigra* (black walnut), and *Celtis occidentalis* (common hackberry) are scattered. Although not captured in plots, a few *Quercus bicolor* (swamp white oak) occur in the swales and braided channels. *Ulmus americana* (American elm) is the leading subcanopy tree, with *Tilia americana var. americana* (American basswood), young *Fraxinus americana* (white ash), and young *Carya cordiformis* (bitternut hickory) also present. The shrub layer is diverse, with *Cercis canadensis var. canadensis* (eastern redbud), *Carpinus caroliniana* (American hornbeam), *Asimina triloba* (pawpaw), and *Viburnum prunifolium* (blackhaw) all common. *Quercus stellata* (post oak), *Carya glabra* (pignut hickory), and *Ptelea trifoliata* (common hoptree) are confined to the driest, rockiest part of the habitat where the floodplain is clearly transitioning to a strath terrace. The herb layer contains high cover of graminoids, including *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Chasmanthium latifolium* (Indian woodoats), *Elymus villosus* (hairy wildrye), *Elymus virginicus var. virginicus* (Virginia wildrye), *Festuca subverticillata* (nodding fescue), *Dichanthelium boscii* (Bosc's panicgrass), *Carex blanda* (eastern woodland sedge), *Carex amphibola* (eastern narrowleaf sedge), *Carex hirtifolia* (pubescent sedge), and the exotic *Microstegium vimineum* (Nepalese browntop). Among forbs, *Amphicarpaea bracteata* (American hogpeanut), *Galium concinnum* (shining bedstraw), *Ageratina altissima var. altissima* (white snakeroot), *Packera aurea* (golden ragwort), and *Verbesina alternifolia* (wingstem) occur in all three plots with mean cover >1%. Many additional low-cover species occur, and total species richness is high (range = 76 to 89 taxa/plot).

Global Vegetation: These are open forests to woodlands with the tree canopy dominated by *Quercus rubra* (northern red oak), *Quercus shumardii* (Shumard oak), *Fraxinus americana* (white ash), and *Carya cordiformis* (bitternut hickory). Minor overstory associates include *Quercus alba* (white oak), *Ulmus americana* (American elm), *Juglans nigra* (black walnut), *Ulmus rubra* (slippery elm), *Quercus bicolor* (swamp white oak), and *Celtis occidentalis* (common hackberry). *Quercus macrocarpa* (bur oak) is a Maryland state-rare species that occurs in this type. The subcanopy layers are poorly developed. The shrub layer ranges from very open (on the Maryland side) to fairly dense (on the Virginia side); *Cercis canadensis* (eastern redbud) is a constant and characteristic shrub throughout, while *Carpinus caroliniana* (American hornbeam), *Asimina triloba* (pawpaw), and *Ptelea trifoliata* (common hoptree) are common in the Virginia stands. The herbaceous layer also varies dramatically on the two sides of the river. The Maryland stands are dominated by tall, weedy native species, primarily *Ageratina altissima* (white snakeroot) and *Teucrium canadense* (Canada germander), with *Verbesina alternifolia* (wingstem) and *Symphyotrichum lateriflorum* (calico aster) also common. These weedy herbs are much less abundant in the Virginia stands, which are dominated by graminoids, primarily *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Elymus villosus* (hairy wildrye), *Elymus virginicus* (Virginia wildrye), *Dichanthelium boscii* (Bosc's panicgrass), *Festuca subverticillata* (nodding fescue), and *Chasmanthium latifolium* (Indian woodoats), which are entirely absent from the Maryland stands. Mesophytic forbs such as *Amphicarpaea bracteata* (American hogpeanut), *Galium concinnum* (shining bedstraw), and *Packera aurea* (golden ragwort) are also common in the Virginia stands, which

have a notably higher mean species richness (n = 82 taxa per 400 m2) than their Maryland counterparts (n = 54 taxa per 400 m2). The invasive introduced grass *Microstegium vimineum* (Nepalese browntop) is rampantly abundant in parts of this association.

Global Dynamics: The unusual combination of tall, disturbance-adapted herbs of low floodplains, upland herbs, and trees of higher floodplains and uplands is probably due to the combination of frequent flooding and seasonal dryness. This vegetation type is apparently somewhat spatially ephemeral in that it represents a transition from depositional processes to erosional processes and may "migrate" upstream with the Potomac River channel knickpoint at Great Falls. The type would be converted to a channel shelf (and eventually, a channel) type if attacked by erosion, or to a more xeric terrace type if it remained elevated on an interfluve between two deepening channels. Construction of the Washington Aqueduct diversion dam (weir) just above Great Falls may have stalled new formation of this type or converted existing examples of it (prior to 1857) by increasing the rate of deposition on surfaces that were once more conducive to formation of this type. Conn Island, which is located just above the dam, was evidently continuous with present-day Great Falls and Olmsted Island prior to this construction and may have supported this type. There is some evidence of this hypothesis in the frequency of *Quercus rubra* (northern red oak) on the Conn Island floodplain.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya cordiformis* (bitternut hickory), *Fraxinus americana* (white ash), *Quercus rubra* (northern red oak), *Quercus shumardii* (Shumard oak)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Cercis canadensis* (eastern redbud), *Fraxinus americana* (white ash), *Quercus rubra* (northern red oak), *Quercus shumardii* (Shumard oak)

George Washington Memorial Parkway: *Cercis canadensis* var. *canadensis* (eastern redbud), *Elymus hystrix* var. *hystrix* (eastern bottlebrush grass), *Elymus villosus* (hairy wildrye), *Fraxinus americana* (white ash), *Quercus shumardii* (Shumard oak), *Viburnum prunifolium* (blackhaw)

Global: *Cercis canadensis* (eastern redbud), *Quercus rubra* (northern red oak), *Quercus shumardii* (Shumard oak)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Quercus macrocarpa* (bur oak, G5, MD state-rare species); **Invasive/Exotic Plants**: *Allium vineale* (wild garlic, Medium/Insignificant), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Barbarea vulgaris* (garden yellowrocket, Low/Insignificant), *Cardamine hirsuta* (hairy bittercress), *Chaiturus marrubiastrum* (lion's tail), *Datura stramonium* (jimsonweed, High/Low), *Glechoma hederacea* (ground ivy, Low), *Lamium purpureum* (purple deadnettle), *Lespedeza cuneata* (sericea lespedeza, Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Melilotus officinalis* (yellow sweetclover, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Ornithogalum nutans* (drooping star of Bethlehem, Insignificant), *Perilla frutescens* (beefsteakplant, Low), *Rumex crispus* (curly dock, Low/Insignificant), *Trifolium hybridum* (alsike clover, Medium/Low), *Urtica dioica* (stinging nettle), *Verbascum thapsus* (common mullein, Medium)

George Washington Memorial Parkway: Vulnerable Plants: *Cerastium arvense* var. *velutinum* (field chickweed, G5T4?, VA state-imperiled); **Invasive/Exotic Plants**: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium)

Global: Vulnerable Plants: *Quercus macrocarpa* (bur oak, G5, MD state-rare); **Invasive/Exotic Plants**: *Microstegium vimineum* (Nepalese browntop, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR

RELATED CONCEPTS

Global Similar Types:

- *Carya glabra - Quercus (rubra, montana) - Fraxinus americana / Viburnum rafinesqueanum* Forest (CEGL006209)
- *Fagus grandifolia - Carya cordiformis - Quercus michauxii / Ilex opaca / Podophyllum peltatum* Forest (CEGL006493)

Global Related Concepts:
- *Quercus rubra - Quercus shumardii - Fraxinus americana / Teucrium canadense* Forest (Lea 2000) =
- *Quercus rubra - Quercus shumardii / Cercis canadensis* Temporarily Flooded Forest [Provisional] (Fleming et al. 2007b) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Potomac Gorge Bedrock Oak Floodplain Forest is sometimes referred to as Potomac Gorge Bedrock Floodplain Oak Forest.
George Washington Memorial Parkway Classification Comments: Potomac Gorge Bedrock Oak Floodplain Forest is very distinctive and unlikely to be confused with other types. It is the only floodplain forest in the Potomac Gorge section of George Washington Memorial Parkway with a high proportion of oaks in the overstory, and the only one in which *Cercis canadensis var. canadensis* (eastern redbud) is a dominant shrub. The rocky floodplain habitat and the prevalence of upland forest grasses are also diagnostic.

Potomac Gorge Bedrock Oak Floodplain Forest is sometimes referred to as Potomac Gorge Bedrock Floodplain Oak Forest.
George Washington Memorial Parkway Other Comments: Potomac Gorge Bedrock Oak Floodplain Forest has an ecotonal character, is of extremely limited extent (<12 ha), and therefore lacks replication, even within the Potomac Gorge. In addition, although similar in woody composition, the herbaceous vegetation captured by plots on the two sides of the river differs greatly in composition and richness. A possible explanation for this difference is that the Maryland-side plots were sampled by Lea shortly after the catastrophic flood of 1996. The scouring of the habitat during this event may have temporarily removed some established forest herbs and resulted in the prevalence of weedy, flood-adapted species (C. Lea pers. comm.).
Global Classification Comments: Overall, this vegetation type is something of a "hybrid" between a well-drained floodplain forest and ~*Carya glabra - Quercus (rubra*, *montana) - Fraxinus americana / Viburnum rafinesqueanum* Forest (CEGL006209)$$ which occupies higher, rarely flooded bedrock terraces downstream of Great Falls. The 6 plots of this type, 3 from Maryland and 3 from Virginia, do not form a comfortable group due to the pronounced difference in herbaceous vegetation among stands on the two sides of the river and the much higher species richness of Virginia stands. Moreover, this vegetation type is enigmatic and currently unreplicated anywhere. It has a very small range (<10 ha) and occupies an ecotone between other more widespread vegetation types, never fully developing its own character. That said, it cannot be merged with any other type, and the best solution is to treat it as a provisional USNVC type, both for mapping and to get the description out to a wider audience.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: So far as known, this vegetation is endemic to <10 hectares on the Maryland side of the Potomac River near Great Falls, where the floodplain is being rapidly incised by anastomosing channels and is transitional to a strath terrace (Lea 2000).
George Washington Memorial Parkway Range: Potomac Gorge Bedrock Oak Floodplain Forest is restricted to the higher, inner side of the floodplain bounded by the river and the old Patowmack Canal, just above Great Falls. The type covers less than 10 hectares in a similar topographic setting (Falls, Olmestead, and Conn islands) on the Maryland side of Great Falls (Lea 2000).
Global Range: So far as known, this vegetation is endemic to <10 hectares on the Maryland side of the Potomac River near Great Falls, where the floodplain is being rapidly incised by anastomosing channels and is transitional to a strath terrace (Lea 2000).
Nations: US
States/Provinces: MD:SNR, VA:SU
TNC Ecoregions: 61:C
USFS Ecoregions (2007): 221Db:CCC
Federal Lands: NPS (C&O Canal, George Washington Parkway)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (3 plots): POTO_037.09, POTO_037.11, POTO_037.12.
George Washington Memorial Parkway Plots: GFNP_054, GFNP_055, GFNP_056.
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
George Washington Memorial Parkway Description Author(s): G.P. Fleming

Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d., Fleming 2007, Fleming et al. 2007b, Fleming et al. 2017, Lea 2000, Lea 2000*, Lea 2004, Lea pers. comm.

A3408 *Quercus palustris - Quercus bicolor* Floodplain Forest Alliance

This 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 canopies of examples in New England and the northern Piedmont contain *Fraxinus pennsylvanica* (green ash), *Quercus palustris* (pin oak), and *Ulmus americana* (American elm), with *Acer rubrum* (red maple) and occasionally with *Quercus bicolor* (swamp white oak). In addition, *Carya cordiformis* (bitternut hickory), *Fraxinus americana* (white ash), *Fraxinus nigra* (black ash), *Nyssa sylvatica* (blackgum), and/or *Platanus occidentalis* (American sycamore) may be present.

[CEGL006497] *Quercus palustris - Quercus bicolor / Carex tribuloides - Carex radiata - (Carex squarrosa)* Wet Forest

Translated Name: **Pin Oak - Swamp White Oak / Blunt Broom Sedge - Eastern Star Sedge - (Squarrose Sedge) Wet Forest**
Common Name: **Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	East-Central Floodplain Forest (G673)
Alliance	*Quercus palustris - Quercus bicolor* Floodplain Forest Alliance (A3408)

Element Concept

Global Summary: This association occupies poorly drained backswamps, sloughs, low flats, and depressions in the floodplains of streams and small rivers in the Piedmont of Virginia and Maryland, and mountain valleys of Virginia and West Virginia. It is especially common in the broad, clay-rich floodplains of the northern Virginia Culpeper Basin. Shallow seasonal flooding and hummock-and-hollow microtopography are characteristic of most sites, with typical flooding depth of 20 to 25 cm in the hollows. Soils are typically heavy, white- or orange-mottled clay loams that are strongly acidic with moderately low calcium, high magnesium, and intermediate total base saturation levels. Vegetation is a closed forest with mixed overstory dominance by *Quercus palustris* (pin oak), *Quercus bicolor* (swamp white oak), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Fraxinus pennsylvanica* (green ash). *Ulmus americana* (American elm), *Acer rubrum* (red maple), and inconstantly *Acer negundo* (box-elder) are common understory trees. Climbing lianas of *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), and *Vitis vulpina* (frost grape) are plentiful. The shrub layer is typically open to sparse but can include patches or scattered individuals of *Carpinus caroliniana* (American hornbeam), *Viburnum prunifolium* (blackhaw), *Ilex verticillata* (common winterberry), *Viburnum dentatum* (southern arrow-wood), *Cornus amomum* (silky dogwood), *Sambucus nigra ssp. canadensis* (American black elderberry), and *Lindera benzoin* (northern spicebush). The herb layer is graminoid-rich with *Carex tribuloides* (blunt broom sedge), *Carex squarrosa* (squarrose sedge), *Carex radiata* (eastern star sedge), *Cinna arundinacea* (sweet woodreed), and/or *Scirpus polyphyllus* (leafy bulrush) forming dominance-patches. *Saururus cernuus* (lizard's-tail) and *Carex typhina* (cattail sedge) also occasionally exhibit patch-dominance but are very inconstant in the type. Other characteristic herbs include *Arisaema triphyllum* (Jack in the pulpit), *Boehmeria cylindrica* (small-spike false nettle), *Carex intumescens* (greater bladder sedge), *Carex lupulina* (hop sedge), *Carex stipata var. stipata* (awlfruit sedge), *Galium obtusum* (bluntleaf bedstraw), *Geum canadense* (white avens), *Glyceria striata* (fowl mannagrass), *Impatiens capensis* (orange jewelweed), *Lycopus virginicus* (Virginia water horehound), *Leersia virginica* (whitegrass), *Lysimachia ciliata* (fringed loosestrife), *Polygonum punctatum* (dotted smartweed), *Ranunculus hispidus var. caricetorum* (bristly buttercup), *Scutellaria lateriflora* (blue skullcap), *Symphyotrichum lateriflorum* (calico aster), and *Symplocarpus foetidus* (skunk-cabbage). *Lysimachia nummularia* (creeping jenny), *Microstegium vimineum* (Nepalese browntop), and *Polygonum cespitosum var. longisetum* (oriental ladysthumb) can be problematic invasive exotics in this association.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This pin oak forest was sampled in plots at two locations in the park. The sites are flat, seasonally flooded or saturated alluvial plains with poorly drained clay

soil. The unvegetated surface is dominated by leaf litter (78-97% cover) with some wood (2-10%), standing water (1-12%), and mosses and lichens (1-3%). Evidence of disturbance includes hydrologic alteration, deer grazing/browsing, and the presence of exotic species.

Manassas National Battlefield Park Environment: Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest is a seasonally flooded forest that occurs in floodplain backswamps in areas with low soil permeability. This community type primarily occurs in seasonally flooded sloughs and backswamps in the Bull Run floodplain. Sites have hummock-and-hollow microtopography, with typical flooding depth of 20 to 25 cm (8-10 inches) in the hollows, although some sites have shallower flooding. Habitats are probably completely inundated by temporary but major floods every 1-3 years. They typically have shallow, standing water for much of the winter and spring, but are usually well drawn-down by summer. Soils are mapped as silt loams, but samples collected in the field are heavy, red to reddish-brown loamy clays, usually with orange mottling in the upper horizon.

Prince William Forest Park Environment: Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest is a seasonally flooded forest that occurs in floodplain backswamps in areas with low soil permeability. It occurs in a broad floodplain along the South Fork of Quantico Creek in Prince William Forest Park. The swamp forest is especially common in the Triassic Basin and other floodplains with clay soils. The habitat is low-lying and has areas of standing water that typically persist well into the summer.

Global Environment: This forest community occupies poorly drained backswamps, sloughs, low flats, and depressions in the floodplains of streams and small rivers. It is known from scattered locations in the Piedmont of Virginia and Maryland, and mountain valleys of Virginia and West Virginia but favors the broad, clay-rich floodplains of the northern Virginia Culpeper Basin. Shallow seasonal flooding and hummock-and-hollow microtopography are characteristic of most sites, with typical flooding depth of 20 to 25 cm in the hollows. Habitats are probably completely inundated by temporary but major floods every 1-3 years. They typically have shallow, standing water for much of the winter and spring, but are usually well drawn-down by mid-summer. Soils are typically heavy, white- or orange-mottled clay loams that are strongly acidic with moderately low calcium, high magnesium, and intermediate total base saturation levels.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: One stand has a moderate (60% cover) emergent canopy of *Quercus palustris* (pin oak) greater than 35 m tall. The moderate (60%) tree canopy (20-35 m) and sparse (40%) subcanopy (10-20 m) include *Acer rubrum* (red maple), *Acer saccharinum* (silver maple), *Fraxinus pennsylvanica* (green ash), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), and *Ulmus americana* (American elm). The very sparse (<5-20%) tall-shrub (6-10 m) and sparse to moderate (10-40%) short-shrub (1-6 m) layers contain canopy species as well as *Ilex verticillata* (common winterberry), *Lindera benzoin* (northern spicebush), and *Viburnum prunifolium* (blackhaw). The dense herbaceous layer (60-80+%) is dominated by *Saururus cernuus* (lizard's-tail) along with *Cardamine pensylvanica* (Pennsylvania bittercress), *Cinna arundinacea* (sweet woodreed), *Pilea pumila* (Canadian clearweed), and *Scirpus polyphyllus* (leafy bulrush). A total of six exotic species were reported from sampled stands.

Manassas National Battlefield Park Vegetation: Vegetation is a well-developed forest with an overstory variably codominated by *Quercus palustris* (pin oak), *Quercus bicolor* (swamp white oak), and *Fraxinus pennsylvanica* (green ash). An open to dense understory is usually dominated by *Ulmus americana* (American elm) and *Fraxinus pennsylvanica* (green ash). *Acer negundo* (box-elder) and *Acer rubrum* (red maple) are frequent overstory and understory associates. Trees in this community are often festooned with high-climbing lianas of *Toxicodendron radicans* (eastern poison-ivy). Frequent shrubs include *Carpinus caroliniana* (American hornbeam) and *Viburnum prunifolium* (blackhaw). The herb layer is characterized by water-tolerant graminoids and forbs. The deeper hollows are often dominated by clonal patches of *Saururus cernuus* (lizard's-tail), while *Cinna arundinacea* (sweet woodreed) and a variety of sedges occupy slightly better-drained hummocks. The latter include *Carex caroliniana* (Carolina sedge), *Carex festucacea* (fescue sedge), *Carex grayi* (Gray's sedge), *Carex lupulina* (hop sedge), *Carex radiata* (eastern star sedge), *Carex squarrosa* (squarrose sedge), *Carex stipata var. stipata* (awlfruit sedge), *Carex tribuloides* (blunt broom sedge), and *Carex typhina* (cattail sedge). Other characteristic herbs include *Boehmeria cylindrica* (small-spike false nettle), *Glyceria striata* (fowl mannagrass), *Leersia virginica* (whitegrass), *Lycopus virginicus* (Virginia water horehound), *Lysimachia ciliata* (fringed loosestrife), and *Scutellaria lateriflora* (blue skullcap).

Prince William Forest Park Vegetation: The canopy of this saturated deciduous forest is dominated by hydric oaks *Quercus palustris* (pin oak) and *Quercus bicolor* (swamp white oak). Other common canopy associates include *Acer rubrum* (red maple) and *Fraxinus pennsylvanica* (green ash). The shrub layer can be quite open and contains canopy species as well as common floodplain species such as *Carpinus caroliniana* (American hornbeam), *Asimina*

triloba (pawpaw), *Liquidambar styraciflua* (sweetgum), and *Ilex verticillata* (common winterberry). *Viburnum prunifolium* (blackhaw) can have relatively high cover in the low shrub layer. The density of the herb layer varies but is often dominated by *Boehmeria cylindrica* (small-spike false nettle), *Leersia virginica* (whitegrass), and *Carex tribuloides* (blunt broom sedge). The exotic species *Microstegium vimineum* (Nepalese browntop) can have high cover in more disturbed areas. Other low cover herbs include *Carex* (sedge) spp., *Saururus cernuus* (lizard's-tail), *Lycopus virginicus* (Virginia water horehound), and *Cinna arundinacea* (sweet woodreed).

Global Vegetation: Vegetation is a closed forest with mixed overstory dominance by *Quercus palustris* (pin oak), *Quercus bicolor* (swamp white oak), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Fraxinus pennsylvanica* (green ash). In addition, *Ulmus americana* (American elm), *Quercus imbricaria* (shingle oak), *Platanus occidentalis* (American sycamore), and *Quercus shumardii* (Shumard oak) are minor overstory associates. *Ulmus americana* (American elm), *Acer rubrum* (red maple), and inconstantly *Acer negundo* (box-elder) are common understory trees. Climbing lianas of *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), and *Vitis vulpina* (frost grape) are plentiful. The shrub layer is typically open to sparse but can include patches or scattered individuals of *Carpinus caroliniana* (American hornbeam), *Viburnum prunifolium* (blackhaw), *Ilex verticillata* (common winterberry), *Viburnum dentatum* (southern arrow-wood), *Cornus amomum* (silky dogwood), *Sambucus nigra ssp. canadensis* (American black elderberry), and *Lindera benzoin* (northern spicebush). The herb layer is moderately dense and graminoid-rich with *Carex tribuloides* (blunt broom sedge), *Carex squarrosa* (squarrose sedge), *Carex radiata* (eastern star sedge), *Cinna arundinacea* (sweet woodreed), and/or *Scirpus polyphyllus* (leafy bulrush) forming dominance-patches. *Saururus cernuus* (lizard's-tail) and *Carex typhina* (cattail sedge) also occasionally exhibit patch-dominance in the deepest hollows but are very inconstant in the type. Other characteristic herbs include *Boehmeria cylindrica* (small-spike false nettle), *Carex intumescens* (greater bladder sedge), *Carex lupulina* (hop sedge), *Carex stipata var. stipata* (awlfruit sedge), *Geum canadense* (white avens), *Glyceria striata* (fowl mannagrass), *Impatiens capensis* (orange jewelweed), *Lycopus virginicus* (Virginia water horehound), *Leersia virginica* (whitegrass), *Lysimachia ciliata* (fringed loosestrife), *Polygonum punctatum* (dotted smartweed), *Ranunculus hispidus var. caricetorum* (bristly buttercup), *Symplocarpus foetidus* (skunk-cabbage), and *Scutellaria lateriflora* (blue skullcap). *Lysimachia nummularia* (creeping jenny), *Microstegium vimineum* (Nepalese browntop), and *Polygonum cespitosum var. longisetum* (oriental ladysthumb) can be problematic invasives in this association.

Global Dynamics: The habitat occupied by this association limits floristic composition to species with relatively high tolerances for dense, poorly drained soils and prolonged inundation. The relationship between this type and similar types dominated by maples and ash (e.g., *~Acer (rubrum*, *saccharinum) - Fraxinus pennsylvanica - Ulmus americana / Boehmeria cylindrica* Floodplain Forest (CEGL006548)$$) is complex and not fully understood. Field observations (VDNH unpubl. data) of mean flooding depths in various communities suggest that some stands of maple-ash swamp occupy habitats that are too deeply flooded to support hydrophytic oaks. The clearest support for this hypothesis is found in large floodplains that support both types of swamp along an apparent hydrologic gradient. At other sites, especially on smaller streams, it appears that these communities may have a successional relationship in which cut-over or formerly cleared stands of oak-dominated swamp forest have regenerated in stands dominated by *Fraxinus pennsylvanica* (green ash) and *Acer rubrum* (red maple). Along the Potomac in the Chesapeake and Ohio National Historical Park, there are examples with even dominance of *Quercus palustris* (pin oak) and *Acer saccharinum* (silver maple) classified as *Acer (rubrum*, *saccharinum) - Fraxinus pennsylvanica - Ulmus americana / Boehmeria cylindrica* Forest (CEGL006548).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak)
Herb (field)	Graminoid	*Carex radiata* (eastern star sedge), *Carex squarrosa* (squarrose sedge), *Carex tribuloides* (blunt broom sedge)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Quercus palustris* (pin oak)
Manassas National Battlefield Park: *Fraxinus pennsylvanica* (green ash), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), *Saururus cernuus* (lizard's-tail)
Prince William Forest Park: *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak)

Global: *Carex radiata* (eastern star sedge), *Carex squarrosa* (squarrose sedge), *Carex tribuloides* (blunt broom sedge), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low); **Other Plants**: *Styphnolobium japonicum* (Japanese pagoda tree, GNR)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Prince William Forest Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Global: Invasive/Exotic Plants: *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (29-May-2007). This association is uncommon but not rare (probably >300 occurrences by current standards) and likely occurs beyond its known range. It has a restricted geographic distribution but is locally common within that area. The quality of occurrences and long-term viability of habitats are threatened, if not already impacted, over most of the documented range by development, agriculture, and invasive weeds. More inventory and data are needed to refine the rank.

RELATED CONCEPTS

Global Similar Types:

- *Acer (rubrum, saccharinum) - Fraxinus pennsylvanica - Ulmus americana / Boehmeria cylindrica* Floodplain Forest (CEGL006548) similar swamp forest with overlapping range in the Piedmont and Central Appalachians. On average, it occupies more deeply flooded habitats on somewhat larger streams. It lacks a major oak component in the overstory. See comments under Dynamics. Some examples of this community along the Potomac in the Chesapeake and Ohio National Historical Park have equal dominance of *Quercus palustris* (pin oak) and *Acer saccharinum* (silver maple) (AA plots CHF196, CHF 218, CHF 213).
- *Quercus palustris - (Fraxinus nigra) / Lindera benzoin / Carex bromoides* Wet Forest (CEGL007399) high-elevation (>1005 m [3300 feet]) swamp known from Greenbrier County, West Virginia.
- *Quercus palustris - (Quercus bicolor) - Acer rubrum / Vaccinium corymbosum / Osmunda cinnamomea* Wet Forest (CEGL006240) floristically depauperate forest of acidic depression swamps from New Hampshire to northern Virginia.
- *Quercus palustris - (Quercus lyrata) - Fraxinus pennsylvanica / Acer rubrum / Carex* spp. Floodplain Forest (CEGL008597) similar floodplain swamp in Arkansas.
- *Quercus palustris - Quercus bicolor / Viburnum prunifolium / Leersia virginica - Impatiens capensis* Wet Forest (CEGL004643) non-alluvial upland depression swamp of the Maryland and northern Virginia Piedmont.
- *Quercus phellos - Quercus (palustris, lyrata) / Ilex decidua / Carex typhina* Floodplain Forest (CEGL006498)

Global Related Concepts:

- *Quercus bicolor - Nyssa sylvatica / Ilex verticillata / Symplocarpus foetidus* Forested Swamp [Mountain Valley Oak Swamp] (Vanderhorst 2016b) **<**
- *Quercus palustris - Fraxinus pennsylvanica / Saururus cernuus - Cinna arundinacea - Carex tribuloides* Forest (Fleming and Weber 2003) **>**
- *Quercus palustris - Quercus bicolor - Fraxinus pennsylvanica / Carex tribuloides - Carex squarrosa* Forest (Fleming and Patterson 2004) **=**
- *Quercus palustris - Quercus bicolor - Ulmus americana / Carex tribuloides - Carex squarrosa* Forest (Fleming and Patterson 2003) **=**
- *Quercus palustris - Quercus bicolor / Cinna arundinacea - Carex tribuloides - Carex squarrosa* Forest (Fleming 2002b) **=**
- *Quercus palustris - Quercus bicolor / Cinna arundinacea - Carex tribuloides - Carex squarrosa* Forest (Fleming 2002a) **=**
- Piedmont / Mountain Swamp Forest (Fleming pers. comm.) **>**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak

Chesapeake & Ohio Canal National Historical Park Classification Comments: Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest is sometimes referred to as Pin Oak Floodplain Swamp.
Manassas National Battlefield Park Classification Comments: Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest is sometimes referred to as Pin Oak Floodplain Swamp. This community is distinguished by its development in relatively wet floodplain habitats and by its herbaceous composition featuring hydrophytic forbs and sedges. Its overstory composition is similar to that of Northern Piedmont Upland Depression Swamp, which occurs in sluggish, non-alluvial upland depressions and meandering, low-relief headwater streambottoms with little if any active alluvial deposition.

The relationship between this type and Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest (CEGL006548) is complex and not fully understood. Field observations of mean flooding depths in various communities suggest that some stands of Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest occupy habitats that are too deeply flooded to support the hydrophytic oaks present in this type. Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest is distinguished by shallower sloughs that often draw-down earlier in the growing season and a mixed canopy codominated by *Quercus palustris* (pin oak), *Quercus bicolor* (swamp white oak), and *Fraxinus pennsylvanica* (green ash).
Manassas National Battlefield Park Other Comments: Stands of this community along Bull Run just north and just south of U.S. Route 29 are considered to represent a small, but significant occurrence of the type. Portions of these stands are mature, with impressively large oaks, and have a representative diversity of understory and herbaceous species.
Prince William Forest Park Classification Comments: Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest is sometimes referred to as Pin Oak Floodplain Swamp. Examples of this community could be confused with the upland depression swamp Northeastern Pin Oak - Swamp White Oak Wet Forest (CEGL006240), based on the dominance of *Quercus palustris* (pin oak) in the canopy. Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest can be identified by its landscape position in floodplains (versus isolated upland basins) and the lack of highbush blueberries (*Vaccinium* (blueberry) spp.) in the shrub layer. Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest (CEGL006406) occurs in similar landscape positions (backswamps along floodplains), but it is strongly dominated by *Fraxinus pennsylvanica* (green ash) and has no hydric oaks in the canopy.
Global Classification Comments: Classification of this association is supported by analysis of a 1250-plot regional dataset assembled for the National Capital Region vegetation mapping project. In that analysis, this type was represented by 13 Virginia and Maryland plots. Field-collected qualitative data also exist for additional Virginia sites. This association is similar to the partly sympatric *~Quercus palustris - Quercus bicolor / Viburnum prunifolium / Leersia virginica - Impatiens capensis* Wet Forest (CEGL004643)$$, which occurs in sluggish, non-alluvial upland depressions and meandering, low-relief headwater stream bottoms with little, if any, active alluvial deposition. The relationship between these types is somewhat problematic. In their typical floristic expressions and habitats (i.e., floodplain backswamps vs. isolated upland basins), the two types are quite distinct. However, because of very low topographic relief in the Culpeper Basin, there is considerable ambiguity between alluvial and non-alluvial landforms, and composition of stands can be a continuous gradient between the typical expressions. The two groups do not separate well in cluster analysis but do separate convincingly in ordinations studies. Ultimately, very intensive head-to-head analytical comparisons support the recognition of two types. However, some individual stands will be hard to assign by subjective field assessment. Nine West Virginia plots are attributed to this association but were not included in the National Capital Region analysis. Characteristic species in West Virginia include *Quercus bicolor* (swamp white oak), *Nyssa sylvatica* (blackgum), *Symplocarpus foetidus* (skunk-cabbage), and *Carex intumescens* (greater bladder sedge).

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: Found on the north side of the Potomac River in the Seneca area (Canal mile 22-25).
Manassas National Battlefield Park Range: This community occurs in seasonally flooded sloughs and backswamps in the Bull Run floodplain, both north and south of U.S. Route 29. It also occurs along a tributary of Youngs Branch, south of U.S. Route 29. It is widespread along larger stream and rivers in the Culpeper Basin and scattered elsewhere in the northern Virginia and Maryland Piedmont and the Ridge and Valley province of western Virginia.
Prince William Forest Park Range: Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest is only documented at one site in Prince William Forest Park, along the broad floodplain of the South Fork of Quantico Creek in the eastern end of the park.

Global Range: This community type is known from the Piedmont of Maryland and Virginia, the Ridge and Valley of Virginia and West Virginia, and the Greenbrier and Tygart valleys in West Virginia, but is likely to range into adjacent regions. It is relatively common in the Culpeper (Mesozoic) Basin of northern Virginia and adjacent Montgomery County, Maryland, but appears to be a more isolated, smaller patch community elsewhere.
Nations: US
States/Provinces: MD:SNR, VA:S3, WV:S1
TNC Ecoregions: 52:C, 58:C, 59:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, 221Dd:CCC, 221De:CCC, 231Ib:CCC, 231Ic:CCC, M221Aa:CCP, M221Ab:CCC, M221Bb:CCC, M221Bd:CCC
Federal Lands: NPS (C&O Canal, Manassas, Prince William)

ELEMENT SOURCES

Prince William Forest Park Inventory Notes: The single location of this association was quantitatively sampled.
Chesapeake & Ohio Canal National Historical Park Plots: (2 plots): CHOH.225, CHOH.226.
Manassas National Battlefield Park Plots: MANA.1, MANA.3, MANA.35.
Prince William Forest Park Plots: PRWI.43.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
Prince William Forest Park Description Author(s): K. Taverna
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d., Fleming 2002a, Fleming 2002b, Fleming 2002b*, Fleming and Patterson 2003, Fleming and Patterson 2004, Fleming and Weber 2003, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Harrison 2004, Harrison 2011, Vanderhorst 2016b, WVNHP unpubl. data

M503. Central Hardwood Swamp Forest

These swamp forests include seepage, wet flatwood and depression, and lake or pond fringe forests (i.e., not associated with overbank flow from stream or river channels) found in the eastern United States and adjacent Canada, primarily exclusive of the coastal plains. Stands are dominated by hardwood trees, including *Acer rubrum var. trilobum* (red maple), *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Fagus grandifolia* (American beech), *Fraxinus pennsylvanica* (green ash), *Liriodendron tulipifera* (tuliptree), *Liquidambar styraciflua* (sweetgum), *Nyssa biflora* (swamp tupelo), *Nyssa sylvatica* (blackgum), *Platanus occidentalis* (American sycamore), *Quercus alba* (white oak), *Quercus bicolor* (swamp white oak), *Quercus lyrata* (overcup oak), *Quercus michauxii* (swamp chestnut oak), *Quercus palustris* (pin oak), and *Quercus phellos* (willow oak). The collective range includes the northern glaciated midwestern United States ranging east into Lower New England, south into most of the south-central states, including the broad Appalachian region, the unglaciated Interior Low Plateau, and the Ouachitas and Ozarks. Examples of ~Central Interior-Appalachian Seepage Swamp Group (G044)$$ generally occur where the substrate is saturated to the surface for extended periods during the growing season, but where surface water is seldom present for more than short periods of time. This includes streamhead swales or broad sandstone ridges where soils are sandy and saturated due to a combination of perched water table and seepage flow, as well as seepage-fed wetlands on gentle slopes, with substantial seepage flow which may be influenced by wildland fire, and along the bottom slopes of smaller valleys, as well as in the upper riparian zones of larger creeks, sometimes extending upslope along small ephemeral drainages. Examples of ~South-Central Flatwoods & Pond Forest Group (G654)$$ are found in ponds, wet depressions, flats along small streams, and other related environments. Examples of ~Central Interior-Appalachian Flatwoods & Swamp Forest Group (G597)$$ are found in ponds and depressions, and include various kinds of flatwoods (where soils often contain an impermeable clay layer or fragipan creating a shallow, perched water table, soils are poorly drained to very poorly drained, and surface water may be present for extended periods of time, rarely becoming dry).

G654. SOUTH-CENTRAL FLATWOODS & POND FOREST

These primarily *Quercus* (oak)-dominated nonriverine wetland forests are found in ponds, wet depressions, flats along small streams, and other related environments from Maryland south to Alabama and Georgia, and north and west to Kentucky, Missouri and possibly Oklahoma. They encompass a variety of hydroperiods from longer (wetter) areas dominated by *Quercus lyrata* (overcup oak) and *Quercus phellos* (willow oak), to shorter mesic or seasonally wet environments dominated by *Quercus alba* (white oak), *Nyssa sylvatica* (blackgum), and/or *Quercus stellata* (post oak). Other trees that may be present include *Betula nigra* (river birch), *Carya carolinae-septentrionalis* (southern shagbark hickory), *Fraxinus americana* (white ash), *Liquidambar styraciflua* (sweetgum), *Nyssa biflora*

(swamp tupelo), *Quercus michauxii* (swamp chestnut oak), *Quercus oglethorpensis* (Oglethorpe oak), *Quercus shumardii* (Shumard oak), and *Quercus similis* (bottomland post oak). Shrubs may include *Cephalanthus occidentalis* (common buttonbush) and *Lyonia lucida* (fetterbush lyonia). Herbs may include *Carex albolutescens* (greenwhite sedge), *Carex intumescens* (greater bladder sedge), *Carex joorii* (cypress swamp sedge), *Chasmanthium laxum* (slender woodoats), *Cinna arundinacea* (sweet woodreed), *Croton michauxii var. ellipticus* (Willdenow's croton), *Danthonia spicata* (poverty oatgrass), *Pleopeltis polypodioides ssp. michauxiana* (resurrection fern), *Zephyranthes atamasca* (Atamasco lily), and the moss *Climacium americanum* (American climacium moss). The component associations are primarily from the Interior Low Plateau, southern Piedmont, Ridge and Valley/Cumberlands, and Ozarks, with some more peripheral occurrences in the northern Piedmont, mid-Atlantic Coastal Plain, and Ouachitas.

A3430 *Quercus phellos* Piedmont-Cumberland Wet Depression Forest Alliance

This alliance includes vegetation of wet depressions and related habitats in the Piedmont, Cumberland, and Interior Plateau regions of the southeastern United States from Alabama north to Kentucky and Maryland. Examples have *Quercus phellos* (willow oak) as an indicator and typically dominant to codominant component of the canopy. It is noteworthy as an indicator in these regions as it is primarily a species of the coastal plains. The associated species vary across this range. Additional canopy trees include *Liquidambar styraciflua* (sweetgum), *Quercus alba* (white oak), *Quercus lyrata* (overcup oak), *Quercus michauxii* (swamp chestnut oak), *Quercus nigra* (water oak), *Quercus shumardii* (Shumard oak), and *Quercus stellata* (post oak). Some other canopy and subcanopy trees include *Acer floridanum* (southern sugar maple), *Carya carolinae-septentrionalis* (southern shagbark hickory), *Celtis laevigata* (sugarberry), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Morus rubra* (red mulberry), *Nyssa biflora* (swamp tupelo), and *Ulmus americana* (American elm). The small understory trees *Cercis canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Cornus foemina* (stiff dogwood), *Crataegus viridis* (green hawthorn), *Quercus oglethorpensis* (Oglethorpe oak), and *Sideroxylon lycioides* (buckthorn bully) may also occur. Some herbs that are found in component associations include *Carex albolutescens* (greenwhite sedge), *Carex intumescens* (greater bladder sedge), *Carex joorii* (cypress swamp sedge), *Chasmanthium laxum* (slender woodoats), *Chasmanthium sessiliflorum* (longleaf woodoats), *Dichanthelium boscii* (Bosc's panicgrass), *Dulichium arundinaceum* (threeway sedge), *Glyceria striata* (fowl mannagrass), *Hymenocallis occidentalis* (northern spiderlily), *Podophyllum peltatum* (mayapple), and *Zephyranthes atamasca* (Atamasco lily). This alliance occurs in upland depressions and swales in flatwoods that do not receive overbank flooding, including gently sloped upper drainages in flat Piedmont terrain with dense clay hardpan soils that have restricted internal drainage; shallow depressions in ridgetop or plateau-top sandstone of the Cumberland Plateau or on limestones and dolostones in the Southern Ridge and Valley; sloping terrain or shallowly depressed upland flats over gabbro-derived clays in the Piedmont of Georgia and South Carolina; as well as depression swamps found in the Piedmont and in limited areas of the adjacent Inner Coastal Plain.

[CEGL007403] *Quercus phellos / Carex (albolutescens, intumescens, joorii) / Climacium americanum* Wet Forest

Translated Name: **Willow Oak / (Green-white Sedge, Greater Bladder Sedge, Cypress Swamp Sedge) / American Tree**
Moss Wet Forest
Common Name: **Piedmont Upland Depression Willow Oak Swamp Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Swamp Forest (M503)
Group	South-Central Flatwoods & Pond Forest (G654)
Alliance	*Quercus phellos* Piedmont-Cumberland Wet Depression Forest Alliance (A3430)

ELEMENT CONCEPT

Global Summary: This association represents upland depression swamps found in the Piedmont of the Carolinas, Virginia, and the Potomac Valley region of Maryland. It also occurs in limited areas of the adjacent Inner Coastal Plain of the Carolinas. Examples are usually dominated by an almost pure canopy of *Quercus phellos* (willow oak), sometimes with codominant *Quercus lyrata* (overcup oak) or *Liquidambar styraciflua* (sweetgum); scattered individuals of other tree species may be present. Shrubs are generally sparse and not particularly diagnostic of this

community. The most characteristic component of the understory are wetland sedges such as *Carex albolutescens* (greenwhite sedge), *Carex intumescens* (greater bladder sedge), and *Carex joorii* (cypress swamp sedge), but a number of other species may also be encountered. *Sphagnum lescurii* (Lescur's sphagnum), *Climacium americanum* (American climacium moss), and *Polytrichum* (haircap moss) spp. are important moss species. These ponds are important amphibian breeding areas.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This willow oak - red maple forest was sampled with a plot at one location in the park. The site is a gently undulating, saturated depression with organic soil. The unvegetated surface is dominated by leaf litter (63% cover) with some exposed bedrock (9%), wood (20%), bare soil (1%), standing water (4%), and mosses and lichens (3%). Evidence of disturbance includes the presence of exotic species. This community is only known from areas where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.

George Washington Memorial Parkway Environment: This willow oak - red maple forest was sampled with a plot at one location in the park. The site is a gently undulating, saturated depression with organic soil. The unvegetated surface is dominated by leaf litter (63% cover) with some exposed bedrock (9%), wood (20%), bare soil (1%), standing water (4%), and mosses and lichens (3%). Evidence of disturbance includes the presence of exotic species. This community is only known from areas where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.

Prince William Forest Park Environment: Piedmont Upland Depression Willow Oak Swamp Forest occurs in one location in the park as a depression in an upland area with poorly drained, seasonally flooded soil.

Global Environment: This upland depression swamp forest of the Piedmont and inner Coastal Plain is found in small depressional features with hydrologic regimes controlled by fluctuating groundwater or seasonal pooling of rainwater over impermeable substrates. Sites are usually located on areas underlain by fine-grained mafic rocks, slate, or metasiltstone, and typically have dense clay subsoils that impede drainage. They are typically flooded to a depth up to about 50 cm during the winter and early part of the growing season but draw down by late summer. Below the surficial organic matter, soils are usually gleyed or mottled and have a sticky consistency. Although the parent material is often basic, the soils of these swamps are largely leached of bases and are extremely acidic with moderately low cation levels and base saturation. Occurrences on mafic and acidic substrates appear to be indistinguishable. These are important amphibian breeding areas, but they depend on having intact upland areas as habitat for the adults.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: The very dense (80+% cover) tree canopy, 20-35 m tall, and sparse (20%) subcanopy (10-20 m) are dominated by *Acer rubrum* (red maple) and *Quercus phellos* (willow oak). The sparse (20%) tall-shrub (6-10 m) and short-shrub (1-6 m) layers are dominated by *Acer rubrum* (red maple). The herbaceous layer is diverse but sparse (20%) and dominated by *Carex* (sedge) spp. Three exotic species were reported from sampled stands. In addition, this community supports Maryland state-critically imperiled *Carex lupuliformis* (false hop sedge).

George Washington Memorial Parkway Vegetation: The very dense (80+% cover) tree canopy, 20-35 m tall, and sparse (20%) subcanopy (10-20 m) are dominated by *Acer rubrum* (red maple) and *Quercus phellos* (willow oak). The sparse (20%) tall-shrub (6-10 m) and short-shrub (1-6 m) layers are dominated by *Acer rubrum* (red maple). The herbaceous layer is diverse but sparse (20%) and dominated by *Carex* (sedge) spp. Three exotic species were reported from sampled stands. In addition, this community supports Maryland state-critically imperiled *Carex lupuliformis* (false hop sedge).

Prince William Forest Park Vegetation: This deciduous seasonally flooded forest has an open shrub layer and a graminoid-dominated herb layer with areas of bare or litter-covered soil. Standing water is common in ruts and depressions at least during the winter and spring months. The canopy of this forest is dominated by large-diameter *Quercus phellos* (willow oak), occurring with *Acer rubrum* (red maple), *Ulmus americana* (American elm), *Fraxinus pennsylvanica* (green ash), and scattered *Quercus palustris* (pin oak). *Fraxinus pennsylvanica* (green ash) is more common in the understory and shrub layers. Tangles of *Smilax rotundifolia* (roundleaf greenbrier) are scattered in the tall- and short-shrub layers; other vines include *Lonicera japonica* (Japanese honeysuckle), *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax glauca* (cat greenbrier). Characteristic herbaceous species include the sedges *Carex debilis* (white edge sedge), *Carex festucacea* (fescue sedge), *Carex glaucodea* (blue sedge), *Carex radiata* (eastern star sedge), *Carex swanii* (Swan's sedge), and *Carex complanata* (hirsute sedge) and the grasses *Cinna arundinacea* (sweet woodreed), *Dichanthelium*

dichotomum (cypress panicgrass), and *Leersia virginica* (whitegrass). *Symphyotrichum lateriflorum var. lateriflorum* (calico aster) is the most abundant forb, with only 1-2% cover.

Global Vegetation: This upland depression swamp forest is usually dominated by an almost pure canopy of *Quercus phellos* (willow oak), sometimes with codominant *Quercus lyrata* (overcup oak), and with *Quercus bicolor* (swamp white oak) or *Liquidambar styraciflua* (sweetgum). In addition, *Pinus taeda* (loblolly pine), *Ulmus alata* (winged elm), *Quercus stellata* (post oak), *Nyssa biflora* (swamp tupelo), *Quercus nigra* (water oak), *Quercus pagoda* (cherrybark oak), *Diospyros virginiana* (common persimmon), *Magnolia virginiana* (sweetbay), *Quercus michauxii* (swamp chestnut oak), *Ulmus alata* (winged elm), *Acer rubrum var. rubrum* (red maple), and other species may be present. Generally there are patchy or peripheral herbaceous and vine/liana layers of *Chasmanthium sessiliflorum* (longleaf woodoats), *Carex joorii* (cypress swamp sedge), *Rhynchospora glomerata* (clustered beaksedge), *Mitchella repens* (partridgeberry), *Gelsemium sempervirens* (evening trumpetflower), *Juncus coriaceus* (leathery rush), *Smilax tamnoides* (bristly greenbrier), *Smilax bona-nox* (saw greenbrier), *Trachelospermum difforme* (climbing dogbane), *Nekemias arborea* (peppervine), *Smilax tamnoides* (bristly greenbrier), *Vitis rotundifolia* (muscadine), *Toxicodendron radicans* (eastern poison-ivy), *Bignonia capreolata* (crossvine), and likely others. Shrubs include *Ilex decidua* (possum-haw), *Ilex verticillata* (common winterberry), *Nyssa sylvatica* (blackgum), *Vaccinium fuscatum* (black highbush blueberry), *Carpinus caroliniana* (American hornbeam), and abundant *Smilax rotundifolia* (roundleaf greenbrier). Common herbs include *Carex albolutescens* (greenwhite sedge), *Carex brevior* (shortbeak sedge), *Carex caroliniana* (Carolina sedge), *Carex crinita* (fringed sedge), *Carex festucacea* (fescue sedge), *Carex intumescens* (greater bladder sedge), *Carex joorii* (cypress swamp sedge), *Carex louisianica* (Louisiana sedge), *Carex typhina* (cattail sedge), *Carex squarrosa* (squarrose sedge), *Carex pellita* (woolly sedge) (mafic only), *Glyceria striata* (fowl mannagrass), *Scirpus cyperinus* (woolgrass), *Juncus tenuis* (poverty rush), *Juncus coriaceus* (leathery rush), *Chasmanthium laxum* (slender woodoats), and *Trachelospermum difforme* (climbing dogbane). *Sphagnum lescurii* (Lescur's sphagnum) and *Climacium americanum* (American climacium moss) are important moss species. Other *Sphagnum* (sphagnum, peatmoss) spp. and *Polytrichum* (haircap moss) spp. are also found. Exotic plants, especially *Lonicera japonica* (Japanese honeysuckle), sometimes become dense in peripheral zones.

Global Dynamics: At Congaree Swamp National Monument, South Carolina, this community occurs on about a dozen small depressional features, referred to as "isolated, upland, depressional wetlands." All sites are below three acres in size and are usually oval to circular in shape. In the Piedmont, examples in which the canopy is heavily disturbed sometimes develop successional stands dominated by *Liquidambar styraciflua* (sweetgum) or *Acer rubrum* (red maple).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Liquidambar styraciflua* (sweetgum), *Quercus bicolor* (swamp white oak), *Quercus lyrata* (overcup oak), *Quercus phellos* (willow oak)
Herb (field)	Graminoid	*Carex albolutescens* (greenwhite sedge), *Carex brevior* (shortbeak sedge), *Carex caroliniana* (Carolina sedge), *Carex crinita* (fringed sedge), *Carex festucacea* (fescue sedge), *Carex intumescens* (greater bladder sedge), *Carex joorii* (cypress swamp sedge), *Carex louisianica* (Louisiana sedge), *Carex squarrosa* (squarrose sedge), *Carex typhina* (cattail sedge), *Chasmanthium laxum* (slender woodoats), *Glyceria striata* (fowl mannagrass), *Juncus coriaceus* (leathery rush), *Juncus tenuis* (poverty rush), *Scirpus cyperinus* (woolgrass)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Quercus phellos* (willow oak)
George Washington Memorial Parkway: *Quercus phellos* (willow oak)
Prince William Forest Park: *Carex debilis* (white edge sedge), *Carex radiata* (eastern star sedge), *Fraxinus pennsylvanica* (green ash), *Quercus phellos* (willow oak), *Ulmus americana* (American elm)

Global: *Carex albolutescens* (greenwhite sedge), *Carex brevior* (shortbeak sedge), *Carex caroliniana* (Carolina sedge), *Carex crinita* (fringed sedge), *Carex festucacea* (fescue sedge), *Carex intumescens* (greater bladder sedge), *Carex joorii* (cypress swamp sedge), *Carex louisianica* (Louisiana sedge), *Carex squarrosa* (squarrose sedge), *Carex typhina* (cattail sedge), *Carpinus caroliniana* (American hornbeam), *Chasmanthium laxum* (slender woodoats), *Climacium americanum* (American climacium moss), *Glyceria striata* (fowl mannagrass), *Ilex decidua* (possum-haw), *Ilex verticillata* (common winterberry), *Juncus coriaceus* (leathery rush), *Juncus tenuis* (poverty rush), *Nyssa sylvatica* (blackgum), *Quercus bicolor* (swamp white oak), *Quercus lyrata* (overcup oak), *Quercus phellos* (willow oak), *Scirpus cyperinus* (woolgrass), *Smilax rotundifolia* (roundleaf greenbrier), *Sphagnum lescurii* (Lescur's sphagnum), *Trachelospermum difforme* (climbing dogbane), *Vaccinium fuscatum* (black highbush blueberry)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Carex lupuliformis* (false hop sedge, G4, MD-critically imperiled); **Invasive/Exotic Plants**: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium)
George Washington Memorial Parkway: Vulnerable Plants: *Carex lupuliformis* (false hop sedge, G4, MD-critically imperiled); **Invasive/Exotic Plants**: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Prince William Forest Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium)
Global: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (25-Jan-2001). This was never a common community. The small size of examples and their poor drainage for development and economic uses make them a bit less susceptible to conversion than most Piedmont communities, but logging and landscape isolation degrade many that are not destroyed. Their isolated hydrology and small size means they often are exempted from wetland regulations. Much of the habitat for this community has undergone drainage and conversion. Two of the occurrences at Congaree Swamp National Monument showed evidence of drainage of the sites (TNC 1998b). Some extensive losses and degradation in the Piedmont are due to urbanization (e.g., in the vicinities of Charlotte and Butner, NC, some of the largest concentrations of this association).

RELATED CONCEPTS

Global Similar Types:
- *Liquidambar styraciflua - Acer rubrum - Quercus phellos / Eubotrys racemosa* Swamp Forest (CEGL006110) is a closely related type defined for the Chesapeake ecoregion; this accommodates the Ecoregion 58 range formerly accommodated here.
- *Quercus palustris - Quercus bicolor / Viburnum prunifolium / Leersia virginica - Impatiens capensis* Wet Forest (CEGL004643)
- *Quercus phellos - Liquidambar styraciflua / Chasmanthium laxum* Cumberland / Southern Ridge and Valley Wet Forest (CEGL008441)
- *Quercus phellos - Nyssa biflora / Panicum hemitomon - Carex* spp. - *Woodwardia virginica* Swamp Forest (CEGL004104)
- *Quercus phellos - Quercus (michauxii, shumardii) / (Quercus oglethorpensis) / Zephyranthes atamasca* Gabbro Wet Forest (CEGL008484) over gabbroic Iredell soils in the Georgia Piedmont.

Global Related Concepts:
- *Quercus phellos - Liquidambar styraciflua / Smilax rotundifolia / Carex (albolutescens, festucacea)* Woodland (Fleming 2002a) =
- *Quercus phellos / Carex (intumescens, joorii) - Chasmanthium sessiliflorum / Sphagnum lescurii* Forest (Landaal et al. 1998) =
- Quercus phellos / Smilax rotundifolia / Carex (albolutescens, festucacea) Woodland (Fleming and Patterson 2003) =
- Upland Depression Swamp Forest (Schafale and Weakley 1990) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

Chesapeake & Ohio Canal National Historical Park Classification Comments: Piedmont Upland Depression Willow Oak Swamp Forest is also referred to as simply Upland Depression Willow Oak Swamp Forest.
George Washington Memorial Parkway Classification Comments: Piedmont Upland Depression Willow Oak Swamp Forest is also referred to as simply Upland Depression Willow Oak Swamp Forest.
Prince William Forest Park Classification Comments: Piedmont Upland Depression Willow Oak Swamp Forest is also referred to as simply Upland Depression Willow Oak Swamp Forest. A second upland depression forest, Northeastern Pin Oak - Swamp White Oak Wet Forest (CEGL006240), also occurs in the park. It is more common than this type and can be distinguished by the canopy species (*Quercus palustris* (pin oak), *Acer rubrum* (red maple), and/or *Liquidambar styraciflua* (sweetgum)) and a higher density of shrub highbush blueberries (*Vaccinium* (blueberry) spp.). Another wetland community, Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest (CEGL006406), can have *Fraxinus pennsylvanica* (green ash) in the canopy, but it occurs in groundwater seepage zones along the edges of floodplains. It also differs in that it has a dense herbaceous layer with a higher diversity of forbs.
Global Classification Comments: Regional classification conducted by VDNH for the NCR and Mid-Atlantic national parks vegetation mapping projects contained a group of 8 Virginia plots and one Maryland plot belonging to this type. The attribution of plots in the Congaree Swamp National Monument was thought to create a contradiction as the Congaree occurrence was thought to be in a depression in a large river floodplain, not in upland depressions, but this is not correct, so there is no problem. It is a mainly Piedmont upland depression pond type, which is also found in the adjacent Inner Coastal Plain of South Carolina (TNC 1998b). This association is also known to occur in Campbell County, Virginia, in the western Piedmont. In contrast to related ponds in central Tennessee, *Nyssa biflora* (swamp tupelo) is lacking and *Cephalanthus occidentalis* (common buttonbush) is uncommon. Carolina Vegetation Survey plot data exist for this association.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled near Widewater, Berma Road. It is mapped in the vicinity of Canal Lock 15 on the MD side of the canal, and near the intersection of Macarthur Boulevard and Clara Barton Parkway. This community is only known from areas where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.
George Washington Memorial Parkway Range: This community was sampled near Widewater, Berma Road. It is mapped in the vicinity of Canal Lock 15 on the MD side of the canal, and near the intersection of Macarthur Boulevard and Clara Barton Parkway. This community is only known from areas where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.
Prince William Forest Park Range: Piedmont Upland Depression Willow Oak Swamp Forest is documented at only one site in the park, in the upper northwestern corner near the intersection of Route 619 and Route 234. It occurs as an isolated depression on poorly drained soils, surrounded by upland forest.
Global Range: This vegetation is reported from the Atlantic Coastal Plain of South Carolina and ranges through the Piedmont of the Carolinas and Virginia into the Potomac Valley of Maryland. Throughout its range, this is primarily a Piedmont type.
Nations: US
States/Provinces: AL:SNR, GA?:SNA, MD:S1, NC:SNR, SC:SNR, VA:S2
TNC Ecoregions: 52:C, 57:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, 221Dd:CCC, 231Af:CC?, 231Ib:CCC, 231Ic:CCC, 231Id:CCP, 232Bs:CCC
Federal Lands: DOD (Kerr Reservoir); NPS (Appomattox Court House, C&O Canal, Congaree, George Washington Parkway, Prince William); USFS (Sumter, Sumter (Piedmont), Uwharrie); USFWS (Eufaula)

ELEMENT SOURCES

Prince William Forest Park Inventory Notes: The single polygon of this vegetation association was quantitatively sampled.
Chesapeake & Ohio Canal National Historical Park Plots: (1 plot): CHOH.205.
George Washington Memorial Parkway Plots: (1 plot): CHOH.205.
Prince William Forest Park Plots: PRWI.26.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): M.J. Russo
Prince William Forest Park Description Author(s): K. Taverna
Global Description Author(s): A.S. Weakley and G.P. Fleming

References: ALNHP 2002, ALNHP unpubl. data 2018, Fleming 2002a, Fleming 2002b, Fleming and Patterson 2003, Fleming and Patterson 2011b, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Harrison 2004, Harrison 2011, Landaal et al. 1998, Nelson 1986, Patterson 2008a, Patterson pers. comm., Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*

G918. CENTRAL APPALACHIAN-NORTHEAST ALKALINE SWAMP

A4461 *Acer rubrum - Fraxinus pennsylvanica* Northeast Alkaline Swamp Forest Alliance

[CEGL006548] *Acer (rubrum, saccharinum) - Fraxinus pennsylvanica - Ulmus americana / Boehmeria cylindrica* Floodplain Forest

Translated Name: **(Red Maple, Silver Maple) - Green Ash - American Elm / Small-spike False Nettle Floodplain Forest**

Common Name: **Northern Piedmont-Central Appalachian Maple - Ash 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 Appalachian-Northeast Alkaline Swamp (G918)
Alliance	*Acer rubrum - Fraxinus pennsylvanica* Northeast Alkaline Swamp Forest Alliance (A4461)

ELEMENT CONCEPT

Global Summary: This swamp forest ranges from New Jersey and Pennsylvania, south to West Virginia and Kentucky, primarily in the Lower New England / Northern Piedmont, Piedmont, and Central Appalachian ecoregions. It occupies poorly drained backswamps, sloughs, abandoned oxbows, and depressions of large-stream and river floodplains. Soils are flooded at least early in the growing season, and water may be ponded in shallow hollows for most of the year. The overstory is dominated by variable combinations of *Fraxinus pennsylvanica* (green ash), *Acer rubrum* (red maple), and *Acer saccharinum* (silver maple), with *Ulmus americana* (American elm) as a common overstory and understory associate. In Virginia and Maryland, *Acer saccharinum* (silver maple) is most characteristic of large-river (e.g., the James and Potomac) floodplains, where *Acer rubrum* (red maple) is nearly absent. On the smaller order streams that support this type, *Acer saccharinum* (silver maple) is usually absent. In central Kentucky, *Platanus occidentalis* (American sycamore) may also be a canopy component. The shrub layer is typically very sparse or absent, but *Cephalanthus occidentalis* (common buttonbush) may be a component of this stratum. Vines, especially *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis* (grape) spp., are common. The herb layer is usually moderately dense or dense except in deeper hollows. *Boehmeria cylindrica* (small-spike false nettle), *Impatiens capensis* (orange jewelweed), *Cinna arundinacea* (sweet woodreed), *Geum canadense* (white avens), *Glyceria striata* (fowl mannagrass), *Leersia virginica* (whitegrass), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum punctatum* (dotted smartweed), *Pilea pumila* (Canadian clearweed), *Lobelia cardinalis* (cardinalflower), *Saururus cernuus* (lizard's-tail), *Commelina virginica* (Virginia dayflower), *Carex stipata* (awlfruit sedge), *Carex grayi* (Gray's sedge), *Carex tribuloides* (blunt broom sedge), *Carex crinita* (fringed sedge), and *Carex lupulina* (hop sedge) are characteristic species. In the northern part of the range, examples may contain patches of *Symplocarpus foetidus* (skunk-cabbage).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This silver maple - green ash forest was sampled at six locations in the park. The sites are flat alluvial plains, levees and backswamps that are seasonally to semipermanently flooded. It can also occur in the bed of the C & O Canal. Soils are somewhat poorly to very poorly drained clay loam. The unvegetated surface is dominated either by leaf litter (1-97% cover) or bare soil (0-99%) with some wood (1-5%) and mosses and lichens (0-2%). Evidence of disturbance includes altered hydrology (berms), some grazing/browsing, flood-deposited trash, and the presence of exotic species.

George Washington Memorial Parkway Environment: Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest is a seasonally flooded forest that occurs in floodplain backswamps in areas with low soil

permeability. This community occurs along the Potomac floodplain in seasonally flooded sloughs and backswamps that contain standing water for extended periods of the growing season. Sites typically have hummock-and-hollow microtopography, with a variable flooding depth. Soils are typically sticky clay or silty-clay loams with gleyed or mottled upper horizons.

Harpers Ferry National Historical Park Environment: Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest is a seasonally flooded forest that occurs in floodplain backswamps in areas with low soil permeability. This community type occurs along the Potomac and Shenandoah river floodplains in seasonally flooded sloughs and backswamps that contain standing water for extended periods of the growing season. Sites typically have hummock-and-hollow microtopography, with a variable flooding depth (up to 50 cm in the hollows). The deepest portions of the sloughs often do not support trees but can support large patches of wetland forbs. Soils collected from plot-sampling sites are sticky clay or silty-clay loams with gleyed or mottled upper horizons.

Manassas National Battlefield Park Environment: Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest is a seasonally flooded forest that occurs in floodplain backswamps in areas with low soil permeability. This community occurs along the Bull Run floodplain in seasonally flooded sloughs and backswamps that contain standing water for extended periods of the growing season. Sites have hummock-and-hollow microtopography, with a flooding depth up to approximately 50 cm in the hollows. The deepest portions of the sloughs often do not support trees, but can support large patches of wetland forbs. Soils collected from plot-sampling sites are sticky clay or silty-clay loams with gleyed or mottled upper horizons.

National Capital Parks-East Environment: Stands of this association are found in poorly drained areas, including backswamps, sloughs, abandoned oxbows, and depressions of floodplains. The soils are inundated at least early in the growing season. Water may be ponded in shallow hollows for most of the year. This long hydroperiod affects the vegetation.

Global Environment: This association occurs in poorly drained backswamps, sloughs, abandoned oxbows, and depressions of large-stream and river floodplains. Soils are flooded at least early in the growing season, and water may be ponded in shallow hollows for most of the year. Soils collected from plot-sampling sites are sticky clay or silty-clay loams with gleyed or mottled upper horizons. Chemical analysis indicates moderate acidity (mean pH = 5.1) and moderately high calcium, magnesium, and total base saturation levels. At Mammoth Cave National Park (Kentucky), this association is found in a poorly drained backswamp forest which lies just behind the natural levee of the Nolin River. The vegetation is likely influenced by flooding and by upper stream drainage into this small basin wetland (B. Yahn pers. comm. 2015).

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: The dense to very dense (60-80+% cover) tree canopy, 10-35 m tall, is dominated by *Acer saccharinum* (silver maple) and *Fraxinus pennsylvanica* (green ash), as is the sparse moderate (10-40%) subcanopy (10-20 m); additional tree species include *Acer negundo* (box-elder), *Platanus occidentalis* (American sycamore), *Quercus palustris* (pin oak), and *Ulmus americana* (American elm). The very sparse (<5-20%) tall-shrub (6-10 m) and very sparse to sparse (<5-40%) short-shrub (1-6 m) layers are made up of canopy and subcanopy tree saplings. Dominant and/or common species in the herbaceous layer (10-80+%) include *Boehmeria cylindrica* (small-spike false nettle), *Impatiens capensis* (orange jewelweed), *Leersia virginica* (whitegrass), *Pilea pumila* (Canadian clearweed), *Polygonum punctatum* (dotted smartweed), and *Saururus cernuus* (lizard's-tail). Vines of *Toxicodendron radicans* (eastern poison-ivy) and *Vitis riparia* (riverbank grape) climb into the tree and shrub canopies. A total of 24 exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Paspalum fluitans* (horsetail paspalum).

George Washington Memorial Parkway Vegetation: Vegetation is a hardwood forest with *Fraxinus pennsylvanica* (green ash) as a strong dominant in the overstory. *Acer saccharinum* (silver maple), *Ulmus americana* (American elm), and *Salix nigra* (black willow) are occasional overstory associates. *Acer negundo* (box-elder) typically dominates the understory and tall-shrub layer. The shrub layer varies from moderately dense to sparse, and typical species include *Fraxinus pennsylvanica* (green ash), *Acer negundo* (box-elder), *Cornus amomum* (silky dogwood), and *Viburnum recognitum* (southern arrow-wood). Native and exotic vines, especially *Toxicodendron radicans* (eastern poison-ivy), are often present. Deeper areas of standing water do not support trees, although overhanging canopy trees can shade a substantial portion of the habitat. The saturated soils of this type support a mix of wetland graminoids and forbs. Characteristic species include *Carex grayi* (Gray's sedge), *Laportea canadensis* (Canadian woodnettle), *Cryptotaenia canadensis* (Canadian honewort), *Boehmeria cylindrica* (small-spike false nettle), *Impatiens capensis* (orange jewelweed), *Cinna arundinacea* (sweet woodreed), *Lysimachia ciliata* (fringed loosestrife), *Carex tribuloides* (blunt broom sedge), and *Carex lupulina* (hop sedge).

Harpers Ferry National Historical Park Vegetation: Vegetation is a hardwood forest with strong dominance by *Acer saccharinum* (silver maple) and/or *Fraxinus pennsylvanica* (green ash) in the overstory. *Ulmus americana* (American elm) and *Salix nigra* (black willow) are occasional overstory and understory associates. *Acer rubrum* (red maple) is typically absent or has low cover in this community along the Potomac River floodplain. In Virginia, *Acer saccharinum* (silver maple) is characteristic of this type on larger-river floodplains, such as the Potomac, but is uncommon or absent on smaller-order streams. *Acer rubrum* (red maple) is likely more prevalent in examples along the Shenandoah River. The shrub layer is typically very sparse or absent, but vines, especially *Toxicodendron radicans* (eastern poison-ivy), are often present. The deepest portions of the sloughs do not support trees, although overhanging canopy trees can shade a substantial portion of the habitat. The invasive exotic *Lysimachia nummularia* (creeping jenny) may be present.

The more deeply flooded portions of this type support large, nearly monospecific patches of *Saururus cernuus* (lizard's-tail), while slightly higher hummocks and edges support mixed wetland graminoids and forbs. Characteristic species include *Boehmeria cylindrica* (small-spike false nettle), *Impatiens capensis* (orange jewelweed), *Cinna arundinacea* (sweet woodreed), *Mimulus ringens* (Allegheny monkeyflower), *Leersia virginica* (whitegrass), *Polygonum hydropiperoides* (swamp smartweed), *Pilea pumila* (Canadian clearweed), *Phalaris arundinacea* (reed canarygrass), *Carex tribuloides* (blunt broom sedge), and *Carex lupulina* (hop sedge).

Manassas National Battlefield Park Vegetation: Vegetation of this type is a hardwood forest with *Fraxinus pennsylvanica* (green ash) or, less frequently, *Acer rubrum* (red maple) dominant in nearly pure stands. *Ulmus americana* (American elm) is a common overstory and understory associate. *Acer saccharinum* (silver maple) is absent in this community along the Bull Run floodplain. In Virginia, *Acer saccharinum* (silver maple) is characteristic of this type on larger-river (e.g., the James and Potomac) floodplains, but is uncommon or absent on smaller-order streams, such as Bull Run. The shrub layer is typically very sparse or absent, but vines, especially *Toxicodendron radicans* (eastern poison-ivy), are often present. The deepest portions of the sloughs do not support trees, although overhanging *Fraxinus pennsylvanica* (green ash) can shade a substantial portion of the habitat. The more deeply flooded portions of this type support large, nearly monospecific patches of *Saururus cernuus* (lizard's-tail), while slightly higher hummocks and edges support mixed wetland graminoids and forbs. *Glyceria septentrionalis* (floating mannagrass) can also strongly dominant the herb layer earlier in the growing season. Other characteristic species include *Boehmeria cylindrica* (small-spike false nettle), *Impatiens capensis* (orange jewelweed), *Cinna arundinacea* (sweet woodreed), *Glyceria striata* (fowl mannagrass), *Leersia virginica* (whitegrass), *Polygonum hydropiperoides* (swamp smartweed), *Lycopus virginicus* (Virginia water horehound), *Carex stipata var. maxima* (stalkgrain sedge), *Carex tribuloides* (blunt broom sedge), and *Carex lupulina* (hop sedge).

National Capital Parks-East Vegetation: Canopies are variable in this type, but the most characteristic canopy components are *Acer saccharinum* (silver maple), *Acer rubrum* (red maple), and *Fraxinus pennsylvanica* (green ash). Some *Platanus occidentalis* (American sycamore) and *Salix nigra* (black willow) may be present in the subcanopy. Due to the longer hydroperiod, lower woody strata may be sparse, except for seedlings of canopy species and sprigs of *Smilax* (greenbrier). Shrubs may include *Cephalanthus occidentalis* (common buttonbush) and *Quercus palustris* (pin oak). Herbs may be lacking, with the ground mostly bare. Herbs may be found on logs and stumps and may include *Bidens cernua* (nodding beggarticks), *Bidens frondosa* (devil's beggarticks), *Boehmeria cylindrica* (small-spike false nettle), *Carex crinita* (fringed sedge), *Carex tribuloides* (blunt broom sedge), *Cinna arundinacea* (sweet woodreed), *Glyceria striata* (fowl mannagrass), *Hibiscus moscheutos* (crimson-eyed rosemallow), *Iris versicolor* (harlequin blueflag), *Leersia oryzoides* (rice cutgrass), *Lycopus americanus* (American water horehound), *Phytolacca americana* (American pokeweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), and *Polystichum acrostichoides* (Christmas fern). There may be some patches of *Microstegium vimineum* (Nepalese browntop) and additional long-hydroperiod herbs. There may be vines, including *Vitis* (grape) spp.

Global Vegetation: Overstory composition is somewhat limited, with *Fraxinus pennsylvanica* (green ash) usually codominant with *Acer rubrum* (red maple), *Acer saccharinum* (silver maple), or both. Occasional stands vary toward near-monospecific dominance by one of these three species. In Virginia and Maryland, *Acer saccharinum* (silver maple) is most characteristic of large-river (e.g., the James and Potomac) floodplains, where *Acer rubrum* (red maple) is nearly absent. On the smaller order streams that support this type, *Acer saccharinum* (silver maple) is usually absent. *Ulmus americana* (American elm) is a constant minor overstory associate and usually dominates the subcanopy layers when these are developed. Occasional overstory and understory associates include *Acer negundo* (box-elder), *Betula nigra* (river birch), *Platanus occidentalis* (American sycamore), *Quercus bicolor* (swamp white oak), and *Quercus palustris* (pin oak). The shrub layer is typically very sparse or absent but may include tree saplings of *Carpinus caroliniana* (American hornbeam) as well as *Cephalanthus occidentalis* (common buttonbush),

Cornus amomum (silky dogwood), and *Lindera benzoin* (northern spicebush). Vines, especially *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis* (grape) spp., are common. The herb layer is usually moderately dense or dense except in deeper hollows. *Boehmeria cylindrica* (small-spike false nettle) is the most constant herb in 11 Maryland and Virginia plots, averaging 5 to 10% cover. *Saururus cernuus* (lizard's-tail) and *Impatiens capensis* (orange jewelweed) are less constant (55% of plots) but may be high-cover patch-dominants where they occur. Other characteristic and occasionally abundant herbs include *Cinna arundinacea* (sweet woodreed), *Geum canadense* (white avens), *Glyceria striata* (fowl mannagrass), *Leersia virginica* (whitegrass), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum punctatum* (dotted smartweed), *Pilea pumila* (Canadian clearweed), *Lobelia cardinalis* (cardinalflower), *Ludwigia palustris* (marsh seedbox), *Commelina virginica* (Virginia dayflower), *Carex stipata* (awlfruit sedge), *Carex grayi* (Gray's sedge), *Carex tribuloides* (blunt broom sedge), *Carex crinita* (fringed sedge), and *Carex lupulina* (hop sedge). In the northern part of the range, examples may contain patches of *Symplocarpus foetidus* (skunk-cabbage). The invasive exotic *Lysimachia nummularia* (creeping jenny) is problematic in many stands. At Mammoth Cave National Park (Kentucky), the canopy is dominated by *Fraxinus pennsylvanica* (green ash), with *Acer rubrum* (red maple) and *Platanus occidentalis* (American sycamore) also common. The shrub zone is sparse with *Cephalanthus occidentalis* (common buttonbush) dominant; the understory is mostly open. The herb layer is dominated by *Saururus cernuus* (lizard's-tail). Other common herbs include *Carex grayi* (Gray's sedge), *Chasmanthium latifolium* (Indian woodoats), *Leersia virginica* (whitegrass), *Ludwigia palustris* (marsh seedbox), and *Sagittaria latifolia* (broadleaf arrowhead).

Global Dynamics: The habitat occupied by this association limits floristic composition to species with high tolerances for relatively deep and prolonged inundation. The relationship between this type and similar types dominated by oaks (e.g., *~Quercus palustris - Quercus bicolor / Carex tribuloides - Carex radiata - (Carex squarrosa)* Wet Forest (CEGL006497)$$) is complex and not fully understood. Field observations (VDNH unpubl. data) of mean flooding depths in various communities suggest that some stands of this type occupy habitats that are too deeply flooded to support hydrophytic oaks. The clearest support for this hypothesis is found in large floodplains that support both types of swamp along an apparent hydrologic gradient. At other sites, especially on smaller streams, it appears that these communities may have a successional relationship in which cut-over or formerly cleared stands of oak-dominated swamp forest have regenerated in stands dominated by *Fraxinus pennsylvanica* (green ash) and *Acer rubrum* (red maple). Along the Potomac in the Chesapeake and Ohio National Historical Park, there are examples with even dominance of *Quercus palustris* (pin oak) and *Acer saccharinum* (silver maple) classified as *Acer (rubrum*, *saccharinum) - Fraxinus pennsylvanica - Ulmus americana / Boehmeria cylindrica* Forest (CEGL006548).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Acer saccharinum* (silver maple), *Fraxinus pennsylvanica* (green ash)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Acer saccharinum* (silver maple), *Boehmeria cylindrica* (small-spike false nettle), *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm)
George Washington Memorial Parkway: *Acer negundo* (box-elder), *Boehmeria cylindrica* (small-spike false nettle), *Carex grayi* (Gray's sedge), *Fraxinus pennsylvanica* (green ash)
Harpers Ferry National Historical Park: *Acer saccharinum* (silver maple), *Boehmeria cylindrica* (small-spike false nettle), *Fraxinus pennsylvanica* (green ash), *Saururus cernuus* (lizard's-tail)
Manassas National Battlefield Park: *Fraxinus pennsylvanica* (green ash), *Glyceria septentrionalis* (floating mannagrass), *Saururus cernuus* (lizard's-tail), *Ulmus americana* (American elm)
National Capital Parks-East: *Acer rubrum* (red maple), *Acer saccharinum* (silver maple), *Fraxinus pennsylvanica* (green ash)
Global: *Acer rubrum* (red maple), *Acer saccharinum* (silver maple), *Boehmeria cylindrica* (small-spike false nettle), *Fraxinus pennsylvanica* (green ash)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: **Vulnerable Plants**: *Paspalum fluitans* (horsetail paspalum, G5, MD-critically imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium),

Alliaria petiolata (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Barbarea verna* (early yellowrocket), *Datura stramonium* (jimsonweed, High/Low), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Humulus japonicus* (Japanese hop, Medium/Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Poa pratensis* (Kentucky bluegrass, Medium), *Poa trivialis* (rough bluegrass, Medium/Low), *Polygonum hydropiper* (marshpepper knotweed), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Polygonum persicaria* (spotted ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Setaria pumila* (yellow foxtail, Low/Insignificant), *Stellaria media* (common chickweed, Low)
George Washington Memorial Parkway: Invasive/Exotic Plants: *Clematis terniflora* (sweet autumn virginsbower), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb); **Other Plants**: *Artemisia vulgaris* var. *vulgaris* (GUTU)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium), *Poa trivialis* (rough bluegrass, Medium/Low)
National Capital Parks-East: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)
Global: Invasive/Exotic Plants: *Lysimachia nummularia* (creeping jenny, Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (08-Jan-2007).

RELATED CONCEPTS

Global Similar Types:
- *Acer (rubrum, saccharinum) - Fraxinus* spp. - *Ulmus americana* Swamp Forest (CEGL005038)
- *Acer rubrum - Fraxinus pennsylvanica / Saururus cernuus* Swamp Forest (CEGL006606) is the Coastal Plain analogue of CEGL006548 with some compositional overlap; lacks *Acer saccharinum* (silver maple) and contains a number of species with more Coastal affinities, e.g., *Peltandra virginica* (green arrow-arum), *Triadenum walteri* (greater marsh St. Johnswort), *Eubotrys racemosus*, *Quercus lyrata* (overcup oak), etc.
- *Quercus palustris - Quercus bicolor / Carex tribuloides - Carex radiata - (Carex squarrosa)* Wet Forest (CEGL006497) similar swamp forest with overlapping range in the Piedmont and Central Appalachians. On average, occupies less deeply flooded habitats on somewhat smaller streams. Has a stronger component of oaks in the overstory. See comments under Dynamics. Some examples of *Acer (rubrum*, *saccharinum) - Fraxinus pennsylvanica - Ulmus americana / Boehmeria cylindrica* Forest (CEGL006548) along the Potomac in the Chesapeake and Ohio National Historical Park have equal dominance of *Quercus palustris* (pin oak) and *Acer saccharinum* (AA plots CHF196, CHF 218, CHF 213).

Global Related Concepts:
- *Acer (rubrum, saccharinum) - Fraxinus pennsylvanica / Boehmeria cylindrica - Saururus cernuus* Forest (Lea 2004) =
- Piedmont / Mountain Swamp Forest (Fleming pers. comm.) >

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest is sometimes referred to as Maple-Ash Swamp.
George Washington Memorial Parkway Classification Comments: Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest (sometimes referred to as Maple-Ash Swamp) is distinguished from other floodplain types by occurring in deeper sloughs that are flooded most, if not all, of the year and by having a canopy nearly totally dominated by *Fraxinus pennsylvanica* (green ash) with cover of wetland graminoids and herbs, such as *Carex grayi* (Gray's sedge). On Roosevelt Island, this community occurs adjacent to, and intergrades with, Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest (CEGL006287) at the upstream limits of tidal influence. At this hydrological boundary, it may be difficult to distinguish these two swamp forests.

George Washington Memorial Parkway Other Comments: Most examples of Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest in the park are disturbed and have significant cover of exotic vines and herbs.
Harpers Ferry National Historical Park Classification Comments: Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest (sometimes referred to as Maple-Ash Swamp) is distinguished from other floodplain types by deeper sloughs that are flooded much of the year, a canopy nearly totally dominated by *Acer saccharinum* (silver maple) and/or *Fraxinus pennsylvanica* (green ash), and high cover of hydrophytic herbs, particularly *Saururus cernuus* (lizard's-tail). Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217) also has a high cover of *Acer saccharinum* (silver maple), but this floodplain type is well-drained, lacks significant standing water, and has a diverse herb layer of mostly mesophytic herbs.
Manassas National Battlefield Park Classification Comments: Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest is sometimes referred to as Maple-Ash Swamp. The relationship between this type and Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest (CEGL006497) is complex and not fully understood. Field observations of mean flooding depths in various communities suggest that some stands of this type occupy habitats that are too deeply flooded to support the hydrophytic oaks present in Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest. It is distinguished by deeper sloughs that are flooded most, if not all, of the year and a canopy totally dominated by *Fraxinus pennsylvanica* (green ash) with high cover of hydrophytic herbs, particularly *Saururus cernuus* (lizard's-tail).
National Capital Parks-East Classification Comments: Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest is sometimes referred to as Maple-Ash Swamp.
Global Classification Comments: Classification of this associated 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 11 Maryland and Virginia plots, which consistently separate from similar swamp forests of the region [see Similar Associations and Dynamics]. However, this type of swamp vegetation is undersampled in the Northeast, and additional plot data would be very useful in making association circumscriptions and descriptions more robust.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This association commonly occurs in bottomlands along the length of the Chesapeake & Ohio Canal. It was sampled in plots at Spring Gap, along Landers Road, Chick Road floodplain, and elsewhere in Maryland, and along Falling Water Road in Washington, DC.
George Washington Memorial Parkway Range: Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest occurs at Roosevelt Island, Jones Point Park, and at one site on the outer edge of Dyke Marsh.
Harpers Ferry National Historical Park Range: There are two linear stands of Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest in the park, along the Shenandoah River upstream of the Visitors Center across from the Murphy Farm.
Manassas National Battlefield Park Range: This association occurs in six isolated patches along the Bull Run floodplain, north of U.S. Route 29.
National Capital Parks-East Range: There are very few points or mapped polygons of this type at NACE. These are near two points on the Maryland-DC boundary, in the north, in the central area on the Anacostia River, and in the south at Oxon Hill Farm.
Global Range: This community ranges from New Jersey and Pennsylvania, south to West Virginia and Kentucky, primarily in the Lower New England / Northern Piedmont, Piedmont, and Central Appalachian ecoregions.
Nations: US
States/Provinces: DC:SNR, KY:SNR, MD:SNR, NJ:SNR, PA:SNR, VA:S2?, WV:S1
TNC Ecoregions: 44:C, 50:C, 52:C, 58:C, 59:C, 61:C, 62:C
USFS Ecoregions (2007): 221Bc:CCP, 221Db:CCC, 221Dd:CCC, 221De:CCC, 223Dg:CCC, 232Ac:CCP, 232Ad:CCC, M221Aa:CCP, M221Ab:CCC, M221Be:CCC
Federal Lands: NPS (C&O Canal, George Washington Parkway, Harpers Ferry, Mammoth Cave, Manassas, National Capital-East); USFS (Daniel Boone?)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (6 plots): CHOH.001, CHOH.025, CHOH.047, CHOH.224, CHOH.228, CHOH.540.
George Washington Memorial Parkway Plots: GWMP.15.
Harpers Ferry National Historical Park Plots: None.
Manassas National Battlefield Park Plots: MANA.16.
National Capital Parks-East Plots: None.

Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): K. Taverna and G.P. Fleming
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
National Capital Parks-East Description Author(s): M. Pyne
Global Description Author(s): E. Largay, G.P. Fleming and M. Pyne
References: Eastern Ecology Working Group n.d.*, Evans et al. 2009, Fike 1999, Fleming 2002b, Fleming and Patterson 2003, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Harrison 2004, Lea 2004, WVNHP unpubl. data, Yahn pers. comm., Zimmerman 2011g, Zimmerman et al. 2012

[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	Central Hardwood Swamp Forest (M503)
Group	Central Appalachian-Northeast Alkaline Swamp (G918)
Alliance	*Acer rubrum - Fraxinus pennsylvanica* Northeast Alkaline Swamp Forest Alliance (A4461)

Element Concept

Global Summary: This association is a seepage swamp dominated by *Acer rubrum* (red maple) 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* (red maple) dominates the canopy; *Fraxinus pennsylvanica* (green ash) or *Fraxinus americana* (white ash) are usually also found in the canopy and can be codominant. *Fraxinus nigra* (black ash) 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* (tuliptree), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), *Prunus serotina* (black cherry), *Fagus grandifolia* (American beech), *Betula lenta* (sweet birch), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). Conifers such as *Tsuga canadensis* (eastern hemlock) or *Pinus strobus* (eastern white pine) 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* (common winterberry), *Rhododendron viscosum* (swamp azalea), *Clethra alnifolia* (coastal sweet-pepperbush), *Lindera benzoin* (northern spicebush), *Cornus amomum* (silky dogwood), *Alnus serrulata* (hazel alder), and less commonly *Vaccinium corymbosum* (highbush blueberry), *Lyonia ligustrina* (maleberry), *Ilex montana* (mountain holly), *Toxicodendron vernix* (poison-sumac), *Viburnum dentatum* (southern arrow-wood), and *Viburnum nudum var. cassinoides* (withe-rod). The herbaceous layer is variable in cover; *Symplocarpus foetidus* (skunk-cabbage) and *Osmunda cinnamomea* (cinnamon fern) are nearly always present. In some areas, tall ferns (*Osmunda cinnamomea* (cinnamon fern), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Thelypteris palustris* (eastern marsh fern), *Thelypteris noveboracensis* (New York fern)) form an herbaceous canopy within which other species are scattered. Microtopography is generally pronounced, resulting from tip-ups. Tree seedlings and *Sphagnum* (sphagnum, peatmoss) mosses are common on hummocks but do not in general form extensive carpets. Additional nonvascular species can include *Plagiomnium cuspidatum* (toothed plagiomnium moss) and *Calliergon* (spear moss) spp. Invasive shrubs and herbs, including *Berberis thunbergii* (Japanese barberry), *Rosa multiflora* (multiflora rose), *Lonicera morrowii* (Morrow's honeysuckle), *Alliaria petiolata* (garlic mustard), and *Microstegium vimineum* (Nepalese browntop), may be abundant.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This red maple - ash forest was sampled at one plot location in the park. The site is a flat, saturated backswamp with very poorly drained clay soil. The unvegetated surface is made up of equal amounts of leaf litter (30% cover), bare soil (25%), and standing water

(35%) with some small rocks (1%), wood (10%), and liverworts (5%). Evidence of disturbance includes the presence of exotic species.

George Washington Memorial Parkway Environment: Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest is the only non-alluvial wetland community in the Potomac Gorge portion of the George Washington Memorial Parkway. It is restricted to groundwater-saturated flats and bottoms, which are present in just a few localities. Although the habitats of this community are occasionally overflowed during very large flood events, their hydrological, ecological, and vegetation dynamics are largely controlled by groundwater rather than by alluvial processes. Habitats are best characterized as saturated (*sensu* Cowardin et al. 1979) or seasonally saturated (*sensu* Golet et al. 1993), with perched water tables maintaining damp to wet soil conditions for most or part of the growing season. 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). Sites are slightly sloping (mean slope = 1 degree), with hummock-and-hollow microtopography and substrates of heterogeneous, fine to coarse alluvium. They are typically very wet during the winter and spring months but dry up and often entirely lack standing or flowing water by late summer. Soils are predominantly mineral (mean organic matter content = 6.7%), although thin to locally deep organic muck usually accumulates in depressions and intermittent channels. Soil samples extracted from plots are strongly acidic (mean pH = 5.2) but moderately base-rich, with moderately high calcium, magnesium, and base saturation levels. Groundwater pH data collected from all five sites (Lea and Riley 2005) also indicate moderately high base status.

Prince William Forest Park Environment: This saturated, deciduous forest occurs in a backswamp along the floodplain of Quantico Creek in a slight depression adjacent to the upland slope. This seepage forest receives groundwater discharged from the base of an adjoining slope. Soil samples collected from this site are strongly acidic but have high levels of calcium, magnesium, and zinc.

Rock Creek Park Environment: This red maple - ash seepage swamp is a very small and unusual natural community found in groundwater-fed depressions at the base of hills and along floodplains. The amount of saturation varies from one point in a seepage swamp to another, due to water drainage patterns and small changes in elevation. Low areas in the swamp are usually characterized by wet muck (highly decomposed plant matter) over saturated mineral soils of variable pH. Saturated soils may make it easier for trees to be uprooted and toppled during strong windstorms, leaving behind tip-up mounds and bowl-like depressions where their roots once grew. This common occurrence creates lower areas and higher areas, i.e., microhabitats within the swamp which support different suites of species.

Wolf Trap National Park for the Performing Arts Environment: This saturated, deciduous forest occurs in slight depressions along the outer edge of the Wolftrap Creek floodplain. This habitat receives abundant groundwater seepage discharged from the base of an adjoining slope and may also be subject to occasional overland flooding. The habitat is saturated year-round, with standing water present during the spring and early summer, followed by drier conditions later in the growing season. Soil samples collected from the site indicate intermediate levels of base saturation and fertility.

Global Environment: This association is a seepage swamp dominated by *Acer rubrum* (red maple) 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

Chesapeake & Ohio Canal National Historical Park Vegetation: The very dense (80+% cover) tree canopy, 20-35 m tall, is dominated by *Acer rubrum* (red maple) with lesser amounts of *Fagus grandifolia* (American beech) and *Liriodendron tulipifera* (tuliptree). The sparse (20%) subcanopy (10-20 m) includes *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), and *Fraxinus pennsylvanica* (green ash). The very sparse (10%) tall-shrub layer (6-10 m) and sparse (20%) short-shrub layer (1-6 m) is made up of canopy species as well as *Alnus serrulata* (hazel alder), *Lindera benzoin* (northern spicebush), and *Viburnum recognitum* (southern arrow-wood). The dense herbaceous layer (80+%) is dominated by *Boehmeria cylindrica* (small-spike false nettle), *Leersia virginica* (whitegrass), *Symplocarpus foetidus* (skunk-cabbage) and *Saururus cernuus* (lizard's-tail). Eight exotic species were reported from sampled stands.

George Washington Memorial Parkway Vegetation: This forest has an open overstory strongly dominated by *Acer rubrum* (red maple). *Platanus occidentalis* (American sycamore) is an important overstory associate in one plot but is not characteristic. *Liriodendron tulipifera* (tuliptree) (with stems up to 67 cm [26 inches] dbh) is a more constant but minor canopy tree. Mean canopy height is 29 m (95 feet) and mean canopy cover is 65-70%. *Acer rubrum* (red maple) also dominates the subcanopy tree layers, with *Carpinus caroliniana* (American hornbeam) second in importance. *Fraxinus pennsylvanica* (green ash), *Fraxinus americana* (white ash), *Ulmus americana* (American elm), and *Quercus palustris* (pin oak) each occur as scattered overstory and understory species in some stands of the type. Climbing and scrambling lianas of *Vitis labrusca* (fox grape), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax rotundifolia* (roundleaf greenbrier) are frequent in the understory. The shrub layer is usually open (37% mean stratum cover) and dominated by *Ilex verticillata* (common winterberry) (145 stems/ha). *Asimina triloba* (pawpaw), *Lindera benzoin* (northern spicebush), and *Viburnum dentatum var. dentatum* (southern arrow-wood) are constant, low-cover shrubs, while *Vaccinium fuscatum* (black highbush blueberry) is important in a single plot.

The herb layer is dense, at least in the early part of the growing season, when *Symplocarpus foetidus* (skunk-cabbage) is the overwhelming dominant. Early-flowering herbs that are often hidden among the leafy *Symplocarpus foetidus* (skunk-cabbage) plants are *Cardamine pensylvanica* (Pennsylvania bittercress), *Ranunculus recurvatus* (blisterwort), *Carex prasina* (drooping sedge), and *Carex debilis var. debilis* (white edge sedge). By mid-summer, *Symplocarpus foetidus* (skunk-cabbage) dies back and dominance shifts to *Saururus cernuus* (lizard's-tail) and a suite of other summer-green forbs, including *Impatiens capensis* (orange jewelweed), *Geum canadense* (white avens), and *Boehmeria cylindrica* (small-spike false nettle). Less constant or abundant herbs that have high fidelity to this community include *Cinna arundinacea* (sweet woodreed), *Glyceria striata* (fowl mannagrass), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Dryopteris cristata* (crested woodfern), *Thelypteris palustris var. pubescens* (eastern marsh fern), *Carex crinita* (fringed sedge), *Carex laevivaginata* (smoothsheath sedge), *Polygonum arifolium* (halberdleaf tearthumb), *Chelone glabra* (white turtlehead), *Lobelia cardinalis* (cardinalflower), and *Viola cucullata* (marsh blue violet). Total species richness ranges from 47-57 taxa per 400 square meters.

Prince William Forest Park Vegetation: Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest is an open forest with dense to open shrub layers and a dense, continuous herb layer dominated by a mix of wetland graminoids and forbs. Canopy trees are mostly *Fraxinus pennsylvanica* (green ash), and common associates include *Platanus occidentalis* (American sycamore), *Acer rubrum* (red maple), and *Betula nigra* (river birch). Trees may be absent in the wettest parts of this community but rooted around the margins of the seep. *Fraxinus pennsylvanica* (green ash) also dominates the tall-shrub stratum. Other common shrubs are *Lindera benzoin* (northern spicebush), *Carpinus caroliniana* (American hornbeam), and *Asimina triloba* (pawpaw). Herbaceous dominance varies from *Symplocarpus foetidus* (skunk-cabbage) (visible only early in the growing season) to *Saururus cernuus* (lizard's-tail); *Carex laevivaginata* (smoothsheath sedge), *Poa trivialis* (rough bluegrass), *Impatiens capensis* (orange jewelweed), and *Ranunculus pusillus* (low spearwort) can also have high cover. Other typical species that may occur with lower cover include *Boehmeria cylindrica* (small-spike false nettle), *Cinna arundinacea* (sweet woodreed), *Amphicarpaea bracteata* (American hogpeanut), *Chelone glabra* (white turtlehead), *Hydrocotyle ranunculoides* (floating marshpennywort), *Onoclea sensibilis* (sensitive fern), *Carex amphibola* (eastern narrowleaf sedge), *Arisaema triphyllum* (Jack in the pulpit), *Symphyotrichum lateriflorum* (calico aster), and *Circaea lutetiana* (broadleaf enchanter's nightshade).

Rock Creek Park Vegetation: The open tree canopy is characterized by *Acer rubrum* (red maple). Though present in the understory of other natural communities in the park, *Acer rubrum* (red maple) may be dominant in the understory as well as the canopy of this community. *Fraxinus pennsylvanica* (green ash) is another frequent canopy tree in this natural community. The shrub layer may include *Rhododendron viscosum* (swamp azalea), *Ilex verticillata* (common winterberry), *Lindera benzoin* (northern spicebush), *Viburnum prunifolium* (blackhaw), and *Viburnum dentatum* (southern arrow-wood). The field layer is often dominated by *Symplocarpus foetidus* (skunk-cabbage) from late winter until mid-summer at which time it goes dormant quickly and is often not visible at all by late July or early August. At this time of year, *Impatiens capensis* (orange jewelweed) is often conspicuous in the field layer. Other herbaceous species include *Osmunda cinnamomea* (cinnamon fern), *Onoclea sensibilis* (sensitive fern), *Ludwigia palustris* (marsh seedbox), *Mimulus* (monkeyflower) sp., Polygonum arifolium, Lobelia cardinalis, and *Pilea pumila* (Canadian clearweed). Most plants in this community tolerate saturated soil at least during the growing season, if not year-round. *Fagus grandifolia* (American beech) and *Liriodendron tulipifera* (tuliptree) often grow on slightly elevated and better drained ground within the community.

Wolf Trap National Park for the Performing Arts Vegetation: Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest is a saturated forest with dense to open shrub layers and a dense, continuous herb

layer dominated by wetland forbs and ferns. Canopy trees are mostly *Acer rubrum* (red maple) with some *Liriodendron tulipifera* (tuliptree) and *Quercus alba* (white oak) on better-drained edges of the swamp. *Lindera benzoin* (northern spicebush) and *Ilex verticillata* (common winterberry) are common in the tall-shrub stratum. Other short and tall shrubs include *Vaccinium corymbosum* (highbush blueberry), *Viburnum nudum* (possumhaw), *Toxicodendron vernix* (poison-sumac), and *Viburnum recognitum* (southern arrow-wood). The herb layer is densely dominated by *Symplocarpus foetidus* (skunk-cabbage) early in the growing season; this species typically evanesces by the end of June or early July. Later in the growing season, *Saururus cernuus* (lizard's-tail) assumes dominance. *Osmunda cinnamomea var. cinnamomea* (cinnamon fern) has moderate to high cover throughout the season. Other typical species that occur with lower cover include *Boehmeria cylindrica* (small-spike false nettle), *Lycopus virginicus* (Virginia water horehound), *Glyceria striata* (fowl mannagrass), *Cinna arundinacea* (sweet woodreed), *Microstegium vimineum* (Nepalese browntop), *Chelone glabra* (white turtlehead), *Impatiens capensis* (orange jewelweed), *Osmunda regalis var. spectabilis* (royal fern), *Veratrum viride* (green false hellebore), and *Pilea pumila* (Canadian clearweed).

Global Vegetation: *Acer rubrum* (red maple) dominates the canopy; *Fraxinus pennsylvanica* (green ash) or *Fraxinus americana* (white ash) are usually also found in the canopy and either can be codominant in the canopy. *Fraxinus nigra* (black ash) is not generally associated with this type and, if present, occurs only as scattered individuals. Other canopy or subcanopy associates may include *Liriodendron tulipifera* (tuliptree), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), *Prunus serotina* (black cherry), *Fagus grandifolia* (American beech), *Betula lenta* (sweet birch), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). Conifers such as *Tsuga canadensis* (eastern hemlock) or *Pinus strobus* (eastern white pine) 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* (common winterberry), *Rhododendron viscosum* (swamp azalea), *Clethra alnifolia* (coastal sweet-pepperbush), *Lindera benzoin* (northern spicebush), *Cornus amomum* (silky dogwood), *Alnus serrulata* (hazel alder), *Carpinus caroliniana* (American hornbeam), and less commonly *Vaccinium corymbosum* (highbush blueberry), *Lyonia ligustrina* (maleberry), *Ilex montana* (mountain holly), *Toxicodendron vernix* (poison-sumac), *Viburnum dentatum* (southern arrow-wood), and *Viburnum nudum var. cassinoides* (withe-rod). The herbaceous layer is variable in cover; *Symplocarpus foetidus* (skunk-cabbage) and *Osmunda cinnamomea* (cinnamon fern) are nearly always present. In some areas, tall ferns (*Osmunda cinnamomea* (cinnamon fern), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Thelypteris palustris* (eastern marsh fern), *Thelypteris noveboracensis* (New York fern)) form an herbaceous canopy within which other species are scattered. These other herbaceous species include *Impatiens capensis* (orange jewelweed), *Galium aparine* (stickywilly), *Geum canadense* (white avens), *Arisaema triphyllum* (Jack in the pulpit), *Carex stricta* (upright sedge), *Carex gracillima* (graceful sedge), *Carex intumescens* (greater bladder sedge), *Carex radiata* (eastern star sedge), *Carex laevivaginata* (smoothsheath sedge), *Veratrum viride* (green false hellebore), *Boehmeria cylindrica* (small-spike false nettle), *Chelone glabra* (white turtlehead), *Cardamine pensylvanica* (Pennsylvania bittercress), *Pilea pumila* (Canadian clearweed), and *Glyceria* (mannagrass) spp. At the southern end of the range in Maryland and Virginia, *Symplocarpus foetidus* (skunk-cabbage) is usually greatly dominant (>50% cover) early in the growing season, with *Saururus cernuus* (lizard's-tail) frequently assuming patch-dominance during the summer. Tree seedlings and *Sphagnum* (sphagnum, peatmoss) mosses are common on hummocks but do not in general form extensive carpets. Additional nonvascular species can include *Plagiomnium cuspidatum* (toothed plagiomnium moss) and *Calliergon* (spear moss) spp. Invasive shrubs and herbs, including *Berberis thunbergii* (Japanese barberry), *Rosa multiflora* (multiflora rose), *Lonicera morrowii* (Morrow's honeysuckle), *Alliaria petiolata* (garlic mustard), and *Microstegium vimineum* (Nepalese browntop), may be abundant.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Fraxinus americana* (white ash)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata* (common winterberry)
Herb (field)	Flowering forb	*Symplocarpus foetidus* (skunk-cabbage)
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea* (cinnamon fern)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Symplocarpus foetidus* (skunk-cabbage)

George Washington Memorial Parkway: *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Ilex verticillata* (common winterberry), *Lindera benzoin* (northern spicebush), *Saururus cernuus* (lizard's-tail), *Symplocarpus foetidus* (skunk-cabbage)
Prince William Forest Park: *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), *Lindera benzoin* (northern spicebush), *Saururus cernuus* (lizard's-tail), *Symplocarpus foetidus* (skunk-cabbage)
Rock Creek Park: *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), *Symplocarpus foetidus* (skunk-cabbage)
Wolf Trap National Park for the Performing Arts: *Acer rubrum* (red maple), *Symplocarpus foetidus* (skunk-cabbage)
Global: *Acer rubrum* (red maple), *Clethra alnifolia* (coastal sweet-pepperbush), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Lindera benzoin* (northern spicebush), *Osmunda cinnamomea* (cinnamon fern), *Rhododendron viscosum* (swamp azalea), *Symplocarpus foetidus* (skunk-cabbage)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Berberis thunbergii* (Japanese barberry, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* (oriental ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Taraxacum officinale* (common dandelion)
George Washington Memorial Parkway: Vulnerable Plants: *Erigenia bulbosa* (harbinger of spring, G5, VA state-vulnerable), *Valeriana pauciflora* (largeflower valerian, G4, VA state-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb)
Prince William Forest Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Poa trivialis* (rough bluegrass, Medium/Low)
Rock Creek Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Berberis thunbergii* (Japanese barberry, High/Medium), *Euonymus fortunei* (winter creeper, High/Medium), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Malus* sp., *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Viburnum plicatum* (Japanese snowball)
Wolf Trap National Park for the Performing Arts: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)

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 / Ilex mucronata - Vaccinium corymbosum* Swamp Forest (CEGL006220)
- *Acer rubrum / Rhododendron viscosum - Clethra alnifolia* Swamp Forest (CEGL006156)

Global Related Concepts:
- *Acer rubrum - Fraxinus pennsylvanica / Lindera benzoin / Symplocarpus foetidus* Forest (Fleming and Patterson 2003) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest is sometimes referred to as Red Maple Seepage Swamp.

George Washington Memorial Parkway Classification Comments: This unit is the most distinctive of all forested community types in the Potomac Gorge and is easily recognized in the field. Its swampy, saturated, stream-bottom habitats and vegetation are usually separated from adjacent communities by abrupt transitions. Occasionally, it intermingles with stands of Northern Piedmont Small Stream Floodplain Forest (CEGL006492) on floodplains that have soil drainage conditions variable over small spatial scales (e.g., along the lower part of the Carriage Road swamp at Great Falls Park). It is sometimes referred to as Red Maple Seepage Swamp.
George Washington Memorial Parkway Other Comments: Although disturbed in the distant past, the bedrock terrace occurrences of this community at Great Falls Park are exceptionally large, high-quality examples of the type.
Prince William Forest Park Classification Comments: Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest is also referred to as Red Maple Seepage Swamp. It can be distinguished from similar communities by its landscape position, non-alluvial hydrology, and the composition of its canopy and/or herbaceous layer. In Prince William Forest Park, the wetland community Piedmont Upland Depression Willow Oak Swamp Forest (CEGL007403) can have *Fraxinus pennsylvanica* (green ash) in the canopy but lacks many of the herbaceous species found in Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest and is seasonally flooded rather than saturated. The wetland community Southern Red Maple - Blackgum Swamp Forest (CEGL006238) can occur in similar landscape positions with groundwater seepage, but it is an acidic swamp and can be distinguished by the absence or unimportance of *Fraxinus pennsylvanica* (green ash) in the canopy. Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest (CEGL006497) also occurs in floodplain backswamps but has a canopy with a prominent component of hydric oaks (*Quercus palustris* (pin oak) or *Quercus bicolor* (swamp white oak)).
Rock Creek Park Classification Comments: This community is sometimes referred to as Red Maple Seepage Swamp. Diagnostic features include *Symplocarpus foetidus* (skunk-cabbage), *Acer rubrum* (red maple), and *Fraxinus pennsylvanica* (green ash). There may be occasional shrubs, including *Lindera benzoin* (northern spicebush) or *Rhododendron viscosum* (swamp azalea).
Rock Creek Park Other Comments: This community is found where groundwater seeps to the surface, depends on natural processes that produce regular groundwater discharge. It is seriously threatened by activities in the watershed that reduce groundwater discharge. Other threats to this community include non-native invasive plants and non-native insect pests such as emerald ash borer, Asian long-horned beetle, viburnum leaf beetle, and Dutch elm disease or elm yellows.
Wolf Trap National Park for the Performing Arts Classification Comments: Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest (also referred to as Red Maple Seepage Swamp) can be distinguished from Northern Piedmont Small Stream Floodplain Forest (CEGL006492) by its groundwater-controlled hydrology and the composition of its herbaceous layer with a high cover of *Symplocarpus foetidus* (skunk-cabbage) (visible only until late June or early July).
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

Chesapeake & Ohio Canal National Historical Park Range: This community was found near Marble Quarry (Canal mile 38-39), Violettes Lock (Canal mile 22), Muddy Branch (Canal mile 20), and Great Falls (Canal mile 16).
George Washington Memorial Parkway Range: In the Potomac Gorge section of George Washington Memorial Parkway, Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest is known only from upper Dead Run (south of the parkway) in Turkey Run Park; along lower Mine Run in Great Falls Park; and in several places near the Carriage Road on the bedrock terrace below the picnic grounds at Great Falls Park.
Prince William Forest Park Range: Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest is documented at one location in Prince William Forest Park, in the eastern end of the park at the confluence of the South Fork of Quantico Creek and the main stem of Quantico Creek.
Rock Creek Park Range: This natural community is very uncommon at Rock Creek Park. One of the easiest-to-access examples is found along the Valley Trail in the northernmost part of the park. Another can be found along the Valley Trail opposite Picnic Area 10. A difficult location to access because of road traffic, but with a high-quality seepage swamp, is in the extreme northwest of the park, near where Rock Creek crosses from Maryland to DC, on the south side of Beach Drive, across the street from Rock Creek.

Wolf Trap National Park for the Performing Arts Range: This community is mapped at three locations at WOTR, one at the far western end of the park near the maintenance facility, and the other two near Wolf Trap Creek east of the Filene Center.
Global Range: This vegetation occurs in southern New England south through the mid-Atlantic states to Virginia.
Nations: US
States/Provinces: CT:SNR, DC:SNR, DE:S1, IN:SNR, MA:SNR, MD:SNR, NH:SNR, NJ:S3S5, NY:SNR, PA:SNR, RI:SNR, VA:S2?
TNC Ecoregions: 48:C, 52:C, 58:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (2007): 211Fa:CCP, 211Fb:CCP, 211Fc:CCC, 211Fd:CCP, 221Aa:CC?, 221Ab:CCC, 221Ac:CC?, 221Ad:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ai:CCC, 221Ak:CC?, 221Al:CCC, 221An:CC?, 221Ba:CCC, 221Bc:CCP, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Dc:CCC, 222Ib:CCC, 222Ic:CCC, 222Ja:CCC, 231Ib:CCC, 231Ic:CCC, 232Ha:CC?, 232Je:C??, 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, Roosevelt-Vanderbilt, Saratoga, Upper Delaware, Weir Farm, Wolf Trap); USFWS (Great Meadows?, Iroquois, Montezuma, Patuxent)

ELEMENT SOURCES

Prince William Forest Park Inventory Notes: The single polygon of this type was quantitatively sampled.
Chesapeake & Ohio Canal National Historical Park Plots: (3 plots): CHOH.202, MDGM_039, MDGM_108.
George Washington Memorial Parkway Plots: GFNP_003, GFNP_004, GFNP_005, GFNP_041, TURK_011.
Prince William Forest Park Plots: PRWI. 49.
Rock Creek Park Plots: ROCR.2.
Wolf Trap National Park for the Performing Arts Plots: WOTR.1.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo and C.W. Nordman
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Prince William Forest Park Description Author(s): K. Taverna
Rock Creek Park Description Author(s): J. Teague
Wolf Trap National Park for the Performing Arts Description Author(s): K. Taverna
Global Description Author(s): L.A. Sneddon, S.C. Gawler and G.P. Fleming
References: Breden 1989, Breden et al. 2001, Coxe 2009, Davis 2011f, Eastern Ecology Working Group n.d.*, Edinger et al. 2008a, Edinger et al. 2014a, Edinger et al. 2014b, Ehrenfeld 1977, Enser and Lundgren 2006, Fike 1999, Fleming 2007, Fleming and Patterson 2003, Fleming et al. 2007b, Fleming et al. 2017, Gawler et al. 2017, Golet et al. 1993, Harrison 2004, Harrison 2011, Hop et al. 2009, Lea and Riley 2005, Metzler and Barrett 2006, Metzler et al. 2009, NRCS 2001b, NRCS 2004a, Patterson 2008a, Perles et al. 2007, Perles et al. 2008, Reschke 1990, Sechler et al. 2014, Sneddon et al. 2008, Swain and Kearsley 2014, Thompson and Sorenson 2005, 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	Central Hardwood Swamp Forest (M503)
Group	Central Appalachian-Northeast Alkaline Swamp (G918)
Alliance	*Acer rubrum - Fraxinus pennsylvanica* Northeast Alkaline Swamp Forest Alliance (A4461)

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* (red maple), *Fraxinus americana* (white ash), and *Liriodendron tulipifera* (tuliptree) the

most abundant species. *Fraxinus nigra* (black ash) is a frequent overstory associate but more abundant and sometimes dominant in the understory, along with young *Acer rubrum* (red maple) and *Fraxinus americana* (white ash). With increasing elevation, *Betula alleghaniensis* (yellow birch) 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* (sweet birch) and *Tilia americana* (American basswood). 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* (northern spicebush) is usually the most abundant species, and considerable stratum cover is contributed by tree saplings. Other frequently occurring true shrubs are *Alnus serrulata* (hazel alder), *Carpinus caroliniana* (American hornbeam), *Hamamelis virginiana* (American witch-hazel), *Ilex verticillata* (common winterberry), and *Sambucus nigra ssp. canadensis* (American black elderberry). 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* (skunk-cabbage) (mostly at lower elevations) and *Veratrum viride* (green false hellebore) 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* (Schreber's aster), *Caltha palustris* (yellow marsh-marigold), *Carex bromoides* (brome-like sedge), *Carex gynandra* (nodding sedge), *Carex prasina* (drooping sedge), *Chelone glabra* (white turtlehead), *Chrysosplenium americanum* (American golden saxifrage), *Cinna arundinacea* (sweet woodreed), *Dryopteris carthusiana* (spinulose woodfern), *Dryopteris goldieana* (Goldie's woodfern), *Glyceria striata* (fowl mannagrass), *Impatiens capensis* (orange jewelweed), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Ranunculus recurvatus* (blisterwort), *Saxifraga pensylvanica* (eastern swamp saxifrage), *Packera aurea* (golden ragwort), *Sphenopholis pensylvanica* (swamp wedgescale), *Thalictrum pubescens* (king-of-the-meadow), and *Viola cucullata* (marsh blue violet). Moss cover is often significant but only rarely includes *Sphagnum* (sphagnum, peatmoss) 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

Catoctin Mountain Park Environment: This vegetation occurs in linear patches along meandering stream channels with slow-moving clear water; diffuse seepage channels feed the streams from adjacent slightly higher elevations. Soils are mucky and shallow, but firm, overlying silt loam that is often very stony. Large rocks are common on the substrate, and in one area rocks were prevalent beneath a "canopy" of *Symplocarpus foetidus* (skunk-cabbage). Microtopography is characterized by slight hummocks, and the topography is gently sloping (approximately 6%). This association is almost entirely confined to areas underlain by phyllite and quartz schist bedrock, with one known area on metabasalt, of the Catoctin Formation.

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* (brome-like sedge) and *Carex prasina* (drooping sedge)) 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* (black ash), 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

Catoctin Mountain Park Vegetation: This association is characterized by a diversity of tree species often with no single dominant, in a somewhat open canopy. The most frequent tree species are *Betula alleghaniensis* (yellow birch), *Liriodendron tulipifera* (tuliptree) (which may be dominant), *Acer rubrum* (red maple), and *Fagus grandifolia* (American beech). Other less frequently encountered trees may include *Acer saccharum* (sugar maple), *Betula lenta* (sweet birch), *Carya ovata* (shagbark hickory), *Fraxinus americana* (white ash), and *Quercus rubra* (northern red oak). *Platanus occidentalis* (American sycamore) is also occasionally present in the canopy, especially closer to the stream channel. An understory of variable cover is characterized by *Carpinus caroliniana* (American hornbeam), *Ostrya virginiana* (hophornbeam), and smaller individual of species making up the canopy. The shrub layer is also of variable cover, most frequently characterized by *Lindera benzoin* (northern spicebush). *Hamamelis virginiana* (American witch-hazel) may also be present in the shrub layer. The herbaceous layer is usually of high cover, and is often dominated by *Symplocarpus foetidus* (skunk-cabbage). Other commonly present herbaceous species include *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Veratrum viride* (green false hellebore), and *Polystichum acrostichoides* (Christmas fern). Associated herbaceous species are quite varied among locations and may include *Amphicarpaea bracteata* (American hogpeanut), *Carex emoryi* (Emory's sedge), *Chrysosplenium americanum* (American golden saxifrage), *Claytonia virginica* (Virginia springbeauty), *Dryopteris marginalis* (marginal woodfern), *Erythronium americanum* (dogtooth violet), *Eurybia divaricata* (white wood aster), *Leersia virginica* (whitegrass), *Lycopus uniflorus* (northern bugleweed), *Osmorhiza claytonii* (Clayton's sweetroot), *Sanicula trifoliata* (largefruit blacksnakeroot), *Osmunda claytoniana* (interrupted fern), *Pilea pumila* (Canadian clearweed), *Parthenocissus quinquefolia* (Virginia creeper), *Rubus phoenicolasius* (wine raspberry), *Thalictrum pubescens* (king-of-the-meadow), *Thelypteris noveboracensis* (New York fern), *Thelypteris palustris* (eastern marsh fern), *Tiarella cordifolia* (heartleaf foamflower), *Toxicodendron radicans* (eastern poison-ivy), and *Viola pubescens* (downy yellow violet); *Maianthemum canadense* (Canada mayflower) often occurs on hummocks. Invasive exotic species may be frequent but usually not of high cover. *Berberis thunbergii* (Japanese barberry) and *Microstegium vimineum* (Nepalese browntop) are most frequently encountered (although one location has been confirmed where *Microstegium vimineum* (Nepalese browntop) is dominant); *Alliaria petiolata* (garlic mustard) and *Polygonum cespitosum var. longisetum* (oriental ladysthumb) may be found occasionally.

Global Vegetation: Overstory composition is mixed, with *Acer rubrum* (red maple), *Fraxinus americana* (white ash), and *Liriodendron tulipifera* (tuliptree) the most abundant species. *Fraxinus nigra* (black ash) is a frequent overstory associate but more abundant and sometimes dominant in the understory, along with young *Acer rubrum* (red maple) and *Fraxinus americana* (white ash). With increasing elevation, *Betula alleghaniensis* (yellow birch) 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* (sweet birch) and *Tilia americana* (American basswood). Almost all trees in plot-sampled stands were <50 cm dbh and most were <40 cm dbh; but scattered *Liriodendron* (tuliptree) 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* (northern spicebush) is usually the most abundant species, and considerable stratum cover is contributed by tree saplings. Other frequently occurring true shrubs are *Alnus serrulata* (hazel alder), *Carpinus caroliniana* (American hornbeam), *Hamamelis virginiana* (American witch-hazel), *Ilex verticillata* (common winterberry), and *Sambucus nigra ssp. canadensis* (American black elderberry). 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* (skunk-cabbage) (mostly at lower elevations) and *Veratrum viride* (green false hellebore) 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* (Schreber's aster), *Caltha palustris* (yellow marsh-marigold), *Carex bromoides* (brome-like sedge), *Carex gynandra* (nodding sedge), *Carex prasina* (drooping sedge), *Chelone glabra* (white turtlehead), *Chrysosplenium americanum* (American golden saxifrage), *Cinna arundinacea* (sweet woodreed), *Dryopteris carthusiana* (spinulose woodfern), *Dryopteris goldieana* (Goldie's woodfern), *Glyceria striata* (fowl mannagrass), *Impatiens capensis* (orange jewelweed), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Ranunculus recurvatus* (blisterwort), *Saxifraga pensylvanica* (eastern swamp saxifrage), *Packera aurea* (golden ragwort), *Sphenopholis*

pensylvanica (swamp wedgescale), *Thalictrum pubescens* (king-of-the-meadow), and *Viola cucullata* (marsh blue violet). Moss cover is often significant, but only rarely includes *Sphagnum* (sphagnum, peatmoss) 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 m2 for 25 plot samples).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Fraxinus americana* (white ash), *Fraxinus nigra* (black ash)
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree)
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Lindera benzoin* (northern spicebush)
Herb (field)	Flowering forb	*Symplocarpus foetidus* (skunk-cabbage), *Veratrum viride* (green false hellebore)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Acer rubrum* (red maple), *Amphicarpaea bracteata* (American hogpeanut), *Arisaema triphyllum* (Jack in the pulpit), *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Carpinus caroliniana* (American hornbeam), *Chrysosplenium americanum* (American golden saxifrage), *Circaea lutetiana* ssp. *canadensis* (broadleaf enchanter's nightshade), *Dryopteris marginalis* (marginal woodfern), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Galium triflorum* (fragrant bedstraw), *Hamamelis virginiana* (American witch-hazel), *Impatiens capensis* (orange jewelweed), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Parthenocissus quinquefolia* (Virginia creeper), *Pilea pumila* (Canadian clearweed), *Polystichum acrostichoides* (Christmas fern), *Quercus rubra* (northern red oak), *Symplocarpus foetidus* (skunk-cabbage), *Thalictrum pubescens* (king-of-the-meadow), *Thelypteris noveboracensis* (New York fern), *Veratrum viride* (green false hellebore)
Global: *Acer rubrum* (red maple), *Athyrium filix-femina* ssp. *asplenioides* (asplenium ladyfern), *Caltha palustris* (yellow marsh-marigold), *Cardamine pensylvanica* (Pennsylvania bittercress), *Carex bromoides* (brome-like sedge), *Carex gynandra* (nodding sedge), *Carex laevivaginata* (smoothsheath sedge), *Carex prasina* (drooping sedge), *Carex scabrata* (eastern rough sedge), *Carex scoparia* (broom sedge), *Carex seorsa* (weak stellate sedge), *Chelone glabra* (white turtlehead), *Chrysosplenium americanum* (American golden saxifrage), *Cinna arundinacea* (sweet woodreed), *Dryopteris carthusiana* (spinulose woodfern), *Dryopteris cristata* (crested woodfern), *Eurybia schreberi* (Schreber's aster), *Fraxinus americana* (white ash), *Fraxinus nigra* (black ash), *Huperzia lucidula* (shining clubmoss), *Ilex verticillata* (common winterberry), *Impatiens capensis* (orange jewelweed), *Lindera benzoin* (northern spicebush), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* var. *spectabilis* (royal fern), *Packera aurea* (golden ragwort), *Poa paludigena* (bog bluegrass), *Ranunculus hispidus* var. *caricetorum* (bristly buttercup), *Rosa palustris* (swamp rose), *Sambucus nigra* ssp. *canadensis* (American black elderberry), *Saxifraga micranthidifolia* (lettuceleaf saxifrage), *Saxifraga pensylvanica* (eastern swamp saxifrage), *Sphenopholis pensylvanica* (swamp wedgescale), *Symplocarpus foetidus* (skunk-cabbage), *Thalictrum pubescens* (king-of-the-meadow), *Thelypteris noveboracensis* (New York fern), *Trautvetteria caroliniensis* (Carolina bugbane), *Trillium cernuum* (whip-poor-will flower), *Veratrum viride* (green false hellebore), *Veronica americana* (American speedwell), *Veronica anagallis-aquatica* (water speedwell), *Viola cucullata* (marsh blue violet), *Vitis labrusca* (fox grape)

OTHER NOTEWORTHY SPECIES

Catoctin Mountain Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb)
Global: Vulnerable Plants: *Aconitum reclinatum* (trailing white monkshood, G3G4), *Euphorbia purpurea* (Darlington's glade spurge, G3, Southern Blue Ridge endemic), *Platanthera grandiflora* (greater purple fringed orchid, G5, VA state-rare), *Poa paludigena* (bog bluegrass, G3G4), *Symphyotrichum praealtum* var. *angustior* (willowleaf aster, G5T4, VA state-rare), *Trillium cernuum* (whip-poor-will flower, 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* (blackgum), *Vaccinium* (blueberry) spp., *Pinus rigida* (pitch pine), *Rubus hispidus* (bristly dewberry), etc.; calciphilic species such as *Caltha palustris* (yellow marsh-marigold), *Carex bromoides* (brome-like sedge), *Fraxinus nigra* (black ash), 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 and Pennsylvania; more northern and fen-like compared to CEGL008416.

Global Related Concepts:

- *Acer rubrum - Betula alleghaniensis - Fraxinus (americana, nigra) / Carex bromoides* Forest (Young et al. 2007a) =
- *Acer rubrum - Fraxinus americana - Fraxinus nigra / Carex bromoides - Carex prasina - (Caltha palustris)* Forest (Fleming and Coulling 2001) =
- *Acer rubrum - Fraxinus nigra / Caltha palustris - Carex bromoides* Forest (Fleming 1999) =
- Black Ash - American Elm - Red Maple: 39 (Eyre 1980) >

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Catoctin Mountain Park Classification Comments: Central Appalachian Basic Seepage Swamp Forest is sometimes referred to as Basic Seepage Swamp. *Betula alleghaniensis* (yellow birch) is particularly characteristic of this vegetation at Catoctin Mountain, and *Fraxinus americana* (white ash), although somewhat frequent, is less so than the global description states. This appears to reflect in part the somewhat higher elevation of this setting as noted in Global Classification Comments. However, *Symplocarpus foetidus* (skunk-cabbage) is prevalent in Catoctin.

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* (ash) spp. (especially *Fraxinus nigra* (black ash)) and nutrient-demanding species, among the most diagnostic of which are *Caltha palustris* (yellow marsh-marigold), *Carex bromoides* (brome-like sedge), *Carex laevivaginata* (smoothsheath sedge), *Pilea fontana* (lesser clearweed), *Poa paludigena* (bog bluegrass), *Ranunculus hispidus var. caricetorum* (bristly buttercup), *Saxifraga pensylvanica* (eastern swamp saxifrage), and *Trillium cernuum* (whip-poor-will flower). These communities lack the *Sphagnum* (sphagnum, peatmoss) 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* (pitch pine), *Nyssa sylvatica* (blackgum), *Viburnum nudum var. nudum* (possumhaw), *Parnassia asarifolia* (kidneyleaf grass of Parnassus), *Platanthera ciliaris* (yellow fringed orchid), *Platanthera clavellata* (small green wood orchid), *Rubus hispidus* (bristly dewberry), *Lycopodium obscurum* (rare clubmoss), *Carex debilis var. debilis* (white edge sedge), and *Carex folliculata* (northern long sedge)) (Fleming and Van Alstine 1999).

Additionally, the spectrum of stands representing this association in Virginia shows a clear elevation gradient, with *Symplocarpus foetidus* (skunk-cabbage) and *Fraxinus nigra* (black ash) decreasing in frequency and abundance and *Betula alleghaniensis* (yellow birch) 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

Catoctin Mountain Park Range: This association is restricted to the central portion of the park along stream drainages occurring on the Catoctin Formation.
Global Range: The range of this community encompasses the Central Appalachian region of Pennsylvania, Maryland, West Virginia, 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:SNR, NJ:SNR, PA:SNR, VA:S3, WV:S1
TNC Ecoregions: 52:C, 58:C, 59:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, 221De:CCC, M221Aa:CCP, 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

Catoctin Mountain Park Plots: CATO.007, CATO.040, CATO.056.
Catoctin Mountain Park Description Author(s): L. Sneddon
Global Description Author(s): G.P. Fleming
References: Coxe 2009, Ehrenfeld 1977, Eyre 1980, Fleming 1999, Fleming and Coulling 2001, Fleming and Taverna 2006, Fleming and Van Alstine 1999, Fleming et al. 2007b, Fleming et al. 2017, 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.*, Young et al. 2006, Young et al. 2007a, Young et al. 2009

A4476 *Quercus palustris - Quercus bicolor - Acer rubrum* Appalachian Swamp Forest Group

[CEGL006240] *Quercus palustris - (Quercus bicolor) - Acer rubrum / Vaccinium corymbosum / Osmunda cinnamomea* Wet Forest

Translated Name: **Pin Oak - (Swamp White Oak) - Red Maple / Highbush Blueberry / Cinnamon Fern Wet Forest**
Common Name: **Northeastern Pin Oak - Swamp White Oak Wet Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Swamp Forest (M503)
Group	Central Appalachian-Northeast Alkaline Swamp (G918)
Alliance	*Quercus palustris - Quercus bicolor - Acer rubrum* Appalachian Swamp Forest Group (A4476)

ELEMENT CONCEPT

Global Summary: This association comprises a perched hardwood swamp occurring in the northeastern United States from New Hampshire to Virginia. These are closed to partially open, deciduous, seasonally flooded forests. They occur in basin areas that are seasonally wet (winter and early spring) with a shallow, perched water table, but tend to be dry in late summer and early fall. There is usually pronounced hummock-and-hollow microtopography. They are found on sandy loams or clayey soils of glacial lakeplains, or on soils with impermeable subsoils in unglaciated regions. There is generally some layer that impedes drainage. The canopy is codominated by *Quercus palustris* (pin oak) and/or *Quercus bicolor* (swamp white oak) and *Acer rubrum* (red maple). Common associates include *Nyssa sylvatica* (blackgum) and occasionally *Tsuga canadensis* (eastern hemlock) or *Carya* (hickory) spp. The shrub layer may be sparse or dense and contains *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), *Viburnum dentatum* (southern arrow-wood), *Cephalanthus occidentalis* (common buttonbush), and *Kalmia angustifolia* (sheep laurel). The sparse herb layer may include *Osmunda cinnamomea* (cinnamon fern), *Scirpus cyperinus* (woolgrass), *Thelypteris palustris* (eastern marsh fern), *Thelypteris*

simulata (bog fern), *Carex frankii* (Frank's sedge), *Glyceria striata* (fowl mannagrass), *Isoetes* (quillwort) spp., *Carex crinita* (fringed sedge), *Onoclea sensibilis* (sensitive fern), and *Osmunda regalis* (royal fern).

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This pin oak - red maple forest was sampled at five locations in the park. The sites are flat to gently undulating, seasonally flooded depressions. Soils poorly to very poorly drained clay and clay loam. The unvegetated surface is made up of leaf litter (10-93% cover), wood (2-25%), bare soil (0-10%), standing water (0-55%), and mosses and lichens (0-10%). Evidence of disturbance includes the presence of exotic species.

George Washington Memorial Parkway Environment: Northeastern Pin Oak - Swamp White Oak Wet Forest is a seasonally flooded forest that occurs as small, isolated, upland depression swamps. The basins are not connected to streams and are seasonally wet with shallow, perched water tables and tend to be dry in late summer and early fall. The forest is typically associated with oligotrophic soils on upland flats in the park.

Prince William Forest Park Environment: Northeastern Pin Oak - Swamp White Oak Wet Forest is a seasonally flooded forest that occurs as small, isolated, upland depression swamps. The basins are seasonally wet with shallow, perched water tables and tend to be dry in late summer and early fall. The forest is typically associated with oligotrophic soils on upland flats in the park.

Global Environment: This vegetation is found in basin areas that are seasonally wet (winter and early spring) with a shallow, perched water table, but which tend to be dry in late summer and early fall. There is usually pronounced hummock-and-hollow microtopography. They are found on sandy loams or clayey soils of glacial lakeplains, or on soils with impermeable subsoils in unglaciated regions. Although substrates are variable, all generally have some layer that impedes drainage and may receive groundwater seepage. Soils collected from Maryland and Virginia plots have very low pH and base cation levels.

Vegetation Description

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderate to very dense (60-80+% cover) tree canopy can be either 20-35 m tall or 10-20 m tall, in which case a subcanopy is not differentiated. It is codominated by *Acer rubrum* (red maple) and *Quercus palustris* (pin oak), as is the very sparse to moderate (10-60%) subcanopy (10-20 m) along with *Nyssa sylvatica* (blackgum), when present. One stand is densely dominated by *Quercus lyrata* (overcup oak). *Acer rubrum* (red maple), *Cephalanthus occidentalis* (common buttonbush), and *Nyssa sylvatica* (blackgum) dominate the very sparse to sparse (<5-40%) tall-shrub (6-10 m) and short-shrub (1-6 m) layers. The herbaceous layer (<5-40%) is dominated by *Chasmanthium laxum* (slender woodoats). Nonvascular species can cover up to 10% of the ground surface. Only one exotic species was reported from sampled stands.

George Washington Memorial Parkway Vegetation: This seasonally flooded forest is floristically depauperate, and the canopy varies from closed forest to quite open. The overstory has variable dominance by *Quercus palustris* (pin oak), *Acer rubrum* (red maple), and/or *Liquidambar styraciflua* (sweetgum). Common understory species include *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Fraxinus pennsylvanica* (green ash), and *Ilex opaca var. opaca* (American holly). Species of highbush blueberries (*Vaccinium corymbosum* (highbush blueberry), *Vaccinium fuscatum* (black highbush blueberry), and *Vaccinium formosum* (southern blueberry)) are the most characteristic shrubs. Other shrubs include *Ilex verticillata* (common winterberry) and *Viburnum prunifolium* (blackhaw). Common vines include *Smilax rotundifolia* (roundleaf greenbrier), *Smilax glauca* (cat greenbrier), and *Campsis radicans* (trumpet creeper). Herbs are typically very sparse but can include scattered patches of graminoids such as *Carex tribuloides* (blunt broom sedge), *Carex swanii* (Swan's sedge), *Carex glaucodea* (blue sedge), *Glyceria striata* (fowl mannagrass), *Juncus effusus* (common rush), and *Juncus tenuis* (poverty rush). Patches of *Sphagnum* (sphagnum, peatmoss) spp. are common on the forest floor.

Prince William Forest Park Vegetation: This seasonally flooded forest is floristically depauperate, and the canopy varies from closed forest to quite open. The overstory has variable dominance by *Quercus palustris* (pin oak), *Acer rubrum* (red maple), and/or *Liquidambar styraciflua* (sweetgum). Common understory species include *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Nyssa sylvatica* (blackgum), *Carpinus caroliniana* (American hornbeam), and *Ilex opaca var. opaca* (American holly). Species of highbush blueberries (*Vaccinium corymbosum* (highbush blueberry), *Vaccinium fuscatum* (black highbush blueberry), and *Vaccinium formosum* (southern blueberry)) are the most characteristic shrubs. Other shrubs include *Lyonia ligustrina* (maleberry) and *Viburnum prunifolium* (blackhaw). Common vines include *Smilax rotundifolia* (roundleaf greenbrier), *Smilax glauca* (cat greenbrier), *Lonicera japonica* (Japanese honeysuckle), and *Toxicodendron radicans* (eastern poison-ivy). Herbs are typically very sparse but can include scattered patches of graminoids such as *Carex* (sedge) spp., *Leersia*

virginica (whitegrass), *Chasmanthium laxum* (slender woodoats), and *Danthonia spicata* (poverty oatgrass). Patches of *Sphagnum* (sphagnum, peatmoss) spp. are common on the forest floor.

Global Vegetation: This seasonally flooded pin oak community occurs in the northeastern United States. These are closed to partially open, deciduous, seasonally flooded forests codominated by *Quercus palustris* (pin oak) and *Acer rubrum* (red maple). Common associates include *Quercus bicolor* (swamp white oak), *Nyssa sylvatica* (blackgum), and occasionally *Tsuga canadensis* (eastern hemlock) or *Carya* (hickory) spp. The shrub layer may be sparse or dense and contains *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), and *Viburnum dentatum* (southern arrow-wood). The sparse herb layer may include *Osmunda cinnamomea* (cinnamon fern), *Scirpus cyperinus* (woolgrass), *Thelypteris palustris* (eastern marsh fern), *Thelypteris simulata* (bog fern), *Carex frankii* (Frank's sedge), *Glyceria striata* (fowl mannagrass), *Isoetes* (quillwort) spp., *Carex crinita* (fringed sedge), *Onoclea sensibilis* (sensitive fern), and *Osmunda regalis* (royal fern). Occurrences at the southern end of the range in Maryland and northern Virginia are generally very species-poor, with an overstory dominated by *Quercus palustris* (pin oak) (rarely *Quercus bicolor* (swamp white oak)), *Acer rubrum* (red maple), and *Liquidambar styraciflua* (sweetgum). Species of highbush blueberries (*Vaccinium corymbosum* (highbush blueberry), *Vaccinium fuscatum* (black highbush blueberry), and *Vaccinium formosum* (southern blueberry)) are the most characteristic shrubs. Herbs are very sparse.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Ilex verticillata* (common winterberry)
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea* (cinnamon fern)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Acer rubrum* (red maple), *Quercus palustris* (pin oak)

George Washington Memorial Parkway: *Carex tribuloides* (blunt broom sedge), *Liquidambar styraciflua* (sweetgum), *Quercus palustris* (pin oak), *Vaccinium formosum* (southern blueberry), *Vaccinium fuscatum* (black highbush blueberry)

Prince William Forest Park: *Liquidambar styraciflua* (sweetgum), *Quercus palustris* (pin oak), *Vaccinium corymbosum* (highbush blueberry), *Vaccinium formosum* (southern blueberry), *Vaccinium fuscatum* (black highbush blueberry)

Global: *Acer rubrum* (red maple), *Osmunda cinnamomea* (cinnamon fern), *Quercus bicolor* (swamp white oak)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)

George Washington Memorial Parkway: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)

Prince William Forest Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (14-Jul-2016).

RELATED CONCEPTS

Global Similar Types:

- *Liquidambar styraciflua - Acer rubrum - Quercus phellos / Eubotrys racemosa* Swamp Forest (CEGL006110) similar to occurrences at the southern end of the range; occurs in Coastal Plain depressions of the Chesapeake Bay region.
- *Quercus palustris - (Fraxinus nigra) / Lindera benzoin / Carex bromoides* Wet Forest (CEGL007399)
- *Quercus palustris - Acer rubrum / Carex grayi - Geum canadense* Wet Forest (CEGL006185)
- *Quercus palustris - Quercus bicolor / Carex tribuloides - Carex radiata - (Carex squarrosa)* Wet Forest (CEGL006497)
- *Quercus palustris - Quercus bicolor / Viburnum prunifolium / Leersia virginica - Impatiens capensis* Wet Forest (CEGL004643)

Global Related Concepts:

- Tupelo - Swamp White Oak - Pin Oak Association (Searcy et al. 1994) ><

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Northeastern Pin Oak - Swamp White Oak Wet Forest is sometimes referred to as Pin Oak - Swamp White Oak Forest.
George Washington Memorial Parkway Classification Comments: Northeastern Pin Oak - Swamp White Oak Wet Forest is sometimes referred to as Pin Oak - Swamp White Oak Forest. It can be identified by its landscape position in isolated upland basins (versus alluvial floodplain backswamps) and the prevalence of highbush blueberries (*Vaccinium* (blueberry) spp.) in the shrub layer. It is the only seasonally flooded forest in the park that is not connected to the Potomac River or other streams.
Prince William Forest Park Classification Comments: Northeastern Pin Oak - Swamp White Oak Wet Forest is sometimes referred to as Pin Oak - Swamp White Oak Forest. Examples of this community could be confused with the floodplain swamp Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest (CEGL006497), based on the dominance of *Quercus palustris* (pin oak) in the canopy. Northeastern Pin Oak - Swamp White Oak Wet Forest can be identified by its landscape position in isolated upland basins (versus alluvial floodplain backswamps) and the prevalence of highbush blueberries (*Vaccinium* (blueberry) spp.) in the shrub layer. Piedmont Upland Depression Willow Oak Swamp Forest (CEGL007403) is an upland depression forest that also occurs in one location in the park, and it differs from Northeastern Pin Oak - Swamp White Oak Wet Forest by having a canopy dominated by *Quercus phellos* (willow oak) and a richer understory that lacks highbush blueberries.
Prince William Forest Park Other Comments: The overstory of this association has variable dominance by *Quercus palustris* (pin oak), *Acer rubrum* (red maple), and/or *Liquidambar styraciflua* (sweetgum). *Quercus palustris* (pin oak) was not recorded at all (*Liquidambar styraciflua* (sweetgum) dominant) in one example of this type in the Chopawamsic area of Prince William Forest Park.
Global Classification Comments: Vegetation tentatively assigned to this association was classified through analysis of a regional dataset assembled for the NCR vegetation mapping project. The type was represented by nine Maryland and Virginia plots. Composition of this southern variant differs somewhat from the existing description but is conceptually similar. Although six states to the north of Maryland and Virginia have recognized this type, substantial data from across this range are lacking (L. Sneddon pers. comm.). Therefore, at present, this association represents a broad concept that may have to be split once variation over its range is more fully understood.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled near Carderock and on Bear Island. (Canal mile 11-14)
George Washington Memorial Parkway Range: Northeastern Pin Oak - Swamp White Oak Wet Forest only occurs in three small stands in the park. Two stands are located as isolated upland depressions in Fort Hunt Park and the third stand is located on the north side of the parkway near Mount Vernon.
Prince William Forest Park Range: Seven examples of Northeastern Pin Oak - Swamp White Oak Wet Forest are documented in Prince William Forest Park. The stands are scattered throughout the park and occur as small isolated depressions in an otherwise upland landscape. The size ranges from 0.07 to 0.37 hectares, covering a total of 0.93 hectares (2.30 acres).
Global Range: This vegetation occurs in southern New England south to Maryland and northern Virginia.
Nations: US
States/Provinces: CT:SNR, DC?:SNA, DE:S2, MA:S1, MD:SNR, NH:SNR, NJ:SNR, NY:SNR, PA:SNR, VA:S1
TNC Ecoregions: 52:C, 58:C, 59:C, 60:?, 61:C, 62:C
USFS Ecoregions (2007): 211Ga:CCP, 221Ae:CCC, 221Af:CCC, 221Ai:CCC, 221Ak:CC?, 221Am:CCC, 221An:CC?, 221B:CP, 221Da:CCC, 221Db:CCC, 221Dc:CCC, 231Ic:CCC, 232Ac:CCP, 232Ad:CCC, M221Ac:CCC, M221Ad:CCC, M221Bc:CCC, M221Be:CCC, M221Da:CCC
Federal Lands: DOD (Fort Belvoir); NPS (C&O Canal, Gateway, George Washington Parkway, Prince William); USFWS (Great Swamp)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (5 plots): CHOH.201, CHOH.206, CHOH.551, CHOH.552, CHOH.553.
George Washington Memorial Parkway Plots: GWMP.17.
Prince William Forest Park Plots: PRWI.22, PRWI.28, PRWI.36.

Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): K. Taverna and G.P. Fleming
Prince William Forest Park Description Author(s): K. Taverna
Global Description Author(s): S.L. Neid and G.P. Fleming
References: Breden et al. 2001, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2008a, Edinger et al. 2014a, Fike 1999, Fleming 2002b, Fleming and Patterson 2003, Fleming and Patterson 2011b, Fleming et al. 2007b, Fleming et al. 2017, Golet et al. 1993, Harrison 2004, Harrison 2011, Metzler and Barrett 2006, NRCS 2001b, Searcy et al. 1994, Sechler et al. 2014, Sperduto and Nichols 2004, Swain and Kearsley 2014, Zimmerman 2011f, Zimmerman et al. 2012

[CEGL004643] *Quercus palustris - Quercus bicolor / Viburnum prunifolium / Leersia virginica - Impatiens capensis* Wet Forest

Translated Name: **Pin Oak - Swamp White Oak / Blackhaw / Whitegrass - Orange Jewelweed Wet Forest**
Common Name: **Pin Oak - Swamp White Oak Seasonal Pond**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Swamp Forest (M503)
Group	Central Appalachian-Northeast Alkaline Swamp (G918)
Alliance	*Quercus palustris - Quercus bicolor - Acer rubrum* Appalachian Swamp Forest Group (A4476)

Element Concept

Global Summary: This wetland forest community is nearly endemic to hardpan soils of the Culpeper Basin in northern Virginia and Montgomery County, Maryland, with a few known outliers elsewhere in the Piedmont and the Ridge and Valley of Maryland, Virginia, and West Virginia. Habitats are shallow, seasonally flooded upland basins and wet, elongated bottoms along sluggish small streams with little or no active alluvial deposition. These habitats are characterized by shallow seasonal flooding induced by perched groundwater. Moderate hummock-and-hollow microtopography is often present, and maximum flooding depth is usually <25 cm (10 inches). A-horizon soils are dark brown to blackish, loamy clays which typically exhibit pronounced orange and white mottling and have moderate base status. This type is most common on areas underlain by diabase but also occurs on some soils weathered from siltstone and other metasedimentary substrates. The vegetation is an open forest or woodland dominated by *Quercus palustris* (pin oak), mixtures of *Quercus palustris* (pin oak) and *Quercus bicolor* (swamp white oak), or less frequently *Quercus bicolor* (swamp white oak) alone. *Fraxinus pennsylvanica* (green ash) and *Acer rubrum* (red maple) are the most frequent subcanopy trees. *Viburnum prunifolium* (blackhaw) is the sole shrub dominant, while *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), and *Parthenocissus quinquefolia* (Virginia creeper) are common climbing and scrambling vines. The herb layer is usually open or sparse. The most constant and characteristic herbs are *Leersia virginica* (whitegrass), *Cinna arundinacea* (sweet woodreed), *Impatiens capensis* (orange jewelweed), *Arisaema triphyllum* (Jack in the pulpit), *Symphyotrichum lateriflorum* (calico aster), *Galium obtusum* (bluntleaf bedstraw), *Lycopus virginicus* (Virginia water horehound), and *Juncus tenuis* (poverty rush). Less constant herbs that can be locally common or abundant include *Carex pellita* (woolly sedge), *Carex festucacea* (fescue sedge), *Dichanthelium acuminatum var. lindheimeri* (Lindheimer panicgrass), *Eleocharis tenuis var. tenuis* (slender spikerush), *Glyceria striata* (fowl mannagrass), *Scirpus georgianus* (Georgia bulrush), and *Stachys pilosa var. arenicola* (hairy hedgenettle). The invasive exotic *Microstegium vimineum* (Nepalese browntop) can be problematic on the drier edges and hummocks.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This pin oak forest was sampled at four locations in the park. The sites are flat, seasonally flooded alluvial plains with somewhat poorly to poorly drained clay or clay loam soil. The unvegetated surface is dominated by leaf litter (71-96% cover) with some wood (2-25%), bare soil (1-3%), and mosses and lichens (1%). Evidence of disturbance includes deer grazing/browsing and the presence of exotic species.
Manassas National Battlefield Park Environment: This community occupies shallow, seasonally flooded upland basins and wet, elongated bottoms along small streams. Headwater drainages are very diffuse, with sluggish, usually intermittent flows and little or no active alluvial deposition. Within this physiographic context, it can be difficult to distinguish true isolated wetlands from small streambottoms. Hydrologically, these habitats are comparable, with shallow seasonal flooding induced by perched water tables during the winter and spring months.

Hydroperiods, however, can apparently be irregular and unpredictable. Maximum flooding depth is usually <25 cm (10 inches). A-horizon soils are dark brown to blackish, loamy clays which typically exhibit pronounced orange and white mottling. Samples collected from plot-sampling sites vary from extremely to moderately acidic, with high calcium, magnesium, and aluminum levels but only moderate total base saturation.

Global Environment: This community occupies shallow, seasonally flooded upland basins and wet, elongated bottoms along small streams. Most of the known occurrences are in the Culpeper (Mesozoic) Basin of northern Virginia and adjacent Montgomery County, Maryland. Because of the basin's low relief, headwater drainages are very diffuse, with sluggish, usually intermittent flows and little or no active alluvial deposition. Within this physiographic context, it can be difficult to distinguish true isolated wetlands from small stream bottoms. Hydrologically, these habitats are comparable, with shallow seasonal flooding induced by perched water tables during the winter and spring months. Hydroperiods, however, can apparently be irregular and unpredictable. Moderate hummock-and-hollow microtopography is often present, and maximum flooding depth is usually <25 cm (10 inches). A-horizon soils are dark brown to blackish, loamy clays which typically exhibit pronounced orange and white mottling. Samples collected from plot-sampling sites varied from extremely to moderately acidic, with moderate to high calcium, magnesium, and aluminum levels but only moderate total base saturation. This type is most common on areas underlain by diabase but also occurs on some soils weathered from siltstone and other metasedimentary substrates. One stand located around a sinkhole depression pond on a sandstone ridge in West Virginia is attributed to this association based on similar non-alluvial landform.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: One stand has a sparse (20% cover) emergent canopy of *Quercus palustris* (pin oak) greater than 35 m tall. The moderate to dense (60-80+%) tree canopy (20-35 m) and sparse (20-40%) subcanopy (10-20 m) are also dominated by *Quercus palustris* (pin oak); additional tree species may include *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Quercus alba* (white oak), *Quercus stellata* (post oak), and *Ulmus americana* (American elm). The very sparse (10-20%) tall-shrub (6-10 m) and sparse to dense (20-80+%) short-shrub (1-6 m) layers are dominated by *Acer rubrum* (red maple); other shrubs include *Amelanchier arborea* (common serviceberry), *Nyssa sylvatica* (blackgum), *Prunus serotina var. serotina* (black cherry), and *Viburnum prunifolium* (blackhaw). The herbaceous layer (20-40%) contains *Carex lupuliformis* (false hop sedge) (Maryland state-critically imperiled), *Carex tribuloides* (blunt broom sedge), *Impatiens capensis* (orange jewelweed), *Leersia virginica* (whitegrass), and *Podophyllum peltatum* (mayapple). Vines of *Smilax rotundifolia* (roundleaf greenbrier) and *Toxicodendron radicans* (eastern poison-ivy) climb into the shrub and tree layers. A total of nine exotic species were reported from sampled stands.

Manassas National Battlefield Park Vegetation: Vegetation is an open forest or woodland (mean canopy cover = 65%) dominated by well-formed *Quercus bicolor* (swamp white oak) and *Quercus palustris* (pin oak). *Fraxinus pennsylvanica* (green ash) is a frequent overstory associate and often prevalent in a subcanopy layer. Additional understory tree associates include *Acer rubrum* (red maple), *Diospyros virginiana* (common persimmon), and *Ulmus americana* (American elm). *Carya* (hickory) spp. often grow along the margins of the wetland habitats. *Viburnum prunifolium* (blackhaw) is the leading shrub dominant, with densities up to 850 stems/ha recorded in plots. Minor shrubs include *Celtis tenuifolia* (dwarf hackberry), *Ilex verticillata* (common winterberry), *Lindera benzoin* (northern spicebush), and *Zanthoxylum americanum* (common pricklyash). Small individuals of *Juniperus virginiana var. virginiana* (eastern red-cedar) usually grow on wetland edges and hummocks, while *Toxicodendron radicans* (eastern poison-ivy) and *Parthenocissus quinquefolia* (Virginia creeper) are common, climbing lianas. The herb layer is usually open and characterized by diverse graminoids. Locally common, often patch-dominant species include *Carex granularis* (limestone meadow sedge), *Carex pellita* (woolly sedge), *Carex squarrosa* (squarrose sedge), *Eleocharis tenuis var. tenuis* (slender spikerush), *Glyceria striata* (fowl mannagrass), *Leersia virginica* (whitegrass), and *Scirpus georgianus* (Georgia bulrush). *Arisaema triphyllum* (Jack in the pulpit) and *Impatiens capensis* (orange jewelweed) are the most abundant forbs and may dominate some areas. Other minor but characteristic herbs include *Carex gracilescens* (slender looseflower sedge), *Carex vulpinoidea* (fox sedge), *Dichanthelium acuminatum var. lindheimeri* (Lindheimer panicgrass), *Galium obtusum* (bluntleaf bedstraw), *Juncus tenuis* (poverty rush), *Pycnanthemum tenuifolium* (narrowleaf mountainmint), and *Scirpus pendulus* (rufous bulrush).

Global Vegetation: The vegetation is an open forest or woodland dominated by *Quercus palustris* (pin oak), mixtures of *Quercus palustris* (pin oak) and *Quercus bicolor* (swamp white oak), or less frequently *Quercus bicolor* (swamp white oak) alone. Disturbed examples are often dominated by *Acer rubrum* (red maple). *Fraxinus pennsylvanica* (green ash) is a frequent overstory associate and often prevalent in a subcanopy layer. Additional understory tree associates include *Acer rubrum* (red maple), *Diospyros virginiana* (common persimmon), and *Ulmus*

americana (American elm). *Carya* (hickory) spp. often grow along the margins of the wetland habitats. *Viburnum prunifolium* (blackhaw) is the sole shrub dominant, with densities up to 850 stems/ha recorded in some plots. Minor shrubs include *Carpinus caroliniana* (American hornbeam), *Cephalanthus occidentalis* (common buttonbush), *Ilex verticillata* (common winterberry), *Rosa palustris* (swamp rose), and *Zanthoxylum americanum* (common pricklyash). Small individuals of *Juniperus virginiana var. virginiana* (eastern red-cedar) usually grow on wetland edges and hummocks, while *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), and *Parthenocissus quinquefolia* (Virginia creeper) are common climbing and scrambling vines. The herb layer is usually open or sparse. The most constant and characteristic herbs are *Leersia virginica* (whitegrass), *Cinna arundinacea* (sweet woodreed), *Impatiens capensis* (orange jewelweed), *Arisaema triphyllum* (Jack in the pulpit), *Symphyotrichum lateriflorum* (calico aster), *Galium obtusum* (bluntleaf bedstraw), *Lycopus virginicus* (Virginia water horehound), and *Juncus tenuis* (poverty rush). Less constant herbs that can be locally common or abundant include *Carex lupulina* (hop sedge), *Carex pellita* (woolly sedge), *Carex festucacea* (fescue sedge), *Dichanthelium acuminatum var. lindheimeri* (Lindheimer panicgrass), *Eleocharis tenuis var. tenuis* (slender spikerush), *Glyceria striata* (fowl mannagrass), *Scirpus georgianus* (Georgia bulrush), *Boehmeria cylindrica* (small-spike false nettle), *Polygonum hydropiperoides* (swamp smartweed), *Scirpus ancistrochaetus* (barbedbristle bulrush), and *Stachys pilosa var. arenicola* (hairy hedgenettle). The invasive exotic *Microstegium vimineum* (Nepalese browntop) can be problematic on the drier edges and hummocks. Mean species richness of 16 Virginia and Maryland plot samples was 46 taxa per 400 m2, significantly higher than that of other forested depression wetlands in the region.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Viburnum prunifolium* (blackhaw)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Impatiens capensis* (orange jewelweed), *Quercus palustris* (pin oak)
Manassas National Battlefield Park: *Impatiens capensis* (orange jewelweed), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), *Viburnum prunifolium* (blackhaw)
Global: *Impatiens capensis* (orange jewelweed), *Leersia virginica* (whitegrass), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), *Viburnum prunifolium* (blackhaw)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Carex lupuliformis* (false hop sedge, G4, MD-critically imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera maackii* (Amur honeysuckle, High), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Manassas National Battlefield Park: Vulnerable Plants: *Isoetes appalachiana* (Appalachian quillwort, G4, VA state-rare species), *Stachys pilosa* var. *arenicola* (hairy hedgenettle, G5T4?, VA state-rare species); **Invasive/Exotic Plants**: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Global: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (29-May-2007). In evaluating the global status of this unit, six ranking criteria of approximately equal weight were used: (1) Estimated number of occurrences: <300; (2) Area of Occupancy: 1000 to 10,000 acres; (3) Long-Term Decline: moderate (26-75% of original area remaining); (4) Environmental Specificity: highly specific abiotic and biotic factors required for community to persist; (5) Global Range: regional endemic (100 to 10,000 square miles); and (6) Condition of Remaining Occurrences: few high-quality EOs. This community type has a very limited geographic range and is restricted to wetland habitats with special edaphic conditions. Although there are probably hundreds of occurrences, these tend to be small and degraded to some degree by invasive weeds, agricultural impacts such as grazing and ditching, and poor landscape context. A "large" patch of this association is

10 acres, and most are much smaller (historically, however, stands may have been much more extensive). A significant part of this community's range is situated in the greater Washington, DC, metropolitan area; many occurrences have been destroyed outright by development, and many others are imminently threatened with destruction or severe alteration.

RELATED CONCEPTS

Global Similar Types:

- *Quercus palustris - (Quercus bicolor) - Acer rubrum / Vaccinium corymbosum / Osmunda cinnamomea* Wet Forest (CEGL006240) acidic pin oak swamp of the northeastern states, occurring just east of the range of CEGL004643 in VA and MD; exceedingly species-poor with shrub dominance by *Vaccinium corymbosum* (highbush blueberry) and other acidophiles.
- *Quercus palustris - Quercus bicolor / Carex tribuloides - Carex radiata - (Carex squarrosa)* Wet Forest (CEGL006497) alluvial swamp forest of the same region; differs in the composition of understory and herb layers.
- *Quercus phellos / Carex (albolutescens, intumescens, joorii) / Climacium americanum* Wet Forest (CEGL007403) upland depression swamp of the southern Piedmont, but sympatric in the Potomac valley region; dominated by *Quercus phellos* (willow oak).

Global Related Concepts:

- *Quercus bicolor - Quercus palustris / Viburnum prunifolium / Cinna arundinacea* Woodland (Fleming and Patterson 2004) =
- *Quercus bicolor - Quercus palustris / Viburnum prunifolium / Glyceria striata - Scirpus atrovirens* Woodland (Fleming 2002a) =
- *Quercus bicolor - Quercus palustris / Viburnum prunifolium / Glyceria striata - Scirpus atrovirens* Woodland (Fleming 2002b) =
- *Quercus bicolor - Quercus palustris / Viburnum prunifolium / Impatiens capensis - Scirpus atrovirens* Woodland (Fleming and Patterson 2003) =
- *Quercus bicolor - Quercus palustris / Viburnum prunifolium / Scirpus atrovirens* Woodland (Fleming and Weber 2003) =
- *Quercus palustris - Quercus bicolor / Viburnum prunifolium / Leersia virginica - Impatiens capensis* Forest (Fleming et al. 2007b) =
- *Quercus palustris / Carex lupulina* Sinkhole Swamp [Sinkhole Pond Oak Swamp] (Vanderhorst 2016b) <

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Manassas National Battlefield Park Classification Comments: This community may be distinguished by its occurrence in isolated wetlands and wet, amorphous streambottoms with no active alluvial processes. Its overstory composition is similar to that of Northern Piedmont-Central Appalachian Pin Oak Floodplain Swamp Forest, which occurs in seasonally flooded backswamps and sloughs in the floodplain of Bull Run. Its herbaceous composition, however, is notably different and lacks many of the prevalent floodplain species such as *Saururus cernuus* (lizard's-tail), *Glyceria septentrionalis* (floating mannagrass), *Carex typhina* (cattail sedge), *Carex lupulina* (hop sedge), *Allium canadense* (meadow garlic), and *Cicuta maculata* (spotted water hemlock).

Manassas National Battlefield Park Other Comments: *Isoetes appalachiana* (Appalachian quillwort) is a state-rare plant species that has been recorded in semi-aquatic habitats (e.g., shallow, sluggish streams and hollows) within stands of this community type. The state-rare *Stachys pilosa var. arenicola* (hairy hedgenettle) is also associated but usually occurs in slightly better-drained microhabitats.

Global Classification Comments: Classification of this association is supported by analysis of a 1250-plot regional dataset assembled for the NCR vegetation mapping project. In that analysis, this type was represented by 16 Virginia and Maryland plots. Field-collected qualitative data also exist for additional Virginia sites. This association is similar to the partly sympatric ~*Quercus palustris - Quercus bicolor / Carex tribuloides - Carex radiata - (Carex squarrosa)* Wet Forest (CEGL006497)$$, which occurs in backswamps, sloughs, wet flats, and depressions of large-stream and small-river floodplains in the same region. The relationship between these types is somewhat problematic. In their typical floristic expressions and habitats (i.e., floodplain backswamps vs. isolated upland basins), the two types are quite distinct. However, because of very low topographic relief in the Culpeper Basin, there is considerable ambiguity between alluvial and non-alluvial landforms, and composition of stands can be a continuous gradient between the typical expressions. The two groups do not separate well in cluster analysis, but do separate convincingly in ordinations studies. Ultimately, very intensive head-to-head analytical comparisons support

the recognition of two types. However, some individual stands will be hard to assign by subjective field assessment. One stand located around a sinkhole depression pond in the Ridge and Valley of West Virginia is attributed to this association based on similar composition and non-alluvial landform. Atypical species at the West Virginia site include *Cephalanthus occidentalis*and *Scirpus ancistrochaetus* (barbedbristle bulrush).

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled at the Diabase Upland Depression Swamp, Edwards Ferry (Canal mile 31-32) and near Mexico Farms (Canal mile 178).
Manassas National Battlefield Park Range: Occurrences of this community are scattered throughout the park. Outstanding examples are found at the eastern base of Stuarts Hill, south of U.S. Route 29 opposite Battery Heights, and on Bald Hill.
Global Range: This community type is nearly endemic to hardpan soils of the Culpeper Basin in northern Virginia and Montgomery County, Maryland, with a few known outliers elsewhere in the Piedmont and the Ridge and Valley of Maryland, Virginia, and West Virginia.
Nations: US
States/Provinces: MD:S1, VA:S2, WV:S1
TNC Ecoregions: 52:C, 59:C
USFS Ecoregions (2007): 221Dd:CCC, 231Ic:CCC, M221Aa:CCC, M221Ab:CCC
Federal Lands: NPS (C&O Canal, Manassas)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (4 plots): CHOH.081, CHOH.082, CHOH.210, CHOH.222.
Manassas National Battlefield Park Plots: MANA.4, MANA.5, MANA.6, MANA.11, MANA.36.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
Global Description Author(s): G.P. Fleming and A.S. Weakley
References: Fleming 2002a, Fleming 2002b, Fleming and Patterson 2003, Fleming and Patterson 2004, Fleming and Patterson 2011b, Fleming and Weber 2003, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Southeastern Ecology Working Group n.d.*, Vanderhorst 2016b, WVNHP unpubl. data

M302. Eastern North American Ruderal Flooded & Swamp Forest

This macrogroup consists of forested wetlands throughout much of the eastern half of the United States and southern Canada north of Virginia, Tennessee, and Arkansas and east of the Great Plains. Sites where these forests are found have been extensively affected by disturbance such as logging, agricultural use, or a large change in the hydrologic regime. Sites are in depressional wetlands or along the edges of ponds, lakes or rivers. Dominant trees are early-successional native species adapted to wet conditions, especially *Acer negundo* (box-elder) (exotic in some parts of the range), *Acer rubrum* (red maple), *Acer saccharinum* (silver maple), *Fraxinus pennsylvanica* (green ash), and *Salix* (willow) spp. In a few sites, exotic trees such as *Acer platanoides* (Norway maple), *Salix alba* (white willow), or *Salix fragilis* (crack willow) may be dominant. The understory is heavily invaded by exotic or invasive native shrub and herbaceous species, including exotics such as *Berberis thunbergii* (Japanese barberry) (mostly in floodplains and temporarily flooded swamps), *Frangula alnus* (glossy buckthorn), *Ligustrum sinense* (Chinese privet), *Ligustrum vulgare* (European privet), *Rhamnus cathartica* (common buckthorn), and *Rosa multiflora* (multiflora rose) (mostly in open floodplains), with occasional generalist native species such as *Cornus amomum* (silky dogwood) and *Cornus sericea* (red-osier dogwood). Herbaceous species may include the exotics *Alliaria petiolata* (garlic mustard) (mostly in floodplains), *Barbarea vulgaris* (garden yellowrocket), *Galeopsis* (hempnettle) spp., *Glechoma hederacea* (ground ivy), *Hesperis matronalis* (dames rocket), *Hylotelephium telephium* (witch's moneybags), *Lysimachia nummularia* (creeping jenny), *Microstegium vimineum* (Nepalese browntop) (more in floodplains but also basin wetlands), *Myosotis scorpioides* (true forget-me-not), *Phalaris arundinacea* (reed canarygrass), *Phlox paniculata* (fall phlox), *Phragmites australis* (common reed), and many others. They may be mixed with very generalist native herbaceous species, such as *Calamagrostis canadensis* (bluejoint), *Cirsium* (thistle) spp., *Eupatorium* (thoroughwort) spp., *Galium* (bedstraw) spp., *Geum canadense* (white avens), *Glyceria striata* (fowl mannagrass), *Impatiens capensis* (orange jewelweed), *Leersia oryzoides* (rice cutgrass), *Solidago canadensis* (Canada goldenrod), *Solidago rugosa* (wrinkleleaf goldenrod), and *Urtica dioica* (stinging nettle).

G552. EASTERN NORTH AMERICAN RUDERAL FLOODED & SWAMP FOREST

This group consists of forested wetlands throughout much of the eastern half of the United States and southern Canada north of Virginia, Tennessee, and Arkansas and east of the Great Plains. Sites where these forests are found have been extensively affected by disturbance such as logging, agricultural use, or a large change in the hydrologic regime. Sites are in depressional wetlands or along the edges of ponds, lakes or rivers. Dominant trees are early-successional native species adapted to wet conditions, especially *Acer negundo* (box-elder) (exotic in some parts of the range), *Acer rubrum* (red maple), *Acer saccharinum* (silver maple), *Fraxinus pennsylvanica* (green ash), *Ostrya virginiana* (hophornbeam), *Populus balsamifera* (balsam poplar), *Prunus serotina* (black cherry), and *Salix* (willow) spp. Northward *Picea glauca* (white spruce) is an occasional dominant. The understory is heavily invaded by exotic or invasive native shrub and herbaceous species, including exotics such as *Frangula alnus* (glossy buckthorn), *Rhamnus cathartica* (common buckthorn), *Rosa multiflora* (multiflora rose) (mostly in open floodplains), *Berberis thunbergii* (Japanese barberry) (mostly in floodplains and temporarily flooded swamps), *Ligustrum sinense* (Chinese privet), and *Ligustrum vulgare* (European privet) with occasional generalist native species such as *Cornus amomum* (silky dogwood) and *Cornus sericea* (red-osier dogwood). Herbaceous exotics include *Alliaria petiolata* (garlic mustard) (mostly in floodplains), *Barbarea vulgaris* (garden yellowrocket), *Galeopsis* (hempnettle) spp., *Glechoma hederacea* (ground ivy), *Hesperis matronalis* (dames rocket), *Hylotelephium telephium* (witch's moneybags), *Lysimachia nummularia* (creeping jenny), *Microstegium vimineum* (Nepalese browntop) (more in floodplains but also basin wetlands), *Myosotis scorpioides* (true forget-me-not), *Phalaris arundinacea* (reed canarygrass), *Phlox paniculata* (fall phlox), *Phragmites australis* (common reed), and many others. They may be mixed with very generalist native herbaceous species such as *Calamagrostis canadensis* (bluejoint), *Cirsium* (thistle) spp., *Eupatorium* (thoroughwort) spp., *Galium* (bedstraw) spp., *Geum canadense* (white avens), *Glyceria striata* (fowl mannagrass), *Impatiens capensis* (orange jewelweed), *Leersia oryzoides* (rice cutgrass), *Solidago canadensis* (Canada goldenrod), and *Solidago rugosa* (wrinkleleaf goldenrod).

A4099 *Acer negundo - Betula nigra / Alliaria petiolata* Ruderal Floodplain Forest Alliance

This semi-open to closed-canopy forest is found on floodplains in the southern, eastern, and midwestern United States. Stands are typically temporarily flooded in the spring. These early-successional forests are dominated by *Acer negundo* (box-elder). Other characteristic species include *Acer rubrum* (red maple), *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Carpinus caroliniana* (American hornbeam), *Carya cordiformis* (bitternut hickory), *Celtis laevigata* (sugarberry), *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Morus rubra* (red mulberry), *Platanus occidentalis* (American sycamore), *Populus deltoides* (eastern cottonwood), *Robinia pseudoacacia* (black locust), *Ulmus alata* (winged elm), and *Ulmus rubra* (slippery elm). The shrub and herb layers range from sparse to dense, and the vine component is often heavy. The herb layer consists of a mixture of weedy exotics and native floodplain generalists, including *Alliaria petiolata* (garlic mustard) and *Microstegium vimineum* (Nepalese browntop). Stands occur on large rivers in active floodplains and on sandbars and also form farther from the riverfront in disturbed wet areas. Occurrences are mostly on higher floodplain terraces with less rocky soils that were cleared for agriculture or other development.

[CEGL005033] *Acer negundo* Ruderal Floodplain Forest

Translated Name: **Box-elder Ruderal Floodplain Forest**
Common Name: **Ruderal Box-elder Floodplain Forest**

USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Eastern North American Ruderal Flooded & Swamp Forest (M302)
Group	Eastern North American Ruderal Flooded & Swamp Forest (G552)
Alliance	*Acer negundo - Betula nigra / Alliaria petiolata* Ruderal Floodplain Forest Alliance (A4099)

ELEMENT CONCEPT

Global Summary: This semi-open to closed-canopy ruderal forest is found on disturbed sites in floodplains in the southern, eastern, and midwestern United States. Stands occur on large rivers in the active floodplain and on sandbars and may form farther from the riverfront following disturbance. Occurrences are mostly on higher

floodplain terraces with less rocky soils which were used for agriculture or habitation. They are typically temporarily flooded in the spring. These ruderal forests are dominated by *Acer negundo* (box-elder). Other characteristic species include *Platanus occidentalis* (American sycamore), *Celtis laevigata* (sugarberry), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Robinia pseudoacacia* (black locust), *Liquidambar styraciflua* (sweetgum), *Acer saccharinum* (silver maple), *Ulmus alata* (winged elm), *Ulmus rubra* (slippery elm), *Carya cordiformis* (bitternut hickory), *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), *Carpinus caroliniana* (American hornbeam), *Morus rubra* (red mulberry), and *Populus deltoides* (eastern cottonwood). The shrub and herb layers range from sparse to relatively lush, and the vine component often is heavy. The herb layer consists of a mixture of weedy exotics and native floodplain species, including *Rhamnus cathartica* (common buckthorn) and various invasive *Lonicera* species.

Environmental Description

Antietam National Battlefield Environment: This young box-elder forest is typically found surrounding agricultural fields or along creeks and tributaries. The forest floor is typically a mixture of leaf litter and bare soil and often contains many groundhog burrows.
Chesapeake & Ohio Canal National Historical Park Environment: This box-elder forest commonly occurs along the Chesapeake & Ohio Canal in the floodplain bottomlands of the Potomac River.
George Washington Memorial Parkway Environment: This box-elder forest is an early-successional community that develops following disturbances on floodplains, often related to agriculture or homesites. Stands occur along the Potomac River in the active floodplain on higher floodplain terraces, as well as along disturbed tributaries and areas of shoreline fill. Stands may be flooded during high water events.
Harpers Ferry National Historical Park Environment: This box-elder forest is an early-successional community that develops following abandonment of agricultural and homesite clearings on floodplains. Stands occur on higher terraces of the Potomac River floodplain, as well as along disturbed tributaries. Stands are typically flooded during high-water events.
Manassas National Battlefield Park Environment: This box-elder forest is an early-successional community that develops following disturbances on floodplains, usually related to agriculture or homesites. Stands occur along Bull Run in the active floodplain on higher floodplain terraces and may form farther from the riverfront following disturbance. Stands are flooded during high water events.
Monocacy National Battlefield Environment: Stands of this young box-elder forest are typically found surrounding agricultural fields or along creeks and tributaries. The forest floor is typically a mixture of leaf litter and bare soil and often contains many groundhog burrows.
National Capital Parks-East Environment: Stands of this box-elder forest are found in the active floodplain of the Anacostia River and the floodplains of other creeks. These are presumably areas that were heavily disturbed by clearing or agriculture in the past.
Global Environment: Stands of this box-elder forest occur on disturbed sites in large rivers in the active floodplain and on sandbars and may form farther from the riverfront following disturbance. Occurrences are mostly on higher floodplain terraces with less rocky soils which were used for agriculture or habitation. They are typically temporarily flooded in the spring and have sandy soils. In Kentucky, these forests may also occur in old fields within floodplains.

Vegetation Description

Antietam National Battlefield Vegetation: Forest is strongly dominated by *Acer negundo* (box-elder) in the canopy, subcanopy, and/or tall-shrub layer. Other associates can include *Robinia pseudoacacia* (black locust), *Juglans nigra* (black walnut), *Pinus strobus* (eastern white pine), *Celtis occidentalis* (common hackberry), *Fraxinus americana* (white ash), *Prunus* (plum) spp., *Ailanthus altissima* (tree of heaven), *Acer rubrum* (red maple), and/or *Juniperus virginiana* (eastern red-cedar). *Rubus* (blackberry) spp. and *Rosa multiflora* (multiflora rose) are typical short shrubs. In the herbaceous layer, *Viola* (violet) spp., *Verbesina alternifolia* (wingstem), *Urtica dioica* (stinging nettle), *Galium aparine* (stickywilly), and *Polygonum* (knotweed) spp. are common species. However, the herbaceous layer is typically depauperate, with exotic *Alliaria petiolata* (garlic mustard) as the common species.
Chesapeake & Ohio Canal National Historical Park Vegetation: These early-successional forests (sometimes woodlands) are dominated by *Acer negundo* (box-elder). Other trees in the canopy or subcanopy include *Celtis occidentalis* (common hackberry), *Juglans nigra* (black walnut), *Platanus occidentalis* (American sycamore), *Prunus serotina var. serotina* (black cherry), *Robinia pseudoacacia* (black locust), *Ulmus americana* Shrubs include *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), *Lindera benzoin* (northern spicebush), and *Rosa multiflora.* Vines include *Parthenocissus quinquefolia* (Virginia creeper), *Vitis vulpina* (frost grape), and *Lonicera japonica* (Japanese honeysuckle). Common herbaceous plants include *Alliaria petiolata* (garlic mustard), *Elymus*

hystrix var. hystrix (eastern bottlebrush grass), *Festuca subverticillata* (nodding fescue), *Glechoma hederacea* (ground ivy), *Microstegium vimineum* (Nepalese browntop), *Verbesina alternifolia* (wingstem), and *Viola sororia* (common blue violet).

George Washington Memorial Parkway Vegetation: This disturbance-related forest has a semi-open to closed canopy that varies from strong dominance by *Acer negundo* (box-elder) to codominance by *Acer negundo* (box-elder) and other alluvial and early-successional hardwoods. Other characteristic canopy species include *Liquidambar styraciflua* (sweetgum), *Celtis occidentalis* (common hackberry), *Platanus occidentalis* (American sycamore), *Acer saccharinum* (silver maple), *Robinia pseudoacacia* (black locust), *Ulmus americana* (American elm), and *Juglans nigra* (black walnut). *Acer negundo* (box-elder) is also typically abundant in the subcanopy, in association with *Morus rubra* (red mulberry), *Ulmus rubra* (slippery elm), and *Fraxinus pennsylvanica* (green ash). The shrub and herb layers range from sparse to relatively lush, with *Lindera benzoin* (northern spicebush) and *Asimina triloba* (pawpaw) common shrubs. Vines are often rampant and include the native species *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax rotundifolia* (roundleaf greenbrier), as well as many exotic vines that include *Celastrus orbiculatus* (oriental bittersweet), *Hedera helix* (English ivy), *Lonicera japonica* (Japanese honeysuckle), *Euonymus fortunei* (winter creeper), and *Nekemias arborea* (peppervine). The herb layer consists of a mixture of weedy exotics and native floodplain species such as *Verbesina alternifolia* (wingstem), *Boehmeria cylindrica* (small-spike false nettle), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Dichanthelium clandestinum* (deertongue), *Geum canadense* (white avens), and *Polygonum virginianum* (jumpseed).

Harpers Ferry National Historical Park Vegetation: This semi-open to closed-canopy forest is dominated by *Acer negundo* (box-elder) which is common in both the canopy and subcanopy. Other characteristic canopy species include *Platanus occidentalis* (American sycamore), *Celtis occidentalis* (common hackberry), *Acer saccharinum* (silver maple), *Robinia pseudoacacia* (black locust), *Ulmus americana* (American elm), and *Juglans nigra* (black walnut). Subcanopy species can include *Cercis canadensis* (eastern redbud), *Carpinus caroliniana* (American hornbeam), *Ulmus rubra* (slippery elm), and *Fraxinus pennsylvanica* (green ash). The shrub and herb layers range from sparse to relatively lush, with *Lindera benzoin* (northern spicebush) and *Asimina triloba* (pawpaw) common shrubs. Vines are often quite abundant and include *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax rotundifolia* (roundleaf greenbrier). The herb layer consists of a mixture of weedy exotics and native floodplain species such as *Verbesina alternifolia* (wingstem), *Boehmeria cylindrica* (small-spike false nettle), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Dichanthelium clandestinum* (deertongue), *Geum canadense* (white avens), and *Polygonum virginianum* (jumpseed).

Manassas National Battlefield Park Vegetation: This semi-open to closed-canopy forest is dominated by *Acer negundo* (box-elder). *Acer negundo* (box-elder) is common in the canopy and subcanopy. Other characteristic canopy species include *Platanus occidentalis* (American sycamore), *Celtis occidentalis* (common hackberry), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Robinia pseudoacacia* (black locust), *Ulmus rubra* (slippery elm), and *Juglans nigra* (black walnut). Subcanopy species can include *Carpinus caroliniana* (American hornbeam), *Ulmus rubra* (slippery elm), and *Fraxinus pennsylvanica* (green ash). The shrub and herb layers range from sparse to relatively lush, with *Lindera benzoin* (northern spicebush) and *Asimina triloba* (pawpaw) common shrubs. Vines are often quite heavy and include *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax rotundifolia* (roundleaf greenbrier). The herb layer consists of a mixture of weedy exotics and native floodplain species such as *Boehmeria cylindrica* (small-spike false nettle), *Amphicarpaea bracteata* (American hogpeanut), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Dichanthelium clandestinum* (deertongue), *Elymus virginicus* (Virginia wildrye), *Geum canadense* (white avens), *Polygonum virginianum* (jumpseed), and *Verbesina alternifolia* (wingstem).

Monocacy National Battlefield Vegetation: This forest is strongly dominated by *Acer negundo* (box-elder) in the canopy, subcanopy, and/or tall-shrub layer. Other associates can include *Acer saccharinum* (silver maple), *Juglans nigra* (black walnut), *Prunus* (plum) spp., *Platanus occidentalis* (American sycamore), *Fraxinus americana* (white ash), *Robinia pseudoacacia* (black locust), and/or *Celtis occidentalis* (common hackberry). Tree canopy ranges from 12-20 m in height with 75-80% cover. The subcanopy, if present, ranges from 6-10 m with 25-50% cover. Stands with shorter canopies may lack a subcanopy. The sparse tall-shrub layer (0-20%) often contains *Acer negundo* (box-elder) and *Ailanthus altissima* (tree of heaven). *Rubus* (blackberry) spp. and *Rosa multiflora* (multiflora rose) are typical short shrubs. In the herbaceous layer, *Viola* (violet) spp., *Verbesina alternifolia* (wingstem), *Urtica dioica* (stinging nettle), *Galium aparine* (stickywilly), and *Polygonum* (knotweed) spp. are common species. However, the herbaceous layer is typically depauperate, with *Alliaria petiolata* (garlic mustard) and *Lonicera japonica* (Japanese honeysuckle) as the most common species.

National Capital Parks-East Vegetation: These early-successional stands are dominated by *Acer negundo* (box-elder). Other characteristic species may include *Platanus occidentalis* (American sycamore) and *Liriodendron tulipifera* (tuliptree). The herb layer consists of a mixture of weedy exotics and native floodplain species, including *Carex blanda* (eastern woodland sedge) and *Elymus villosus* (hairy wildrye).
Global Vegetation: These ruderal forests (sometimes woodlands) are dominated by *Acer negundo* (box-elder). Other characteristic species include *Platanus occidentalis* (American sycamore), *Celtis laevigata* (sugarberry), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Robinia pseudoacacia* (black locust), *Liquidambar styraciflua* (sweetgum), *Acer saccharinum* (silver maple), *Ulmus alata* (winged elm), *Ulmus rubra* (slippery elm), *Carya cordiformis* (bitternut hickory), *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), *Carpinus caroliniana* (American hornbeam), *Morus rubra* (red mulberry), and *Populus deltoides* (eastern cottonwood). The shrub and herb layers range from sparse to relatively lush, and the vine component often is heavy. *Lindera benzoin* (northern spicebush) may be dominant in the shrub layer. The herb layer consists of a mixture of weedy exotics and native floodplain species, including *Ageratina altissima* (white snakeroot), *Alliaria petiolata* (garlic mustard), *Boehmeria cylindrica* (small-spike false nettle), *Carex grayi* (Gray's sedge), *Cryptotaenia canadensis* (Canadian honewort), *Glechoma hederacea* (ground ivy), *Lysimachia nummularia* (creeping jenny), *Mertensia virginica* (Virginia bluebells), *Polygonum virginianum* (jumpseed), *Prunella vulgaris* (common selfheal), *Urtica dioica ssp. dioica* (stinging nettle), and *Verbesina alternifolia* (wingstem). The range, dynamics, and variability of this type are complicated by the "weedy" nature of *Acer negundo* (box-elder), e.g., in Kentucky, *Acer negundo* (box-elder) may be dominant in old fields, with *Dichanthelium clandestinum* (deertongue) and *Carex* (sedge) spp. in the ground layer. Elsewhere in the Midwest, logged and grazed stands of *Fraxinus pennsylvanica* (green ash) and *Ulmus americana* (American elm) may be dominated by *Acer negundo* (box-elder).
Global Dynamics: This type is a ruderal, early-successional community that arises from cultural disturbances on floodplains. Stands in natural habitats where occasional flash floods create extensive open alluvial deposits are treated as *~Acer negundo - (Platanus occidentalis*, *Populus deltoides)* Floodplain Forest (CEGL004690)$$.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer negundo* (box-elder)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Acer negundo* (box-elder), *Alliaria petiolata* (garlic mustard)
Chesapeake & Ohio Canal National Historical Park: *Acer negundo* (box-elder)
George Washington Memorial Parkway: *Acer negundo* (box-elder), *Lindera benzoin* (northern spicebush), *Robinia pseudoacacia* (black locust)
Harpers Ferry National Historical Park: *Acer negundo* (box-elder), *Lindera benzoin* (northern spicebush)
Manassas National Battlefield Park: *Acer negundo* (box-elder), *Boehmeria cylindrica* (small-spike false nettle), *Lindera benzoin* (northern spicebush)
Monocacy National Battlefield: *Acer negundo* (box-elder), *Alliaria petiolata* (garlic mustard)
National Capital Parks-East: *Acer negundo* (box-elder), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore)
Global: *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Ageratina altissima* (white snakeroot), *Boehmeria cylindrica* (small-spike false nettle), *Carex grayi* (Gray's sedge), *Lindera benzoin* (northern spicebush), *Liquidambar styraciflua* (sweetgum), *Mertensia virginica* (Virginia bluebells), *Platanus occidentalis* (American sycamore), *Prunella vulgaris* (common selfheal), *Robinia pseudoacacia* (black locust), *Ulmus americana* (American elm), *Verbesina alternifolia* (wingstem)

OTHER NOTEWORTHY SPECIES

Antietam National Battlefield: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Chesapeake & Ohio Canal National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Urtica dioica* (stinging nettle)

George Washington Memorial Parkway: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Euonymus fortunei* (winter creeper, High/Medium), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera maackii* (Amur honeysuckle, High), *Microstegium vimineum* (Nepalese browntop, High/Medium); **Other Plants**: *Toxicodendron radicans* (eastern poison-ivy, G5)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Paulownia tomentosa* (princesstree, Medium/Low)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low), *Stellaria media* (common chickweed, Low)
Monocacy National Battlefield: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low)
Global: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Urtica dioica* ssp. *dioica* (stinging nettle)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (28-Mar-2014). As currently defined, this is a broad-ranging ruderal community type.

RELATED CONCEPTS

Global Similar Types:
- *Acer negundo - (Platanus occidentalis, Populus deltoides)* Floodplain Forest (CEGL004690)
- *Betula nigra - Platanus occidentalis* Floodplain Forest (CEGL002086)
- *Fraxinus nigra - Acer saccharinum* Upper Great Lakes Floodplain Forest (CEGL005488)
- *Fraxinus pennsylvanica - (Ulmus americana) / Symphoricarpos occidentalis* Floodplain Forest (CEGL002088)
- *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)

Global Related Concepts:
- *Acer negundo* Forest (Faber-Langendoen 2001) =
- *Acer negundo* riparian woodland (Vanderhorst 2001b) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Antietam National Battlefield Classification Comments: Ruderal Box-elder Floodplain Forest is also referred to as Successional Box-elder Floodplain Forest.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Ruderal Box-elder Floodplain Forest is also referred to as Successional Box-elder Floodplain Forest. This association is sometimes mapped individually, but small patches may also be mapped as part of the Successional Woody Wetland Map Class (COMP_WOWE) which at this park may include Northeastern Buttonbush Shrub Swamp (CEGL006069), Ruderal Box-elder Floodplain Forest (CEGL005033), and Ruderal Black Walnut Forest (CEGL007879), as well as unclassified successional shrublands and woodlands occurring in wetlands.
George Washington Memorial Parkway Classification Comments: Ruderal Box-elder Floodplain Forest (also referred to as Successional Box-elder Floodplain Forest) can be distinguished from other floodplain types in the park by the strong dominance or codominance of *Acer negundo* (box-elder) in the canopy and subcanopy and high cover of exotic vines and herbs. The subcanopy of Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217) can be dominated by *Acer negundo* (box-elder), but the canopy is dominated by mature *Acer saccharinum* (silver maple) and typically lacks heavy disturbance by exotic vines. This association is sometimes mapped individually, but small patches may also be mapped as part of the Successional Woody Wetland Map Class (COMP_WOWE) which at this park may include Ruderal Box-elder Floodplain Forest (CEGL005033) as well as unclassified successional shrublands and woodlands occurring in wetlands.

George Washington Memorial Parkway Other Comments: Ruderal Box-elder Floodplain Forest is often located adjacent to stands of Successional Vine-Shrubland Map Class (COMP_VISH), which can also occur as small isolated patches within larger stands of Ruderal Box-elder Floodplain Forest.
Harpers Ferry National Historical Park Classification Comments: Ruderal Box-elder Floodplain Forest (also referred to as Successional Box-elder Floodplain Forest) can be distinguished from other floodplain types in the park by the strong or monospecific dominance of *Acer negundo* (box-elder) in the canopy and subcanopy. The subcanopy of Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073) and Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217) can be dominated by *Acer negundo* (box-elder), but the former typically has a mixed hardwood canopy and the latter a canopy dominated by *Acer saccharinum* (silver maple). This association is sometimes mapped individually, but small patches may also be mapped as part of the Successional Woody Wetland Map Class (COMP_WOWE) which at this park may include Ruderal Box-elder Floodplain Forest (CEGL005033) and Ruderal Black Walnut Forest (CEGL007879), as well as unclassified successional shrublands and woodlands occurring in wetlands.
Manassas National Battlefield Park Classification Comments: Ruderal Box-elder Floodplain Forest (also referred to as Successional Box-elder Floodplain Forest) can be distinguished from other floodplain communities in the park by the heavy dominance of *Acer negundo* (box-elder) in the canopy and subcanopy. The subcanopy of Northern Piedmont Small Stream Floodplain Forest (CEGL006492) and Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073) can be dominated by *Acer negundo* (box-elder), but these types typically have mixed hardwood canopies. This association is sometimes mapped individually, but small patches may also be mapped as part of the Successional Woody Wetland Map Class (COMP_WOWE) which at this park may include Ruderal Box-elder Floodplain Forest (CEGL005033) and Ruderal Black Walnut Forest (CEGL007879), as well as unclassified successional shrublands and woodlands occurring in wetlands.
Monocacy National Battlefield Classification Comments: Ruderal Box-elder Floodplain Forest is also referred to as Successional Box-elder Floodplain Forest.
National Capital Parks-East Classification Comments: Ruderal Box-elder Floodplain Forest is also referred to as Successional Box-elder Floodplain Forest. This association is sometimes mapped individually, but small patches may also be mapped as part of the Successional Woody Wetland Map Class (COMP_WOWE) which at this park may include Northeastern Buttonbush Shrub Swamp (CEGL006069) and small patches of Ruderal Box-elder Floodplain Forest (CEGL005033), as well as unclassified successional shrublands and woodlands occurring in wetlands.
Global Classification Comments: The range, dynamics, and variability of this type is complicated by the "weedy" nature of *Acer negundo* (box-elder). For example, disturbed stands in former *Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis*, *laevigata)* Temporarily Flooded Forest Alliance (A.286) often become dominated by *Acer negundo* (box-elder). And in the upper Midwest *Acer negundo* (box-elder)-dominated stands are treated as part of *~Fraxinus pennsylvanica - (Ulmus americana) / Symphoricarpos occidentalis* Floodplain Forest (CEGL002088)$$. Thus, some consistency is needed in the application of this type across its range. In Arkansas, these forests can be pure *Acer negundo* (box-elder) or have *Acer rubrum* (red maple) and *Platanus occidentalis* (American sycamore) as associates (T. Foti pers. comm. 1999). Composition is variable. Where *Acer negundo* (box-elder) occurs in natural habitats in the Southeast, it should be placed in *~Acer negundo - (Platanus occidentalis*, *Populus deltoides)* Floodplain Forest (CEGL004690)$$, e.g., along the Arkansas River in Arkansas (D. Zollner pers. comm. 1999). In Missouri, natural stands would probably be combined with *~Betula nigra - Platanus occidentalis* Floodplain Forest (CEGL002086)$$ (M. Leahy pers. comm. 1999). In Kentucky, this may be found at the Licking River impoundment (Cave Run Lake).

ELEMENT DISTRIBUTION

Antietam National Battlefield Range: This association occurs near agricultural fields or along creeks and tributaries within the park.
Chesapeake & Ohio Canal National Historical Park Range: This association commonly occurs in bottomlands along the length of the Chesapeake & Ohio Canal.
George Washington Memorial Parkway Range: Ruderal Box-elder Floodplain Forest occurs in scattered patches south of Chain Bridge, from Roosevelt Island to Dyke Marsh. It is not documented south of Dyke Marsh. The largest stand occurs along the shoreline of Daingerfield Island.
Harpers Ferry National Historical Park Range: Ruderal Box-elder Floodplain Forest occurs as relatively linear patches along the Potomac River floodplain near the town of Harpers Ferry and at the far eastern end of the park. It also occurs along a tributary to the Shenandoah River along the western side of Jackson's Right Flank.

Manassas National Battlefield Park Range: Ruderal Box-elder Floodplain Forest has limited coverage in the park. It only occurs at two sites along the floodplain of Bull Run. One site is directly north of the Stone Bridge, on the north side of Bull Run. The second is south of U.S. Route 29, on the south side of Bull Run just north of Balls Ford.
Monocacy National Battlefield Range: This association occurs near agricultural fields or along creeks and tributaries throughout the park.
National Capital Parks-East Range: There are points at Piscataway, Oxon Hill Farm, and Fort Washington. In addition to these areas, most of the mapped polygons are in Anacostia Park (part of the central area).
Global Range: This *Acer negundo* (box-elder) ruderal floodplain forest is found sporadically on floodplains in the southern, eastern, and midwestern United States, ranging from New York and New Jersey west to Iowa (and possibly southeastern South Dakota), south to Louisiana and possibly Texas, and east to Georgia. It occurs in the Piedmont region in Pennsylvania and in the Coastal Plain and Piedmont regions in New Jersey and Delaware.
Nations: CA?,US
States/Provinces: AL:SNA, AR:SNA, DC:SNA, DE:SNA, GA:SNA, IA:SNA, KY:SNA, LA:SNA, MD:SNA, MN:SNA, MO:SNA, MS:SNA, NJ:SNA, NY:SNA, OK:SNA, PA:SNA, QC?:SNA, SC:SNA, SD?:SNA, TN:SNA, TX?:SNA, VA:SNA, WV:SNA
TNC Ecoregions: 31:?, 32:P, 36:P, 38:C, 39:C, 40:C, 41:P, 42:C, 43:C, 44:C, 50:C, 53:C, 56:?, 57:?, 58:?, 59:C, 61:C, 62:C
USFS Ecoregions (2007): 221Bc:CCP, 221Ej:CPP, 221En:CP?, 221Ha:CC?, 221Hb:CCP, 221Hc:CC?, 221Hd:CC?, 221He:CC?, 221Ja:CP?, 221Jb:CP?, 221Jc:CP?, 223An:CCP, 223Bc:CPP, 223Bd:CPP, 223Ea:CCP, 223Eb:CCP, 223Ec:CCP, 223Ed:CCP, 223Ee:CCP, 223Ef:CCP, 223Eg:CCC, 223Eh:CCP, 223Fa:CP?, 223Fb:CP?, 223Fc:CP?, 223Fd:CP?, 223Ff:CP?, 231Ba:CCC, 231Bb:CCP, 231Bc:CCP, 231Bd:CCC, 231Be:CCP, 231Bf:CCP, 231Bj:CCP, 231Bk:CCP, 231Bl:CCP, 231Ca:CCP, 231Cb:CCP, 231Cc:CCP, 231Cd:CCC, 231Ce:CCP, 231Cf:CCP, 231Cg:CCP, 231Da:CCP, 231Db:CCP, 231Dc:CCP, 231Dd:CCP, 231De:CCP, 231Ea:CCP, 231Eb:CCP, 231Ec:CC?, 231Ee:CCP, 231Ef:CCP, 231Eg:CCP, 231Ej:CCP, 231Ek:CCP, 231Eo:CC?, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 231Ha:CCC, 231Hb:CCP, 231Hc:CCC, 231Hd:CC?, 231He:CC?, 231Hf:CC?, 231Hg:CC?, 231Hh:CCC, 231Hi:CCC, 232Ac:CCP, 232Ad:CC?, 232Ea:C??, 232Eb:C??, 232Fa:CPP, 232Fb:CPP, 234Aa:CCC, 234Ad:CCC, 234Ah:CCC, 234Cb:CCC, 234Cc:CCC, 234Cd:CCC, 234Da:CCC, 234Db:CCC, 234Dc:CCC, 234Do:CCC, 234Ea:CCC, 234Eb:CCC, 234Ec:CCC, 255Ch:PPP, M221Be:CCC, M221Cb:CCC
Federal Lands: NPS (Antietam, Bluestone, Buffalo River, C&O Canal, Chickamauga-Chattanooga, George Washington Parkway, Harpers Ferry, Manassas, Mississippi, Monocacy, Natchez Trace, National Capital-East, New River Gorge, Ozark Riverways, Saratoga, Shiloh, Vicksburg); USFS (Daniel Boone, St. Francis); USFWS (Little River, National Conservation Training Center)

ELEMENT SOURCES

Antietam National Battlefield Plots: None.
Chesapeake & Ohio Canal National Historical Park Plots: None.
George Washington Memorial Parkway Plots: None.
Harpers Ferry National Historical Park Plots: None.
Manassas National Battlefield Park Plots: None.
Monocacy National Battlefield Plots: None.
National Capital Parks-East Plots: None.
Antietam National Battlefield Description Author(s): S. Perles
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
George Washington Memorial Parkway Description Author(s): K. Taverna and G. Fleming
Harpers Ferry National Historical Park Description Author(s): K. Taverna
Manassas National Battlefield Park Description Author(s): K. Taverna
Monocacy National Battlefield Description Author(s): S. Perles
National Capital Parks-East Description Author(s): M. Pyne
Global Description Author(s): E. Largay, S.C. Gawler, D. Faber-Langendoen
References: Blair 1938, CDPNQ unpubl. data, Campbell pers. comm., Chastain et al. 2006, Coxe 2009, Edinger et al. 2014a, Edinger et al. 2014b, Evans et al. 2009, Faber-Langendoen 2001, Foti pers. comm., Harrison 2004, Harrison 2011, Hop et al. 2012a, INAI 2017, LNHP 2009, Lea 2004, Lea et al. 2013, Leahy pers. comm., NRCS 2004a, Nigh et al. 2000, Nordman et al. 2011, Patterson and DeSelm 1989, Southeastern Ecology Working Group n.d.*, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2008, Zollner pers. comm.

[CEGL006976] *Betula nigra - Acer rubrum - (Liquidambar styraciflua) / Microstegium vimineum* Ruderal Floodplain Forest

Translated Name: **River Birch - Red Maple - (Sweetgum) / Nepalese Browntop Ruderal Floodplain Forest**
Common Name: **Northern Coastal Plain Ruderal Floodplain Forest**

USNVC Classification

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Eastern North American Ruderal Flooded & Swamp Forest (M302)
Group	Eastern North American Ruderal Flooded & Swamp Forest (G552)
Alliance	*Acer negundo - Betula nigra / Alliaria petiolata* Ruderal Floodplain Forest Alliance (A4099)

Element Concept

Global Summary: This ruderal floodplain forest ranges from central Virginia to New Jersey on the Coastal Plain and, in some areas, the eastern edge of the Piedmont. The sites occupied by this community are typically recovering from disturbances such as logging or undergoing natural succession from open wetland to forest. Habitats are temporarily flooded to somewhat seasonally flooded alluvial floodplains of small to large streams. Soils are relatively nutrient-poor, have high silt or clay content, and vary from well-drained to somewhat poorly drained. The vegetation is mostly closed-canopy forest dominated by *Acer rubrum* (red maple), solely or in combination with *Betula nigra* (river birch). On some sites, *Liquidambar styraciflua* (sweetgum) and/or *Platanus occidentalis* (American sycamore) are important in the overstory mixtures. Potential successor trees, such as *Ulmus americana* (American elm), *Liriodendron tulipifera* (tuliptree), *Quercus phellos* (willow oak), *Quercus palustris* (pin oak), *Quercus michauxii* (swamp chestnut oak), *Nyssa sylvatica* (blackgum), and *Fraxinus pennsylvanica* (green ash), occur as minor overstory or understory associates. The shrub and herb layers are variable. On very disturbed sites, near-monocultures of the exotic grass *Microstegium vimineum* (Nepalese browntop) may dominate the herb layer.

Environmental Description

National Capital Parks-East Environment: This successional floodplain forest is widespread at NACE.
Prince William Forest Park Environment: Northern Coastal Plain Ruderal Floodplain Forest is a disturbed forest occurring on temporarily to somewhat seasonally flooded, well-developed alluvial floodplains of Quantico Creek and its tributaries.
Wolf Trap National Park for the Performing Arts Environment: Northern Coastal Plain Ruderal Floodplain Forest is a disturbed forest occurring on temporarily flooded, well-developed alluvial floodplains. This early-successional forest occurs on sites recovering from disturbances such as clearing or undergoing natural succession from open wetland to forest.
Global Environment: Stands are found on temporarily flooded to somewhat seasonally flooded alluvial floodplains of small to large streams. Soils are relatively nutrient-poor, have high silt or clay content, and vary from well-drained to somewhat poorly drained. The sites occupied by this community are typically recovering from disturbances such as logging or undergoing natural succession from open wetland to forest.

Vegetation Description

National Capital Parks-East Vegetation: The canopy is dominated by *Acer rubrum* (red maple) and may also include *Betula nigra* (river birch), *Fraxinus pennsylvanica* (green ash), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Quercus palustris* (pin oak), and *Salix nigra* (black willow). The subcanopy includes *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), and *Nyssa sylvatica* (blackgum). Shrubs and vines include *Asimina triloba* (pawpaw), *Campsis radicans* (trumpet creeper), *Carpinus caroliniana* (American hornbeam), *Clethra alnifolia* (coastal sweet-pepperbush), *Ilex opaca* (American holly), *Lindera benzoin* (northern spicebush), *Liquidambar styraciflua* (sweetgum), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Viburnum dentatum* (southern arrow-wood), and the exotic *Lonicera japonica* (Japanese honeysuckle). The field layer may contain abundant *Microstegium vimineum* (Nepalese browntop), as well as *Arisaema triphyllum* (Jack in the pulpit), *Boehmeria cylindrica* (small-spike false nettle), *Carex crinita* (fringed sedge), *Carex intumescens* (greater bladder sedge), *Cinna arundinacea* (sweet woodreed), *Dichanthelium clandestinum* (deertongue), *Impatiens capensis* (orange jewelweed), *Peltandra virginica* (green arrow-arum), *Solidago rugosa* (wrinkleleaf goldenrod), and patches of ferns (e.g., *Polystichum acrostichoides* (Christmas fern), *Thelypteris noveboracensis* (New York fern), *Phegopteris hexagonoptera* (broad beechfern), *Onoclea sensibilis* (sensitive fern), and *Woodwardia areolata* (netted chainfern)). There is water-stained leaf litter as a ground cover as well as fallen branches.

Prince William Forest Park Vegetation: Canopy dominants may include *Acer rubrum* (red maple) (red maple), *Betula nigra* (river birch) (river birch), *Liquidambar styraciflua* (sweetgum) (sweetgum), *Nyssa sylvatica.* Other trees may include *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis.*
Wolf Trap National Park for the Performing Arts Vegetation: The canopy is often even-aged and canopy cover can vary from quite open to >75%. The canopy is dominated by young even-aged stands of *Betula nigra* (river birch) with *Acer rubrum* (red maple) a common associate. Common subcanopy trees include *Liriodendron tulipifera* (tuliptree), *Carpinus caroliniana* (American hornbeam), and *Fraxinus pennsylvanica* (green ash). Shrub cover varies and can include woody vines such as *Smilax rotundifolia* (roundleaf greenbrier) and *Toxicodendron radicans* (eastern poison-ivy), whereas other areas have a more open shrub layer with species such as *Carpinus caroliniana* (American hornbeam) and *Rubus* (blackberry) sp. The herb layer is often quite dense; typical species include *Leersia virginica* (whitegrass), *Cinna arundinacea* (sweet woodreed), *Carex* (sedge) spp., *Polygonum cespitosum* (oriental ladysthumb), *Onoclea sensibilis* (sensitive fern), *Boehmeria cylindrica* (small-spike false nettle), and *Impatiens capensis* (orange jewelweed). The exotic grass *Microstegium vimineum* (Nepalese browntop) may be abundant.
Global Vegetation: This is a mostly closed-canopy forest dominated by *Acer rubrum* (red maple), solely or in combination with *Betula nigra* (river birch). On some sites, *Liquidambar styraciflua* (sweetgum) and/or *Platanus occidentalis* (American sycamore) are important in the overstory mixtures. Potential successor trees, such as *Ulmus americana* (American elm), *Liriodendron tulipifera* (tuliptree), *Quercus phellos* (willow oak), *Quercus palustris* (pin oak), *Quercus michauxii* (swamp chestnut oak), *Nyssa sylvatica* (blackgum), and *Fraxinus pennsylvanica* (green ash), occur as minor overstory or understory associates. The shrub layer is usually open or patchy, with *Lindera benzoin* (northern spicebush) the most frequent species, and *Carpinus caroliniana* (American hornbeam), *Ilex opaca* (American holly), and *Viburnum dentatum* (southern arrow-wood) important in some stands. Woody vines of *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Campsis radicans* (trumpet creeper), and *Lonicera japonica* (Japanese honeysuckle) are abundant. The herb layer is variable, with *Boehmeria cylindrica* (small-spike false nettle), *Lycopus virginicus* (Virginia water horehound), *Glyceria striata* (fowl mannagrass), *Cinna arundinacea* (sweet woodreed), *Carex intumescens* (greater bladder sedge), *Impatiens capensis* (orange jewelweed), *Arisaema triphyllum* (Jack in the pulpit), *Leersia virginica* (whitegrass), *Dichanthelium clandestinum* (deertongue), *Chasmanthium laxum* (slender woodoats), and *Thelypteris noveboracensis* (New York fern) most frequent. On very disturbed sites, near-monocultures of the exotic grass *Microstegium vimineum* (Nepalese browntop) may dominate the herb layer.
Global Dynamics: This community is an early-successional type that becomes established on abandoned fields or clearcuts in floodplains. Some of the stands of better-drained floodplains probably succeed to *~Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin / Arisaema triphyllum* Floodplain Forest (CEGL004418)$$, a longer-lived mid-successional forest of overlapping range. On more poorly drained sites, stands probably succeed over time to one of the floodplain communities characterized by *Acer rubrum* (red maple) and hydrophytic oaks, e.g., *~Quercus (phellos*, *palustris*, *michauxii) - Liquidambar styraciflua / Cinna arundinacea* Floodplain Forest (CEGL006605)$$.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Betula nigra* (river birch), *Liquidambar styraciflua* (sweetgum), *Platanus occidentalis* (American sycamore)

CHARACTERISTIC SPECIES

National Capital Parks-East: *Acer rubrum* (red maple), *Betula nigra* (river birch), *Liquidambar styraciflua* (sweetgum)
Prince William Forest Park: *Acer rubrum* (red maple), *Betula nigra* (river birch), *Liquidambar styraciflua* (sweetgum)
Wolf Trap National Park for the Performing Arts: *Acer rubrum* (red maple), *Betula nigra* (river birch)
Global: *Acer rubrum* (red maple), *Betula nigra* (river birch), *Liquidambar styraciflua* (sweetgum), *Platanus occidentalis* (American sycamore)

OTHER NOTEWORTHY SPECIES

National Capital Parks-East: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)

Prince William Forest Park: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)
Wolf Trap National Park for the Performing Arts: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* (oriental ladysthumb)
Global: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (15-Dec-2015). This ruderal vegetation is not of conservation concern.

RELATED CONCEPTS

Global Similar Types:
- *Betula nigra - Platanus occidentalis / Alnus serrulata / Boehmeria cylindrica* Floodplain Forest (CEGL007312) range is generally to the south and west (VA to TX) of CEGL006976.
- *Betula nigra - Platanus occidentalis / Impatiens capensis* Floodplain Forest (CEGL006184) is found on sandy or gravelly levees and bars along Mid-Atlantic rivers, primarily west of the Coastal Plain.
- *Betula nigra - Platanus occidentalis* Floodplain Forest (CEGL002086) early-seral forest of sandy, small-river streambanks and shores throughout the east-central U.S.
- *Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin / Arisaema triphyllum* Floodplain Forest (CEGL004418) a wide-ranging small-stream floodplain forest; in the Northern Coastal Plain, this type may be a successor to CEGL006976.

Global Related Concepts:
- *Acer rubrum - (Betula nigra) / Toxicodendron radicans* Forest (Lea 2003) =
- *Acer rubrum - Betula nigra / Smilax rotundifolia* Forest (Fleming 2002b) =
- *Acer rubrum - Betula nigra / Smilax rotundifolia* Forest (Fleming 2002a) =
- *Acer rubrum - Betula nigra / Toxicodendron radicans* Forest (Fleming and Patterson 2003) =
- *Betula nigra - Acer rubrum - (Liquidambar styraciflua, Platanus occidentalis)* Successional Forest (Fleming et al. 2007b) =
- *Betula nigra / Ilex decidua / Boehmeria cylindrica - Lycopus rubellus* Forest (Walton et al. 2001) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
National Capital Parks-East Classification Comments: Northern Coastal Plain Ruderal Floodplain Forest is also referred to as Successional Red Maple Small River Floodplain Forest, or as Successional Floodplain Forest. The composition of this ruderal association can be variable.
Prince William Forest Park Classification Comments: Northern Coastal Plain Ruderal Floodplain Forest is also referred to as Successional Red Maple Small River Floodplain Forest, or as Successional Floodplain Forest. The composition of this ruderal association can be variable.
Wolf Trap National Park for the Performing Arts Classification Comments: Northern Coastal Plain Ruderal Floodplain Forest is also referred to as Successional Red Maple Small River Floodplain Forest, or as Successional Floodplain Forest. It.can be recognized by its occurrence on floodplains and stream terraces, its distinctive canopy composition of *Betula nigra* (river birch) and *Acer rubrum* (red maple), and its temporarily flooded hydrology.
Wolf Trap National Park for the Performing Arts Other Comments: The structure of Northern Coastal Plain Ruderal Floodplain Forest varies depending on stand age and degree of past disturbance. Younger stands typically have a more open canopy, whereas older stands have a taller closed canopy of *Betula nigra* (river birch) and *Acer rubrum* (red maple). Northern Coastal Plain Ruderal Floodplain Forest can be distinguished from Northern Piedmont Small Stream Floodplain Forest (CEGL006492) by its distinctive canopy composition of *Betula nigra* (river birch) and *Acer rubrum* (red maple).
Global Classification Comments: Classification of this type was originally based on a group of 15 Virginia and Maryland plots that emerged in the analysis of a 1300-plot regional (VA, MD, DC) dataset for the National Capital Region vegetation mapping project. It has been supplemented by additional observation point data in the NCR Parks, Mid-Atlantic Region Parks, and elsewhere.

ELEMENT DISTRIBUTION

National Capital Parks-East Range: This type is found across the unit from north to south, at Piscataway, Oxon Run Parkway, the central area, the Suitland Parkway, and the northern Baltimore-Washington Parkway.

Prince William Forest Park Range: This successional floodplain community has been observed scattered throughout the park along the floodplains of Quantico Creek and its tributaries.
Wolf Trap National Park for the Performing Arts Range: Northern Coastal Plain Ruderal Floodplain Forest occurs along disturbed floodplains in this park.
Global Range: This vegetation ranges from east-central Virginia to New Jersey on the Coastal Plain. It also occurs on the eastern edge of the Piedmont in Virginia and possibly Maryland.
Nations: US
States/Provinces: DC:SNA, DE:SNA, MD:SNA, NJ:SNA, VA:SNA
TNC Ecoregions: 52:C, 58:C, 61:C
USFS Ecoregions (2007): 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ad:CCC, 232Ha:CC?, 232Je:C??
Federal Lands: NPS (Fredericksburg-Spotsylvania, National Capital-East, Prince William, Thomas Stone, Wolf Trap)

ELEMENT SOURCES

National Capital Parks-East Plots: None.
Prince William Forest Park Plots: Rapid Assessment Points - 91721a, 91710a, 91719a
Wolf Trap National Park for the Performing Arts Plots: None.
National Capital Parks-East Description Author(s): M. Pyne
Prince William Forest Park Description Author(s): J. Teague
Wolf Trap National Park for the Performing Arts Description Author(s): K. Taverna
Global Description Author(s): G.P. Fleming
References: Coxe 2009, Eastern Ecology Working Group n.d.*, Fleming 2002a, Fleming 2002b, Fleming and Patterson 2003, Fleming et al. 2007b, Lea 2003, Lea et al. 2012, McCoy and Fleming 2000, Patterson 2008e, Taverna and Patterson 2008, Walton et al. 2001

1.B.3.NB. SOUTHEASTERN NORTH AMERICAN FLOODED & SWAMP FOREST

These wetland forests occur in a variety of wetland settings, such as floodplain / riparian, isolated basins, and seepage slopes, centered in the Southeastern Coastal Plain of the United States.

M032. Coastal Plain Evergreen Hardwood - Conifer Swamp

This macrogroup is found in the Southeastern Coastal Plain from southeastern Virginia to eastern Texas. It occurs on poorly drained, organic soil flats and seepage-fed wetlands in dissected coastal plain landscapes. It may also occur in poorly developed upland drainages and small headwater streambottoms, as well as on toeslopes. These areas are saturated by rainfall and seasonally high water tables without influence of river or tidal flooding. The vegetation is characterized by an overstory that generally includes some combination of *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Magnolia virginiana* (sweetbay), *Nyssa sylvatica* (blackgum), *Nyssa biflora* (swamp tupelo), *Persea palustris* (swamp bay), and *Pinus serotina* (pond pine), although there is some variation according to latitude. Some associations may contain *Chamaecyparis thyoides* (Atlantic white-cedar), but this species is not diagnostic of this macrogroup. Understory vegetation throughout the region consistently supports the vine *Smilax laurifolia* (laurel greenbrier), and there may be ferns such as *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Woodwardia areolata* (netted chainfern), and *Woodwardia virginica* (Virginia chainfern). Soils may be wet sands or mixtures of organic (peaty) and mineral soils, which are often extremely nutrient-poor. When these communities are associated with streams, they tend to be low-gradient, with narrow, often braided channels and diffuse drainage patterns.

G039. NORTHERN COASTAL PLAIN SWAMP

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* (Atlantic white-cedar) or *Pinus rigida* (pitch pine), generally not together. *Acer rubrum* (red maple) can be an important associate, especially with *Chamaecyparis* (false cypress), where cutting or other anthropogenic disturbance has altered the vegetation composition. Associated shrubs and herbs indicative of the coastal plain setting include *Gaylussacia dumosa* (dwarf huckleberry), *Clethra alnifolia* (coastal sweet-pepperbush), *Ilex glabra* (inkberry), *Rhododendron viscosum* (swamp azalea), *Eubotrys racemosa* (swamp doghobble), and *Carex striata* (Walter's sedge), as well as the more widespread

Vaccinium corymbosum (highbush blueberry), *Gaylussacia baccata* (black huckleberry), and *Chamaedaphne calyculata* (leatherleaf). Fire has been an important ecological process in the vegetation of this group.

A2058 *Acer rubrum - Nyssa sylvatica* Swamp Forest Alliance

Forests in this alliance have variable canopy composition, but typical canopy species across the range of this alliance include *Acer rubrum var. trilobum* (red maple) and *Nyssa sylvatica* (blackgum); associated trees in the northern portion of the range may include *Picea rubens* (red spruce), *Betula alleghaniensis* (yellow birch), *Tsuga canadensis* (eastern hemlock), and *Pinus strobus* (eastern white pine). *Liquidambar styraciflua* (sweetgum) and *Magnolia virginiana* (sweetbay) are characteristic in the southern portions of the range. These forests are nutrient-poor and generally acidi and occur in basins and seepage areas. The alliance ranges from southern Vermont to the northern Coastal Plain of Virginia.

[CEGL006238] *Acer rubrum - Nyssa sylvatica - Magnolia virginiana / Viburnum nudum var. nudum / Osmunda cinnamomea* Swamp Forest

Translated Name: **Red Maple - Blackgum - Sweetbay / Possumhaw / Cinnamon Fern Swamp Forest**
Common Name: **Southern Red Maple - Blackgum Swamp Forest**

USNVC Classification

Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Coastal Plain Evergreen Hardwood - Conifer Swamp (M032)
Group	Northern Coastal Plain Swamp (G039)
Alliance	*Acer rubrum - Nyssa sylvatica* Swamp Forest Alliance (A2058)

Element Concept

Global Summary: This acidic swamp forest of the eastern middle-latitude states is a nutrient-poor wetland forest occurring in groundwater-saturated stream bottoms and poorly drained depressions. Soils are typically moderately deep to deep muck over mineral soil, with pools of standing water at the surface. Acidic waters originate from groundwater seepage, with little to no overland seasonal flooding. Most sites can be characterized as "groundwater slope wetlands" (*sensu* Golet et al. 1993) with a flow-through hydrology. This community is characterized by *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) in the canopy, which may be quite open in some examples. Canopy associates include *Magnolia virginiana* (sweetbay), *Liquidambar styraciflua* (sweetgum), and *Persea palustris* (swamp bay), plus occasional incidental *Liriodendron tulipifera* (tuliptree) or *Pinus taeda* (loblolly pine). Upland trees may occur on drier hummocks. The shrub layer is characterized by *Vaccinium corymbosum* (highbush blueberry), as well as *Clethra alnifolia* (coastal sweet-pepperbush), *Ilex verticillata* (common winterberry), *Ilex opaca* (American holly), *Viburnum nudum var. nudum* (possumhaw), *Lindera benzoin* (northern spicebush), and *Rhododendron viscosum* (swamp azalea). The herbaceous layer varies from dense to sparse and may include *Symplocarpus foetidus* (skunk-cabbage), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Osmunda regalis var. spectabilis* (royal fern), *Woodwardia areolata* (netted chainfern), *Carex folliculata* (northern long sedge), *Carex lonchocarpa* (southern long sedge), *Carex collinsii* (Collins' sedge), *Carex atlantica* (prickly bog sedge), *Bartonia paniculata* (twining screwstem), *Parnassia asarifolia* (kidneyleaf grass of Parnassus), *Helonias bullata* (swamppink), *Chelone glabra* (white turtlehead), *Oxypolis rigidior* (stiff cowbane), and *Osmunda cinnamomea* (cinnamon fern). *Sphagnum* (sphagnum, peatmoss) spp. and other mosses are common.

Environmental Description

National Capital Parks-East Environment: This red maple - blackgum swamp forest was sample twice in the park, at Oxon Run Parkway. The stand is nearly pristine and the sole occurrence in the District of Columbia. The site is a gently undulating, saturated seep with poorly-drained peat soil. The unvegetated ground surface is dominated by leaf litter with some small rocks, wood, standing water, bare soil, and bryophytes. Evidence of disturbance includes past deer browsing, hydrologic alteration, stormwater runoff resulting in some scouring and trash deposition, and the presence of exotic plants. There are also observation points and rapid assessment points from Greenbelt in Prince Georges County, Maryland. These examples (which depend on seepage of water at the bases of slopes) appear to occur where Holocene alluvium contacts the adjacent Lower Cretaceous Potomac Formation.

Prince William Forest Park Environment: Southern Red Maple - Blackgum Swamp Forest occurs in a few isolated areas in Prince William Forest Park, restricted to groundwater-saturated streambottoms, poorly drained depressions with seepage inputs, and seeping toeslopes. Acidic water originates from groundwater seepage, with

little to no overland seasonal flooding. Sites typically have hummock-and-hollow microtopography with braided channels, *Sphagnum* (sphagnum, peatmoss)-covered hummocks, mucky depressions, and areas of standing water.
Global Environment: This association is generally restricted to groundwater-saturated stream bottoms, seeping toeslopes, and poorly drained depressions with seepage inputs. Most sites can be characterized as "groundwater slope wetlands" (*sensu* Golet et al. 1993) with a flow-through hydrology. Sites typically have hummock-and-hollow microtopography with braided channels, *Sphagnum* (sphagnum, peatmoss)-covered hummocks, mucky depressions, and areas of exposed sand and gravel. Soils are extremely acidic and low in base status.

VEGETATION DESCRIPTION

National Capital Parks-East Vegetation: The moderate to dense (up to 90% cover) canopy tall (20-35 m tall) and sparse (20-40%) subcanopy (10-20 m) are composed of *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Magnolia virginiana* (sweetbay), *Nyssa sylvatica* (blackgum), and numerous *Quercus* (oak) spp. The sparse (20-40%) shrub layers (0.5-10 m) are dominated by *Ilex verticillata* (common winterberry), *Magnolia virginiana* (sweetbay), *Vaccinium fuscatum* (black highbush blueberry), *Viburnum nudum* (possumhaw), and *Viburnum recognitum* (southern arrow-wood); additional shrubs include canopy tree saplings, *Ilex opaca var. opaca* (American holly), *Lindera benzoin* (northern spicebush), *Eubotrys racemosa* (swamp doghobble), *Lyonia ligustrina* (maleberry), *Prunus serotina var. serotina* (black cherry), *Toxicodendron vernix* (poison-sumac), *Vaccinium corymbosum* (highbush blueberry), and *Viburnum acerifolium* (mapleleaf viburnum). Ferns are the most common and/or abundant herbs and include *Athyrium filix-femina ssp. asplenioides* (asplenium ladyfern), *Onoclea sensibilis* (sensitive fern), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Thelypteris noveboracensis* (New York fern), *Thelypteris palustris var. pubescens* (eastern marsh fern), and *Woodsia obtusa ssp. obtusa* (bluntlobe cliff fern). *Symplocarpus foetidus* (skunk-cabbage) is an abundant forb, others may include *Arisaema triphyllum* (Jack in the pulpit), *Pilea pumila* (Canadian clearweed), and *Viola cucullata* (marsh blue violet). Graminoids include *Carex atlantica* (prickly bog sedge), *Carex crinita* (fringed sedge), *Carex seorsa* (weak stellate sedge), *Chasmanthium laxum* (slender woodoats), *Cinna arundinacea* (sweet woodreed), *Glyceria striata* (fowl mannagrass), and *Leersia virginica* (whitegrass). Vines of *Parthenocissus quinquefolia* (Virginia creeper), *Smilax glauca* (cat greenbrier), *Smilax pseudochina* (bamboo vine) (a possible DC record), *Smilax rotundifolia* (roundleaf greenbrier), and *Toxicodendron radicans* (eastern poison-ivy) may be found trailing along the ground or climbing into the shrub canopy.
Prince William Forest Park Vegetation: This acidic swamp forest is characterized by *Acer rubrum* (red maple) and *Liriodendron tulipifera* (tuliptree) in the canopy, which may be quite open in some examples. Canopy associates include *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), and *Liquidambar styraciflua* (sweetgum), plus occasional incidental *Quercus alba* (white oak). Upland trees may occur on drier hummocks. The shrub layer composition varies, but typical species include *Carpinus caroliniana* (American hornbeam), *Vaccinium corymbosum* (highbush blueberry), *Viburnum nudum var. nudum* (possumhaw), *Ilex verticillata* (common winterberry), *Ilex opaca var. opaca* (American holly), *Lyonia ligustrina* (maleberry), *Magnolia virginiana* (sweetbay), and *Lindera benzoin* (northern spicebush). The herbaceous layer varies from dense to sparse and often includes *Symplocarpus foetidus* (skunk-cabbage) (visible only early in the growing season), *Osmunda cinnamomea* (cinnamon fern), *Polygonum sagittatum* (arrowleaf tearthumb), *Chasmanthium laxum* (slender woodoats), *Carex debilis* (white edge sedge), *Carex* (sedge) spp., *Leersia virginica* (whitegrass), *Juncus effusus* (common rush), *Boehmeria cylindrica* (small-spike false nettle), *Impatiens capensis* (orange jewelweed), and *Dichanthelium* (rosette grass) sp. *Sphagnum* (sphagnum, peatmoss) spp. and other mosses are common.
Global Vegetation: Canopy closure ranges from closed to quite open. Plot data from 38 Virginia and Maryland stands indicate that *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) are consistently dominant overstory species. *Liriodendron tulipifera* (tuliptree) is a frequent but minor overstory associate, and *Pinus taeda* (loblolly pine) or *Liquidambar styraciflua* (sweetgum) is occasional in the canopy. *Magnolia virginiana* (sweetbay) is a frequent overstory associate and usually dominant in a subcanopy layer or codominant with *Ilex opaca* (American holly). Trees tend to be slow-growing and of less than optimal stature in the wet, unstable habitats. Shrub layers tend to be dense and diverse, characteristically containing *Viburnum nudum var. nudum* (possumhaw), *Vaccinium corymbosum* (highbush blueberry), *Smilax rotundifolia* (roundleaf greenbrier), *Ilex verticillata* (common winterberry), and *Lindera benzoin* (northern spicebush). In parts of the range, *Clethra alnifolia* (coastal sweet-pepperbush) is a dominant shrub, while in New Jersey, *Chamaedaphne calyculata* (leatherleaf) and *Gaylussacia frondosa* (blue huckleberry) are present. Additional, less constant shrub associates are *Rhododendron viscosum* (swamp azalea), *Eubotrys racemosa* (swamp doghobble), *Chionanthus virginicus* (white fringetree), *Viburnum dentatum* (southern arrow-wood), *Toxicodendron vernix* (poison-sumac), and *Carpinus caroliniana* (American hornbeam). The herb layer varies from dense to sparse. *Osmunda cinnamomea* (cinnamon fern) and

Woodwardia areolata (netted chainfern) are generally the most constant and abundant herbs, but *Symplocarpus foetidus* (skunk-cabbage) is a patch-dominant in approximately two-thirds of the Virginia and Maryland stands. Additional characteristic herbs occurring at low cover include *Arisaema triphyllum ssp. pusillum* (Jack in the pulpit), *Carex atlantica* (prickly bog sedge), *Carex debilis var. debilis* (white edge sedge), *Carex folliculata* (northern long sedge), *Carex intumescens* (greater bladder sedge), *Carex lonchocarpa* (southern long sedge), *Carex seorsa* (weak stellate sedge), *Carex styloflexa* (bent sedge), *Chelone glabra* (white turtlehead), *Impatiens capensis* (orange jewelweed), *Lycopus virginicus* (Virginia water horehound), *Mitchella repens* (partridgeberry), *Osmunda regalis var. spectabilis* (royal fern), *Platanthera clavellata* (small green wood orchid), *Viola cucullata* (marsh blue violet), and *Viola x primulifolia* (primroseleaf violet). Regionally uncommon or rare species that may be locally abundant in this type include *Helonias bullata* (swamppink), *Parnassia asarifolia* (kidneyleaf grass of Parnassus), *Carex collinsii* (Collins' sedge), and *Bartonia paniculata* (twining screwstem).

Global Dynamics: Trees tend to be slow-growing and of less than optimal stature in the wet, unstable habitats. Additionally, these swamps tend to border dry, sandy uplands supporting fire-prone oak/heath forests. Occasional fires, burning into the swamps from the uplands during dry periods, may have once influenced the composition and physiognomy of this type. However, fire has now been excluded from almost all areas within the range. An exception is at Fort A.P. Hill Military Reservation, where military training results in frequent incendiary fires in a roughly 5000-ha area. Stands of this community are very susceptible to flooding from beaver activities, which usually results in the destruction or extreme alteration of a stand. In New Jersey, this community is often situated adjacent to *Chamaecyparis thyoides* (Atlantic white-cedar)-dominated swamp and may replace it after logging.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Nyssa sylvatica* (blackgum)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Clethra alnifolia* (coastal sweet-pepperbush), *Vaccinium corymbosum* (highbush blueberry)
Herb (field)	Fern (Spore-bearing forb)	*Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Woodwardia areolata* (netted chainfern)
Nonvascular	Moss	*Sphagnum* spp.

CHARACTERISTIC SPECIES

National Capital Parks-East: *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Osmunda regalis* var. *spectabilis* (royal fern), *Viburnum nudum* (possumhaw)
Prince William Forest Park: *Acer rubrum* (red maple), *Magnolia virginiana* (sweetbay), *Osmunda cinnamomea* (cinnamon fern), *Symplocarpus foetidus* (skunk-cabbage), *Viburnum nudum* var. *nudum* (possumhaw)
Global: *Acer rubrum* (red maple), *Magnolia virginiana* (sweetbay), *Nyssa sylvatica* (blackgum), *Osmunda cinnamomea* (cinnamon fern)

OTHER NOTEWORTHY SPECIES

National Capital Parks-East: Vulnerable Plants: *Smilax pseudochina* (bamboo vine, G4G5, DC-imperiled, this may be a DC record); **Invasive/Exotic Plants**: *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Ilex crenata* (Japanese holly)
Prince William Forest Park: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)
Global: Vulnerable Plants: *Helonias bullata* (swamppink, G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (30-Mar-2004). The type is restricted to an uncommon wetland habitat in a limited region. It is vulnerable to alteration or destruction by beavers and various anthropogenic activities, including hydrologic modifications.

RELATED CONCEPTS

Global Similar Types:
- *Acer rubrum - Fraxinus pennsylvanica - Liquidambar styraciflua* Floodplain Forest (CEGL006965)
- *Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum* spp. Swamp Forest (CEGL006014)

- *Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Seep Forest (CEGL007853)
- *Acer rubrum var. trilobum / Viburnum nudum var. nudum / Osmunda cinnamomea - Saururus cernuus - Impatiens capensis* Seep Forest (CEGL004426)
- *Pinus taeda / Morella cerifera / Osmunda regalis var. spectabilis* Swamp Forest (CEGL006137)

Global Related Concepts:

- *Acer rubrum - Nyssa sylvatica - Magnolia virginiana / Viburnum nudum / Osmunda cinnamomea - Woodwardia areolata* Forest (Fleming et al. 2006) =
- *Acer rubrum - Nyssa sylvatica - Magnolia virginiana / Viburnum nudum var. nudum / Osmunda cinnamomea - Woodwardia areolata* Forest (Fleming and Patterson 2003) =
- *Acer rubrum - Nyssa sylvatica / Magnolia virginiana / Woodwardia areolata - Symplocarpus foetidus* Forest (Fleming 2002a) =
- *Acer rubrum - Quercus nigra - Nyssa sylvatica* swamp (Harvill 1967) **?**
- *Acer rubrum / Magnolia virginiana / Symplocarpus foetidus - Osmunda cinnamomea* Saturated Forest (McCoy and Fleming 2000) =
- Broadleaf swamp forest (Heckscher 1994) **?**
- Red Maple - Black Gum - Holly Swamp (AN3) (Windisch 2014a) **<**
- Woodland fresh marsh community (Hill 1986) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
National Capital Parks-East Classification Comments: Southern Red Maple - Blackgum Swamp Forest is sometimes referred to as Red Maple - Blackgum Seepage Swamp.
Prince William Forest Park Classification Comments: Southern Red Maple - Blackgum Swamp Forest, sometimes referred to as Red Maple - Blackgum Seepage Swamp, can be distinguished from similar communities by its non-alluvial hydrology, and the composition of its canopy and/or herbaceous layer. In Prince William Forest Park, the wetland community Southern New England-Northern Piedmont Red Maple Seepage Swamp Forest (CEGL006406) can occur in similar landscape positions with groundwater seepage hydrology but has more basic soils and can be distinguished by the dominance of *Fraxinus pennsylvanica* (green ash) in the canopy. CEGL006406 is only documented at one location in the eastern end of the park at the confluence of the South Fork of Quantico Creek and the main stem of Quantico Creek.
Prince William Forest Park Other Comments: Overall size of this association can vary, but most are <2.5 ha. One large stand occurs on a groundwater-saturated flat along Quantico Creek.

ELEMENT DISTRIBUTION

National Capital Parks-East Range: This forest association was sampled at Oxon Run Parkway in Washington, DC. There are also points at Greenbelt. It was mapped in both of these areas.
Prince William Forest Park Range: Southern Red Maple - Blackgum Swamp Forest occurs in Prince William Forest Park as one large stand along the main stem of Quantico Creek, as well as a couple smaller examples along tributaries to Quantico Creek. There is also one small occurrence in the southeastern end of the park at an isolated depression with seeping toeslopes.
Global Range: This community ranges from southeastern New York and New Jersey to southeastern Virginia on the Coastal Plain. In Virginia, it extends into the extreme eastern portion of the Piedmont.
Nations: US
States/Provinces: DC:SNR, DE:S2, MD:S3S4, NJ:S3S4, PA:SNR, VA:S3
TNC Ecoregions: 52:C, 58:C, 59:C, 61:C, 62:C
USFS Ecoregions (2007): 221Am:CCC, 221An:CC?, 221Da:CCC, 221Db:CCC, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ab:CCC, 232Ac:CCP, 232Ad:CCC, 232Ha:CC?, 232Hc:CCP, 232Hd:CCP, 232Ib:CP?, 232Je:C??, M221Da:CCC
Federal Lands: DOD (Fort A.P. Hill, Fort Belvoir); NPS (Assateague Island, Fredericksburg-Spotsylvania, George Washington Birthplace, National Capital-East, Petersburg, Prince William, Richmond, Thomas Stone); USFWS (Cape May, E.B. Forsythe, Patuxent)

ELEMENT SOURCES

National Capital Parks-East Plots: (2 plots: NACE.013, NACE.014).
Prince William Forest Park Plots: PRWI.46, PRWI.48, PRWI.50.

National Capital Parks-East Description Author(s): M.J. Russo, mod. M. Pyne
Prince William Forest Park Description Author(s): K. Taverna
Global Description Author(s): G. Fleming
References: Breden 1989, Breden et al. 2001, Coxe 2009, Eastern Ecology Working Group n.d., Ehrenfeld and Gulick 1981, Eichelberger 2011o, Fike 1999, Fleming 2002a, Fleming 2002b, Fleming and Coulling 2001, Fleming and Patterson 2003, Fleming et al. 2006, Fleming et al. 2006*, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Golet et al. 1993, Harrison 2004, Harrison 2011, Harrison and Stango 2003, Harvill 1967, Heckscher 1994, Hill 1986, Lea et al. 2012, McCormick 1979, McCoy and Fleming 2000, NatureServe 2009, Patterson 2008d, Patterson 2008e, Patterson 2008f, Patterson pers. comm., Robichaud and Buell 1973, Sipple and Klockner 1984, Sneddon et al. 2017, TNC 1995c, Taverna and Patterson 2008, Windisch 1995b, Windisch 2014a, Zimmerman et al. 2012

[CEGL006219] *Nyssa sylvatica - Magnolia virginiana / Rhododendron viscosum - Toxicodendron vernix / Smilax pseudochina* Swamp Woodland

Translated Name: **Blackgum - Sweetbay / Swamp Azalea - Poison-sumac / Bamboovine Swamp Woodland**
Common Name: **Fall-line Terrace Gravel Magnolia Bog**

USNVC Classification

Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Coastal Plain Evergreen Hardwood - Conifer Swamp (M032)
Group	Northern Coastal Plain Swamp (G039)
Alliance	*Acer rubrum - Nyssa sylvatica* Swamp Forest Alliance (A2058)

Element Concept

Global Summary: This saturated woodland is known from a limited area at and just east of the Fall Line in Maryland, the District of Columbia, and northern Virginia. It occurs on saturated toeslopes of fluvial-estuarine terraces where sands and gravels of the Cretaceous-aged Potomac Formation are exposed. Irregular microtopography with abundant groundwater seepage forming braided channels, *Sphagnum* (sphagnum, peatmoss)-covered hummocks, and mucky depressions are characteristic. Historic accounts of this vegetation describe these areas as "bogs" with *Magnolia virginiana* (sweetbay) and various shrubs fringing and forming clumps within a more open center dominated by herbaceous plants. Historic vegetation included *Nyssa sylvatica* (blackgum), *Toxicodendron vernix* (poison-sumac) (abundant), *Gaylussacia frondosa* (blue huckleberry), *Viburnum nudum var. nudum* (possumhaw), *Pinus rigida* (pitch pine), and *Eriocaulon decangulare* (tenangle pipewort) (abundant), *Lycopodiella appressa* (southern bog clubmoss), *Carex bullata* (button sedge), *Asclepias rubra* (red milkweed), *Helianthus angustifolius* (swamp sunflower), *Rhynchospora gracilenta* (slender beaksedge), *Xyris torta* (slender yelloweyed grass), *Pogonia ophioglossoides* (snakemouth orchid), and *Utricularia* (bladderwort) spp. Today, remaining examples exist mostly as open woodlands with very dense shrubs (averaging 80% cover) and very small, scattered herbaceous patches. *Nyssa sylvatica* (blackgum) is the most dominant species, followed by *Magnolia virginiana* (sweetbay), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), and *Ilex opaca var. opaca* (American holly). Shrub cover includes *Rhododendron viscosum* (swamp azalea), *Vaccinium* (blueberry) spp., *Smilax rotundifolia* (roundleaf greenbrier), *Gaylussacia frondosa* (blue huckleberry), *Viburnum nudum var. nudum* (possumhaw), *Eubotrys racemosa* (swamp doghobble), *Aronia arbutifolia* (red chokeberry), *Ilex verticillata* (common winterberry), *Amelanchier canadensis* (Canadian serviceberry), *Ilex laevigata* (smooth winterberry), and *Toxicodendron vernix* (poison-sumac). The only herbs that have significant cover are *Osmunda cinnamomea* (cinnamon fern) and *Dichanthelium dichotomum var. dichotomum* (cypress panicgrass), while many others have low cover. Regionally uncommon or rare "bog" species persisting at one or a few sites include *Solidago uliginosa var. uliginosa* (bog goldenrod), *Eurybia radula* (low rough aster), *Eriocaulon decangulare* (tenangle pipewort), *Juncus longii* (Long's rush), *Drosera intermedia* (spoonleaf sundew), *Asclepias rubra* (red milkweed), and *Kalmia angustifolia* (sheep laurel). Historically, fire may have been an important factor in maintaining herbaceous patches and limiting the growth of shrubs and trees, but the geohydrologic conditions and effects of permanently saturated soils ("root pruning") that cause blowdowns of large trees (except *Pinus rigida* (pitch pine) and *Nyssa sylvatica* (blackgum)) have also been observed to be prominent factors. Ice storms, which are frequent over time in the natural range of this community, also maintain an open mosaic in these wetlands. This community has always had a limited distribution in the Mid-Atlantic fall-line zone and has probably always been rare. Today, less than 20 sites remain in very small patches degraded by hydrologic disturbance, non-native invasive plants, woody succession, fire

exclusion, and various anthropogenic impacts. This community has similarities with the bog vegetation of the New Jersey Pine Barren region, but is likely distinguished by species with southern affinities.

Environmental Description

National Capital Parks-East Environment: This blackgum - sweetbay woodland was sampled at two locations in the park, at Greenbelt. Sites are saturated toeslopes with poorly-drained peat soil. The unvegetated ground surface is dominated by leaf litter with some wood, standing water and bryophytes. Evidence of disturbance includes deer grazing/browsing, wind/ice damage, trails/roads and the presence of exotic plants. The points and mapped polygons appear to be found on the sand-dominated facies of the Lower Cretaceous Potomac Formation, or at the interface between these and the clay-dominated facies, and in one case (Oxon Run) at the interface between Holocene alluvium and the clay-dominated facies of the Potomac Formation.
Global Environment: This community type usually occurs on saturated toeslopes at bases of highly weathered, highly acidic, fluvial-estuarine terrace gravel deposits of Cretaceous or Tertiary age. Irregular microtopography with abundant groundwater seepage forming braided channels, *Sphagnum* (sphagnum, peatmoss)-covered hummocks, and mucky depressions is characteristic. Soils consist mostly of coarse gravel and sand, with large cobbles often abundantly exposed at the surface. Soil samples collected from plots were extremely acidic, low in organic matter content, and low in base status.

Vegetation Description

National Capital Parks-East Vegetation: The moderate to dense (up to 80% cover) canopy tall (20-35 m tall) and moderate to dense (40-80%) subcanopy (10-20 m) are dominated by *Magnolia virginiana* (sweetbay) and *Nyssa sylvatica* (blackgum); additional tree species (some nearly as abundant) include *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Pinus rigida* (pitch pine), *Quercus alba* (white oak), and *Quercus coccinea* (scarlet oak). The dense (up to 80%) shrub layers (0.5-10 m) are dominated by *Ilex opaca var. opaca* (American holly) and sapling canopy species; additional shrubs found at lower covers may include *Chionanthus virginicus* (white fringetree), *Gaylussacia frondosa* (blue huckleberry), *Ilex laevigata* (smooth winterberry), *Ilex verticillata* (common winterberry), *Kalmia latifolia* (mountain laurel), *Eubotrys racemosa* (swamp doghobble), *Lyonia ligustrina* (maleberry), *Rhododendron viscosum* (swamp azalea), *Toxicodendron vernix* (poison-sumac), *Vaccinium corymbosum* (highbush blueberry), *Vaccinium fuscatum* (black highbush blueberry), and *Viburnum nudum* (possumhaw). Ferns *Osmunda cinnamomea* (cinnamon fern) and *Osmunda regalis var. spectabilis* (royal fern) dominate the herb layer; other herbs include *Carex atlantica ssp. capillacea* (prickly bog sedge), *Carex folliculata* (northern long sedge), *Carex lurida* (shallow sedge), *Cypripedium acaule* (moccasin flower), *Dichanthelium dichotomum* (cypress panicgrass), *Dioscorea villosa* (wild yam), *Mitchella repens* (partridgeberry), and *Viola X primulifolia* (primroseleaf violet). Vines of *Smilax pseudochina* (bamboo vine) (MD-state imperiled), *Smilax rotundifolia* (roundleaf greenbrier), *Vitis labrusca* (fox grape), and *Toxicodendron radicans* (eastern poison-ivy) may be found trailing along the ground or climbing into the shrub canopy. *Sphagnum* (sphagnum, peatmoss) mosses may also be present.
Global Vegetation: McAtee (1918) originally described these "bogs" as having a physiognomic zonation, with *Magnolia virginiana* (sweetbay) and various shrubs fringing and forming clumps within a more open center dominated by herbaceous plants. Exceptionally clear historical photographs taken by McAtee in 1909 show the more open condition of one of the bogs. The following species are clearly identifiable in the photos: *Nyssa sylvatica* (blackgum), *Toxicodendron vernix* (poison-sumac) (abundant), *Gaylussacia cf. frondosa* (abundant), *Viburnum nudum var. nudum* (possumhaw), *Pinus rigida* (pitch pine), and *Eriocaulon decangulare* (tenangle pipewort) (abundant). Herbaceous species mentioned by McAtee (1918) as characteristic of many historical bogs include *Lycopodiella appressa* (southern bog clubmoss), *Carex bullata* (button sedge), *Asclepias rubra* (red milkweed), *Helianthus angustifolius* (swamp sunflower), *Rhynchospora gracilenta* (slender beaksedge), *Xyris torta* (slender yelloweyed grass), *Pogonia ophioglossoides* (snakemouth orchid), and *Utricularia* (bladderwort) spp. Except where open conditions have been artificially maintained by powerline rights-of-way, the physiognomy of remnant patches of this community is that of an open woodland with a very dense shrub layer and very small, scattered herbaceous patches. In 11 analyzed plot samples, *Nyssa sylvatica* (blackgum) has the highest mean tree cover, followed by *Magnolia virginiana* (sweetbay), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), and *Ilex opaca var. opaca* (American holly). *Pinus rigida* (pitch pine) occurs in about half the plots, sometimes with significant cover. Shrub cover usually averages about 80%, most of it contributed by the following species in rough descending order of importance: *Rhododendron viscosum* (swamp azalea), *Vaccinium corymbosum* (highbush blueberry), *Smilax rotundifolia* (roundleaf greenbrier), *Gaylussacia frondosa* (blue huckleberry), *Viburnum nudum var. nudum* (possumhaw), *Eubotrys racemosa* (swamp doghobble), *Aronia arbutifolia* (red chokeberry), *Ilex verticillata* (common winterberry), *Amelanchier canadensis* (Canadian serviceberry), *Ilex laevigata* (smooth winterberry), and

Toxicodendron vernix (poison-sumac). *Rubus hispidus* (bristly dewberry) is a creeping shrub common in most occurrences. The only herbs that achieve significant mean cover are *Osmunda cinnamomea* (cinnamon fern) and *Dichanthelium dichotomum var. dichotomum* (cypress panicgrass). Low-cover herbs occurring in >50% of the plots are *Mitchella repens* (partridgeberry), *Smilax pseudochina* (bamboo vine), *Dioscorea villosa* (wild yam), *Solidago rugosa* (wrinkleleaf goldenrod), *Dichanthelium dichotomum var. ensifolium* (cypress panicgrass), *Rhynchospora capitellata* (brownish beaksedge), *Viola x primulifolia* (primroseleaf violet), *Medeola virginiana* (Indian cucumber), *Lycopus virginicus* (Virginia water horehound), *Chasmanthium laxum* (slender woodoats), *Glyceria striata* (fowl mannagrass), and *Leersia virginica* (whitegrass). Regionally uncommon or rare "bog" species persisting at one or a few sites include *Solidago uliginosa var. uliginosa* (bog goldenrod), *Eurybia radula* (low rough aster), *Eriocaulon decangulare* (tenangle pipewort), *Juncus longii* (Long's rush), *Drosera intermedia* (spoonleaf sundew), *Asclepias rubra* (red milkweed), and *Kalmia angustifolia* (sheep laurel).

Global Dynamics: This community occurs in small patches adjacent to dry to mesic, acidic upland forests dominated by oaks and/or pines (McAtee 1918) and was possibly impacted by occasional wildfires. The historical abundance of *Pinus rigida* (pitch pine) in the vicinity of these bogs (McAtee 1918) and its persistence in some of the surviving remnants may also suggest a history of fire. Remnant stands appear to have become more closed and densely shrubby, which could be attributed to a number of factors, including a post-successional period following widespread clearing throughout the region, fire exclusion, and others.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus rigida* (pitch pine)
Tree canopy	Broad-leaved deciduous tree	*Nyssa sylvatica* (blackgum)
Tree canopy	Broad-leaved evergreen tree	*Magnolia virginiana* (sweetbay)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Rhododendron viscosum* (swamp azalea), *Toxicodendron vernix* (poison-sumac)

CHARACTERISTIC SPECIES

National Capital Parks-East: *Magnolia virginiana* (sweetbay), *Nyssa sylvatica* (blackgum)
Global: *Magnolia virginiana* (sweetbay), *Nyssa sylvatica* (blackgum), *Pinus rigida* (pitch pine), *Rhododendron viscosum* (swamp azalea), *Toxicodendron vernix* (poison-sumac)

OTHER NOTEWORTHY SPECIES

National Capital Parks-East: Vulnerable Plants: *Carex bullata* (button sedge, G5, MD-vulnerable), *Smilax pseudochina* (bamboo vine, G4G5, MD-imperiled); **Invasive/Exotic Plants**: *Arthraxon hispidus* (small carpgrass, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Global: Vulnerable Plants: *Asclepias rubra* (red milkweed, G4G5, regionally rare), *Drosera intermedia* (spoonleaf sundew, G5, regionally rare), *Eriocaulon decangulare* (tenangle pipewort, G5, regionally rare), *Eurybia radula* (low rough aster, G5, regionally rare), *Juncus longii* (Long's rush, G3Q, regionally rare), *Kalmia angustifolia* (sheep laurel, G5, regionally rare), *Solidago uliginosa* var. *uliginosa* (bog goldenrod, G5T4T5, regionally rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (08-Apr-2015). This association is currently extant at less than 20 sites rangewide and occurs in very small patches subject to multiple disturbances, including hydrologic alterations, grazing, sand mining, and development. This community has always had a limited distribution in the Mid-Atlantic fall-line zone and has probably always been rare. However, many historically documented occurrences have been destroyed by development of the District of Columbia metropolitan area and the few remaining examples have been degraded by hydrologic disturbance, non-native invasive plants, possible fire exclusion, woody succession, and various other anthropogenic impacts.

RELATED CONCEPTS

Global Similar Types:

- *Pinus rigida - Nyssa sylvatica / Clethra alnifolia - Eubotrys racemosa* Forest (CEGL006926) forested seep of deep Coastal Plain sands from New Jersey to Maryland; a true forest, never an open "bog," even historically (fide L.A. Sneddon), and has some floristic differences with CEGL006219.
- *Pinus rigida / Osmunda cinnamomea - Carex stricta - Eriophorum virginicum / Sphagnum* spp. Swamp Woodland (CEGL007056)

- *Pinus rigida / Vaccinium corymbosum - Eubotrys racemosa / Sphagnum* spp. Swamp Woodland (CEGL006195) *Pinus rigida* (pitch pine)-dominated woodland of the New Jersey Pine Barrens.

Global Related Concepts:

- *Nyssa sylvatica - Magnolia virginiana - (Pinus rigida) / Rhododendron viscosum - Gaylussacia frondosa / Smilax pseudochina* Woodland (Fleming and Patterson 2003) =
- *Nyssa sylvatica - Magnolia virginiana - (Pinus rigida) / Rhododendron viscosum - Toxicodendron vernix / Smilax pseudochina* Woodland (Fleming et al. 2007b) =
- Coastal Plain / Piedmont Seepage Bog (Fleming and Patterson 2004) >
- Magnolia Bog (McAtee 1918) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
National Capital Parks-East Classification Comments: Fall-line Terrace Gravel Magnolia Bog is sometimes referred to as Magnolia Bog.
Global Classification Comments: Data have been collected by Rod Simmons et al. from 14 plot samples representing this type. These data were used (in combination with historical data) during the NCR National Capital Parks project (Phase I, regional vegetation analysis and final NCR East Region analysis) to produce this classification.

ELEMENT DISTRIBUTION

National Capital Parks-East Range: This woodland association was sampled twice at Greenbelt Park in Prince Georges County, Maryland, where it is mapped. There is also one rapid assessment point (which is of somewhat uncertain attribution) at Oxon Run Parkway in the District of Columbia.
Global Range: This community is known from a limited area at and just east of the Fall Line in Howard, Montgomery, Prince George's, and Charles counties, Maryland; the District of Columbia; and the City of Alexandria and Arlington, Fairfax, Prince William, and Stafford counties, Virginia.
Nations: US
States/Provinces: DC:SNR, MD:S1, VA:S1
TNC Ecoregions: 52:?, 58:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, 232Ad:CCC
Federal Lands: DOD (U.S. Army Research Laboratory); NPS (National Capital-East)

ELEMENT SOURCES

National Capital Parks-East Plots: (2 plots: NACE.007, NACE.010).
National Capital Parks-East Description Author(s): M.J. Russo, mod. M. Pyne
Global Description Author(s): J. Harrison, R. Simmons, G. Fleming, and K. Patterson
References: Eastern Ecology Working Group n.d., Fleming 2009, Fleming and Patterson 2003, Fleming and Patterson 2003*, Fleming and Patterson 2004, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Harshberger 1916, Hitchcock and Standley 1919, McAtee 1918, Simmons 2013a, Simmons 2013b, Simmons and Strong 2001, Simmons et al. 2008

A3637 *Liquidambar styraciflua - Acer rubrum / Morella cerifera* Mid-Atlantic Swamp Forest Alliance

These forests are dominated by *Liquidambar styraciflua* (sweetgum). Some stands may be dominated or codominated by *Acer rubrum* (red maple). Other woody species that may be present include *Cornus foemina* (stiff dogwood), *Fraxinus pennsylvanica* (green ash), *Quercus lyrata* (overcup oak), *Quercus palustris* (pin oak), *Quercus phellos* (willow oak), and *Salix nigra* (black willow). Shrubs that may be present include *Cephalanthus occidentalis* (common buttonbush), *Clethra alnifolia* (coastal sweet-pepperbush), *Ilex opaca* (American holly), *Eubotrys racemosa* (swamp doghobble), *Magnolia virginiana* (sweetbay), and *Vaccinium corymbosum* (highbush blueberry). In addition, *Sphagnum* (sphagnum, peatmoss) spp. are common in the ground layer. Known examples of this alliance occur in seasonally flooded depressions rather than in floodplains. One association included here is a saturated forest dominated by *Pinus taeda* (loblolly pine) that may occur adjacent to salt marshes on the bay side of barrier islands. These forests range from the Atlantic Coastal Plain and adjacent southern Piedmont of North Carolina and Virginia north through the Chesapeake Bay and northern Piedmont to the northern Atlantic Coast of New Jersey, Pennsylvania and New York.

[CEGL006110] *Liquidambar styraciflua - Acer rubrum - Quercus phellos / Eubotrys racemosa* Swamp Forest

Translated Name: **Sweetgum - Red Maple - Willow Oak / Swamp Doghobble Swamp Forest**
Common Name: **Sweetgum - Red Maple Swamp Forest**

USNVC Classification

Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Coastal Plain Evergreen Hardwood - Conifer Swamp (M032)
Group	Northern Coastal Plain Swamp (G039)
Alliance	*Liquidambar styraciflua - Acer rubrum / Morella cerifera* Mid-Atlantic Swamp Forest Alliance (A3637)

Element Concept

Global Summary: This association is a seasonally flooded forest of shallow basins and other depressions of the Coastal Plain of the Chesapeake Bay region. The substrate is characterized by mineral soils, generally acidic, gleyed to mottled, sandy or clay loams. Characteristic tree species include *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), and *Nyssa sylvatica* (blackgum), which are nearly constant in the canopy. Associates include *Ilex opaca* (American holly), *Magnolia virginiana* (sweetbay), *Nyssa biflora* (swamp tupelo), *Sassafras albidum* (sassafras), *Quercus palustris* (pin oak), *Pinus taeda* (loblolly pine), and *Quercus phellos* (willow oak), and occasionally *Quercus falcata* (southern red oak), *Quercus lyrata* (overcup oak), or *Betula nigra* (river birch). The shrub layer is characterized by *Eubotrys racemosa* (swamp doghobble), *Vaccinium corymbosum* (highbush blueberry), *Clethra alnifolia* (coastal sweet-pepperbush), *Lindera benzoin* (northern spicebush), *Ilex verticillata* (common winterberry), and *Rhododendron viscosum* (swamp azalea). *Smilax rotundifolia* (roundleaf greenbrier) is a particularly characteristic vine. The herbaceous layer is generally sparse but may include *Mitchella repens* (partridgeberry), *Osmunda cinnamomea* (cinnamon fern), *Chasmanthium laxum* (slender woodoats), *Woodwardia areolata* (netted chainfern), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Carex albolutescens* (greenwhite sedge), *Carex debilis var. debilis* (white edge sedge), *Scirpus cyperinus* (woolgrass), *Juncus effusus* (common rush), and *Polygonum* (knotweed) spp. *Carex joorii* (cypress swamp sedge) is inconstant but locally abundant in some stands in the southern part of the range.

Environmental Description

National Capital Parks-East Environment: This Sweetgum - Red Maple Swamp Forest was sampled at four locations in the park. It occurs in shallow, seasonally flooded depressions in upland settings with clayey hardpans that impede drainage. Stands are typically inundated during winter/spring months but waters gradually recede during the summer months. Basins drawn down during the growing season typically contain water-stained leaves and tree bases. Soils of sampled stands are classified as Fallsington sand loams and are extremely acidic (mean pH = 4.1, N=3 NACE Plots) and low in fertility. Microtopographic features in this association are not very well-developed. The unvegetated ground surface is dominated by leaf litter with some wood and bare soil. Evidence of disturbance includes wind/ice damage, human trash and the presence of exotic plants.

Global Environment: This type occurs in seasonally flooded shallow basins or depressions. Substrates are acidic, gleyed to mottled, sandy or clay loams. Sites are commonly flooded by perched groundwater to depths up to about 50 cm during the winter and early part of the growing season, but commonly are drawn down by late summer. Soils collected from 12 Virginia plot samples were extremely acidic (mean pH = 4.1) with very low cation levels and total base saturation.

Vegetation Description

National Capital Parks-East Vegetation: The canopy (20-35+ m tall) is partially open to dense (40-80% cover) and characterized by *Quercus phellos* (willow oak) (diagnostic), *Quercus palustris* (pin oak), *Nyssa sylvatica* (blackgum), and *Liquidambar styraciflua* (sweetgum). The sparse (10-20%) subcanopy may contain species such as *Diospyros virginiana* (common persimmon), *Acer rubrum* (red maple), *Magnolia virginiana* (sweetbay), *Fraxinus pennsylvanica* (green ash) (infrequent), and *Nyssa sylvatica* (blackgum). Shrubs are sparse (up to 30%) but may contain species such as *Cephalanthus occidentalis* (common buttonbush), *Eubotrys racemosa* (swamp doghobble), and *Vaccinium* (blueberry) spp. Vines include *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Campsis radicans* (trumpet creeper), and *Dioscorea villosa* (wild yam). The herb layer is virtually nonexistent but may contain species such as *Carex tribuloides* (blunt broom sedge), *Juncus effusus* (common rush), *Polygonum* (knotweed) spp., and *Carex albolutescens* (greenwhite sedge) at low cover. Stands are

not well-buffered and subject to weed encroachment; nine exotic/invasive species were reported from the four sampled plots.

Global Vegetation: Characteristic tree species include *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), and *Nyssa sylvatica* (blackgum), which are nearly constant in the canopy. *Quercus phellos* (willow oak) is an important associate or codominant in many stands. Other associates include *Ilex opaca* (American holly), *Magnolia virginiana* (sweetbay), *Nyssa biflora* (swamp tupelo), *Sassafras albidum* (sassafras), *Quercus palustris* (pin oak), *Pinus taeda* (loblolly pine), and occasionally *Quercus falcata* (southern red oak), *Quercus lyrata* (overcup oak), or *Betula nigra* (river birch). The shrub layer is characterized by *Eubotrys racemosa* (swamp doghobble), *Vaccinium corymbosum* (highbush blueberry), *Vaccinium fuscatum* (black highbush blueberry), *Vaccinium formosum* (southern blueberry), *Clethra alnifolia* (coastal sweet-pepperbush), *Lindera benzoin* (northern spicebush), *Ilex verticillata* (common winterberry), and *Rhododendron viscosum* (swamp azalea). *Smilax rotundifolia* (roundleaf greenbrier) is a particularly characteristic vine, often forming dense tangles among the shrubs. The herbaceous layer is generally sparse but may include *Mitchella repens* (partridgeberry), *Osmunda cinnamomea* (cinnamon fern), *Chasmanthium laxum* (slender woodoats), *Woodwardia areolata* (netted chainfern), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Carex albolutescens* (greenwhite sedge), *Carex debilis var. debilis* (white edge sedge), *Scirpus cyperinus* (woolgrass), *Juncus effusus* (common rush), and *Polygonum* (knotweed) spp. *Carex joorii* (cypress swamp sedge) is inconstant but locally abundant in some stands in the southern part of the range.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Nyssa sylvatica* (blackgum), *Quercus phellos* (willow oak)
Short shrub/sapling	Liana	*Smilax rotundifolia* (roundleaf greenbrier)

CHARACTERISTIC SPECIES

National Capital Parks-East: *Quercus phellos* (willow oak)
Global: *Acer rubrum* (red maple), *Eubotrys racemosa* (swamp doghobble), *Liquidambar styraciflua* (sweetgum), *Nyssa sylvatica* (blackgum), *Quercus phellos* (willow oak)

OTHER NOTEWORTHY SPECIES

National Capital Parks-East: Invasive/Exotic Plants: *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Euonymus fortunei* (winter creeper, High/Medium), *Ligustrum vulgare* (European privet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Murdannia keisak* (wartremoving herb, Medium/Low), *Prunus subhirtella* (winter-flowering cherry); **Other Plants**: *Artemisia vulgaris* var. *vulgaris* (GUTU)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (06-Jan-2012). This association occurs naturally in small patches and is restricted to southeastern New York, and the coastal plain of New Jersey, Delaware, Maryland, and Virginia. The New York Natural Heritage Program notes that the acreage of this type likely declined from historical numbers as a result of increasing development and agriculture. The principal causes of wetland loss in the Northeast prior to the mid-1800s include conversion of wetlands to agriculture, the construction of impoundments for hydropower and water supply, and the cutting of swamp timber for lumber, fence posts, and fuel wood (Golet et al. 1993). Extensive historical extirpation of red maple-sweetgum swamps has been cited by Stevens (1992). More wetlands are being drained and filled for development as undeveloped uplands in the metropolitan New York City area have become very scarce. Reportedly, no old-growth examples remain north of Richmond County (Stevens 1992). The Virginia Natural Heritage Program has observed that although occurrences are fairly numerous, they are small and widely degraded by ditching and draining, clearcutting, and outright clearing and conversion to agriculture. This type may actually be more threatened by these kinds of disturbances than more deeply flooded depressions (e.g., CEGL006223 or CEGL006242) because they are drier and easier to drain. In addition, willow oaks attain great size in these habitats and are prime targets for logging (G. Fleming pers. comm. 2011).

RELATED CONCEPTS

Global Similar Types:
- *Acer rubrum - Fraxinus pennsylvanica - Liquidambar styraciflua* Floodplain Forest (CEGL006965)

- *Acer rubrum / Lindera benzoin - Alnus serrulata* Forest (CEGL006953)
- *Pinus serotina / Magnolia virginiana / Vaccinium corymbosum / Carex atlantica* Woodland [Park Special] (CEPS006470)
- *Populus heterophylla - Acer rubrum - Quercus palustris - Liquidambar styraciflua* Forest (CEGL006469)
- *Quercus (phellos, michauxii) / Ilex opaca / Clethra alnifolia / Woodwardia areolata* Wet Forest (CEGL004644)
- *Quercus palustris - (Quercus bicolor) - Acer rubrum / Vaccinium corymbosum / Osmunda cinnamomea* Wet Forest (CEGL006240)
- *Quercus phellos / Carex (albolutescens, intumescens, joorii) / Climacium americanum* Wet Forest (CEGL007403) of the Virginia Piedmont and more southerly areas, dominated by *Quercus phellos* (willow oak).

Global Related Concepts:

- *Acer rubrum - Liquidambar styraciflua - (Quercus phellos) / Vaccinium corymbosum* Forest (Fleming and Patterson 2003) =
- *Acer rubrum - Liquidambar styraciflua - Nyssa sylvatica* Swamp Forest (Clancy 1996) >
- *Acer rubrum - Liquidambar styraciflua / Leucothoe racemosa* Community (Sneddon and Anderson 1994) =
- *Acer rubrum - Quercus phellos - Liquidambar styraciflua / Leucothoe racemosa* Community (Sneddon et al. 1996) =
- *Pinus taeda - Quercus phellos / Ilex opaca / Chasmanthium laxum* Association (Rawinski 1997) =
- *Quercus phellos - Acer rubrum - Liquidambar styraciflua / Vaccinium (corymbosum, formosum, fuscatum)* Forest (Fleming et al. 2007b) =
- Red Maple - Sweetgum Community (Hunt 1998) =
- Sweet Gum - Red Maple - Mid-successional Forest (LA2) (Windisch 2014a) <
- Sweet Gum - Red Maple - Willow Oak - Holly Palustrine Forest (LA1) (Windisch 2014a) =
- Sweetgum - Red Maple Depression Swamp (Bowman 2000) =
- Sweetgum - Willow Oak Coastal Plain Palustrine Forest (Zimmerman et al. 2012) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
National Capital Parks-East Classification Comments: Sweetgum - Red Maple Swamp Forest is also referred to as Red Maple - Sweetgum Swamp.
Global Classification Comments: Classification of this type is supported by two regional analyses of Maryland and Virginia plot data conducted by VDNH for the NCR vegetation mapping project. It is represented by 15 plots from the greater NCR region and an additional 57 plots from The Peninsula in York County, Virginia (Grafton Ponds complex). Delaware examples contain *Quercus* (oak) spp. and *Magnolia virginiana* (sweetbay). In Maryland, *Clethra alnifolia* (coastal sweet-pepperbush) is more prominent than *Eubotrys racemosa* (swamp doghobble), and *Quercus phellos* (willow oak) is less characteristic than *Nyssa sylvatica* (blackgum).

ELEMENT DISTRIBUTION

National Capital Parks-East Range: This forest association was sampled at Oxon Cove, along Piscataway Creek and at Hard Bargain Farm in Prince Georges County, Maryland. Most points and mapped polygons are at Piscataway, but there are a few at Oxon Hill Farm, Greenbelt, and Patuxent North.
Global Range: This association is a seasonally flooded forest of shallow basins and depressions in the mid-Atlantic region. It is primarily associated with the Coastal Plain but occurs locally in gentle, highly acidic terrain of the eastern Piedmont in central and southern Virginia.
Nations: US
States/Provinces: DC:SNR, DE:SNR, MD:SNR, NJ:S3, NY:S1S2, PA:S1, VA:S2
TNC Ecoregions: 52:C, 57:C, 58:C, 61:C, 62:C
USFS Ecoregions (2007): 221Ae:CCC, 221An:CC?, 221Dc:CCC, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ab:CC, 232Ac:CCP, 232Ad:CCC, 232Ha:CC?, 232Hb:CCC, 232Hd:CCP, 232Ib:CCC, 232Je:C??
Federal Lands: DOD (Fort Belvoir, Yorktown); NPS (Colonial, Fredericksburg-Spotsylvania, National Capital-East, Thomas Stone); USFWS (Cape May, Chesapeake Marshlands, E.B. Forsythe, Prime Hook, Supawna Meadows)

ELEMENT SOURCES

National Capital Parks-East Plots: (4 plots: NACE.008, NACE.205, NACE.206, NACE.239).
National Capital Parks-East Description Author(s): J.W. Harrison, mod. M.J. Russo
Global Description Author(s): L.A. Sneddon, E. Largay and G.P. Fleming

References: Bowman 2000, Breden 1989, Breden et al. 2001, Clancy 1996, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2014a, Fleming 2002b, Fleming and Patterson 2003, Fleming and Patterson 2011b, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Golet et al. 1993, Harrison 2004, Harrison 2011, Hunt 1998, Lea et al. 2012, McCoy and Fleming 2000, NatureServe 2009, Patterson 2008c, Patterson 2008e, Rawinski 1997, Rhoads and Block 2011a, Sneddon and Anderson 1994, Sneddon et al. 1996, Stevens 1992, Taverna and Patterson 2008, Windisch 2014a, Zimmerman et al. 2012

A0580 *Pinus rigida* Swamp Woodland Alliance

This alliance comprises acidic wetlands, usually peaty, dominated by an open canopy of *Pinus rigida* (pitch pine) usually over an ericaceous understory. In addition to *Pinus rigida* (pitch pine), canopy associates of this alliance include *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Betula populifolia* (gray birch). The shrub layer may be dominated by *Chamaedaphne calyculata* (leatherleaf) or made up of *Gaylussacia baccata* (black huckleberry), *Gaylussacia frondosa* (blue huckleberry), *Kalmia angustifolia* (sheep laurel), *Rhododendron canadense* (rhodora), and *Vaccinium corymbosum* (highbush blueberry). The herbaceous stratum is generally characterized by *Calopogon tuberosus* (tuberous grasspink), *Eriophorum virginicum* (tawny cottongrass), and *Scirpus* (bulrush) and/or *Schoenoplectus* (bulrush) spp. Northern occurrences may contain *Cornus canadensis* (bunchberry dogwood), *Gaultheria procumbens* (eastern teaberry), *Scheuchzeria palustris* (rannoch-rush), and *Vaccinium macrocarpon* (cranberry), while woodlands in the southern part of the main range support species such as *Arethusa bulbosa* (dragon's mouth), *Calamovilfa brevipilis* (pine barren sandreed), *Gentiana autumnalis* (pine barren gentian), *Helonias bullata* (swamppink), *Lophiola aurea* (goldencrest), *Muhlenbergia torreyana* (New Jersey muhly), *Orontium aquaticum* (goldenclub), *Xerophyllum asphodeloides* (eastern turkeybeard), and Xyris spp. In the New Jersey Pine Barrens, additional species include *Leiophyllum buxifolium* (sandmyrtle) and *Polygala lutea* (orange milkwort). These wetlands are "boggy" in nature, generally with saturated acidic soils and extensive peat accumulation. They form in poorly drained depressions or deeper basins, interdunal swales, and on stream flats (not flooded except in very rare events), and sometimes have a floating bog mat. This alliance ranges from Virginia north to Quebec, but is best developed in New Jersey, New York, and Massachusetts where there are extensive pine barrens.

[CEGL006926] *Pinus rigida - Nyssa sylvatica / Clethra alnifolia - Eubotrys racemosa* Forest

Translated Name: **Pitch Pine - Blackgum / Coastal Sweet-pepperbush - Swamp Doghobble Forest**
Common Name: **Pine Barrens Pitch Pine - Hardwood Swamp Forest**

USNVC Classification

Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Coastal Plain Evergreen Hardwood - Conifer Swamp (M032)
Group	Northern Coastal Plain Swamp (G039)
Alliance	*Pinus rigida* Swamp Woodland Alliance (A0580)

Element Concept

Global Summary: This Pine Barrens lowland forest occurs on saturated sandy soils along braided streams or in depressions in southern New Jersey and on the Coastal Plain of Maryland. The canopy is a mixture of *Pinus rigida* (pitch pine), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), with *Liquidambar styraciflua* (sweetgum) in New Jersey. The canopy ranges from mixed deciduous-evergreen to deciduous. The subcanopy is characterized by *Magnolia virginiana* (sweetbay), with occasional *Ilex opaca* (American holly). Typical shrubs include *Clethra alnifolia* (coastal sweet-pepperbush), *Eubotrys racemosa* (swamp doghobble), *Gaylussacia frondosa* (blue huckleberry), and *Vaccinium corymbosum* (highbush blueberry). There is often significant cover of *Smilax rotundifolia* (roundleaf greenbrier) vines. The herbaceous stratum includes *Osmunda cinnamomea* (cinnamon fern) and *Gaultheria procumbens* (eastern teaberry). Other species of the herbaceous layer may include *Woodwardia areolata* (netted chainfern), *Chasmanthium laxum* (slender woodoats), *Carex folliculata* (northern long sedge), *Bartonia paniculata* (twining screwstem), *Carex atlantica* (prickly bog sedge), *Carex seorsa* (weak stellate sedge), *Glyceria striata* (fowl mannagrass), and *Lycopus virginicus* (Virginia water horehound).

Environmental Description

National Capital Parks-East Environment: At NACE, the only mapped polygon and observation point of this type appears to be found at the interface of the sand-dominated and clay-dominated facies of the Lower Cretaceous Potomac Formation.

Global Environment: This association is restricted to groundwater seepage areas associated with sandy uplands of the Pine Barrens of New Jersey and the Inner Coastal Plain of Maryland.

VEGETATION DESCRIPTION

National Capital Parks-East Vegetation: In the one documented stand, *Liquidambar styraciflua* (sweetgum) dominates the canopy, and *Nyssa sylvatica* (blackgum) dominates the subcanopy. *Clethra alnifolia* (coastal sweet-pepperbush) dominates the tall-shrub stratum, and *Vaccinium corymbosum* (highbush blueberry) is a common low shrub. *Lycopodium* (clubmoss) sp. is the most abundant herb, with *Osmunda cinnamomea* (cinnamon fern). *Pinus rigida* (pitch pine) is not present in the stand, but its overall composition is compatible with this type.
Global Vegetation: The canopy is a mixture of *Pinus rigida* (pitch pine), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), with *Liquidambar styraciflua* (sweetgum) in New Jersey. The canopy ranges from mixed deciduous-evergreen to deciduous. The subcanopy is characterized by *Magnolia virginiana* (sweetbay), with occasional *Ilex opaca* (American holly). Typical shrubs include *Clethra alnifolia* (coastal sweet-pepperbush), *Eubotrys racemosa* (swamp doghobble), *Gaylussacia frondosa* (blue huckleberry), and *Vaccinium corymbosum* (highbush blueberry). There is often significant cover of *Smilax rotundifolia* (roundleaf greenbrier) vines. The herbaceous stratum includes *Osmunda cinnamomea* (cinnamon fern) and *Gaultheria procumbens* (eastern teaberry). Other species of the herbaceous layer may include *Woodwardia areolata* (netted chainfern), *Chasmanthium laxum* (slender woodoats), *Carex folliculata* (northern long sedge), *Bartonia paniculata* (twining screwstem), *Carex atlantica* (prickly bog sedge), *Carex seorsa* (weak stellate sedge), *Glyceria striata* (fowl mannagrass), and *Lycopus virginicus* (Virginia water horehound).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus rigida* (pitch pine)
Tree canopy	Broad-leaved deciduous tree	*Nyssa sylvatica* (blackgum)

CHARACTERISTIC SPECIES

National Capital Parks-East: *Clethra alnifolia* (coastal sweet-pepperbush), *Liquidambar styraciflua* (sweetgum), *Nyssa sylvatica* (blackgum), *Osmunda cinnamomea* (cinnamon fern), *Vaccinium corymbosum* (highbush blueberry)
Global: *Clethra alnifolia* (coastal sweet-pepperbush), *Eubotrys racemosa* (swamp doghobble), *Nyssa sylvatica* (blackgum), *Pinus rigida* (pitch pine)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (01-Dec-2009).

RELATED CONCEPTS

Global Similar Types:

- *Nyssa sylvatica - Magnolia virginiana / Rhododendron viscosum - Toxicodendron vernix / Smilax pseudochina* Swamp Woodland (CEGL006219) fall-line terrace-gravel bog of the MD-DC-northern VA region. Compared to CEGL006926, this type is (or at least was) more open, developed on gravel (rather than sand) deposits, and has a somewhat different composition; *Pinus rigida* (pitch pine) is less important, *Clethra alnifolia* (coastal sweet-pepperbush) is absent, and a number of other species not found in CEGL006926 (e.g., *Toxicodendron vernix* (poison-sumac)) are present.

Global Related Concepts:

- Pitch Pine - Red Maple Swamp (PA) (Windisch 2014a) <

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: Community described based on Gap Project sample sites (#10, #35, #6).

ELEMENT DISTRIBUTION

National Capital Parks-East Range: This type is of very limited known distribution at NACE, with only one observation point and one mapped polygon in the same location at Greenbelt, in Prince Georges County.
Global Range: This community is limited in range to the Pine Barrens of New Jersey and the Inner Coastal Plain of Maryland.
Nations: US
States/Provinces: DC?:SNA, MD:S2S3, NJ:S3

TNC Ecoregions: 58:C, 62:C
USFS Ecoregions (2007): 232Ab:CCC, 232Ac:CCP, 232Ad:CCC
Federal Lands: DOD (Fort Meade); NPS (National Capital-East); USFWS (Cape May, E.B. Forsythe, Beltsville Agricultural, Goddard)

ELEMENT SOURCES

National Capital Parks-East Plots: None.
National Capital Parks-East Description Author(s): M. Pyne
Global Description Author(s): L.A. Sneddon, after Y. Alger, G.P. Fleming
References: Breden et al. 2001, Eastern Ecology Working Group n.d.*, Harrison 2004, Harrison 2011, NatureServe 2005a, NatureServe 2009, Windisch 2014a

M031. Southern Coastal Plain Floodplain Forest

These floodplain forests are found in the southern United States, in the Atlantic and Gulf coastal plains from Delaware to Texas and in adjacent interior provinces, north to southeastern Missouri, southern Illinois, southern Indiana, and western Kentucky. There are three broad combinations of dominant species that collectively constitute the vegetation of this macrogroup: bald-cypress - tupelo forests (G033), oak - sweetgum forests (G034), and ash - elm - willow forests (G759). The dominant species in stands of floodplain forest primarily vary with hydroperiod, with species sorting on a rough gradient from wet to mesic. Bald-cypress - tupelo forests (G033) are primarily dominated by *Taxodium distichum* (bald-cypress) (occasionally *Taxodium ascendens* (pond-cypress)) with *Nyssa aquatica* (water tupelo) (occasionally *Nyssa biflora* (swamp tupelo)). Oak - sweetgum forests (G034) are dominated by *Liquidambar styraciflua* (sweetgum), *Quercus* (oak) spp., and *Ulmus* (elm) spp. There is also some floristic variation based on hydrology; shorter- hydroperiod examples will contain *Quercus michauxii* (swamp chestnut oak), *Quercus pagoda* (cherrybark oak), and *Quercus shumardii* (Shumard oak), and longer-hydroperiod ones will have *Nyssa biflora* (swamp tupelo), *Quercus laurifolia* (laurel oak), *Quercus lyrata* (overcup oak), and *Quercus phellos* (willow oak). Other dominant species include *Acer negundo* (box-elder), *Celtis laevigata* (sugarberry), *Fraxinus pennsylvanica* (green ash), and *Platanus occidentalis* (American sycamore).
Ash - elm - willow forests (G759) are typically dominated by *Fraxinus pennsylvanica* (green ash), *Populus deltoides* (eastern cottonwood), *Salix caroliniana* (coastal plain willow), *Salix nigra* (black willow), and *Ulmus americana* (American elm). Except in the very wet examples, understory, shrub and herb layers are generally well-developed and woody vines are also prominent. Vines such as *Nekemias arborea* (peppervine), *Berchemia scandens* (Alabama supplejack), *Campsis radicans* (trumpet creeper), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis* (grape) spp., may be conspicuous. *Arundinaria gigantea* (giant cane) is a common understory component in these forests on natural levees and higher point bars and may become dominant after thinning or removal of the overstory. These are communities of streams and rivers of all orders and sizes, including some tidal forests. Stands are typically flooded for periods of up to 3 months, but not during the growing season. Stands are known from low bottomlands, depressions, sloughs and abandoned channel segments, as well as from elevated features such as riverfronts, point bars, natural levees, high bottomlands, ridges, and upper terraces. This floristic and ecological variation is accounted for at the group and alliance levels. Some examples of these forests are known as "blackwater" and others as "brownwater."

G034. OAK - SWEETGUM FLOODPLAIN FOREST

This wetland forest group is a very broad one, in its environmental amplitude, its floristic diversity, and its biogeographic range. It is primarily affiliated with the Atlantic and Gulf coastal plains from Virginia to Texas, and the Mississippi River Alluvial Plain and adjacent Upper East Gulf Coastal Plain from Illinois, Missouri and Kentucky south to Mississippi and Louisiana, but it also includes wetland, swamp, and riparian forests of the southern Piedmont from Virginia to Alabama. This group primarily encompasses vegetation dominated by members of the genus *Quercus* (oak), along with *Liquidambar styraciflua* (sweetgum), *Ulmus* (elm) spp., and other trees, being generally known as bottomland hardwood forests. It primarily encompasses communities of streams and rivers of all orders and sizes, as well as some forests of isolated wetlands, including depression ponds. This group includes forests known as "blackwater" as well as "brownwater" examples. Some characteristic components of blackwater forests include *Nyssa biflora* (swamp tupelo), as well as *Quercus laurifolia* (laurel oak), *Quercus lyrata* (overcup oak), *Quercus nigra* (water oak), *Pinus taeda* (loblolly pine), and *Magnolia virginiana* (sweetbay) in higher portions of the floodplain. *Nyssa aquatica* (water tupelo) is generally scarce or absent. Brownwater examples are also likely to contain *Platanus occidentalis* (American sycamore), *Celtis laevigata* (sugarberry), *Fraxinus pennsylvanica* (green ash), *Acer negundo* (box-elder), and others. These stands also may include *Quercus laurifolia* (laurel oak), *Quercus*

michauxii (swamp chestnut oak), *Quercus pagoda* (cherrybark oak), and sometimes *Liquidambar styraciflua* (sweetgum). There is also some floristic variation between shorter and longer hydroperiod examples. *Quercus michauxii* (swamp chestnut oak), *Quercus pagoda* (cherrybark oak), and *Quercus shumardii* (Shumard oak) are characteristic of shorter hydroperiod examples, and *Quercus laurifolia* (laurel oak), *Quercus lyrata* (overcup oak), *Quercus phellos* (willow oak), and *Nyssa biflora* (swamp tupelo) of longer hydroperiod ones.

Except in the very wet examples, understory, shrub and herb layers are generally well-developed and woody vines are also prominent. *Arundinaria gigantea* (giant cane) is a common understory component in these forests on natural levees and higher point bars and may become dominant after thinning or removal of the overstory. Sandbars dominated by *Salix* (willow) spp. and/or *Populus* (cottonwood) spp. may have an open-canopy (woodland) structure.

Most vegetation placed here is associated with rivers and streams, but some are referred to as "flatwoods." It includes riverfront vegetation, which is generally temporarily (but rarely seasonally) flooded, on point bars and natural levees adjacent to the river that formed them, as well as high bottomlands, some low bottomlands, as well as levees, ridges, terraces, and some sloughs and abandoned channel segments. These features are large and well-defined in larger river systems, but the forests of smaller floodplains and bottomlands are not differentiated by these depositional landforms, because these features are small and flooding regimes are variable. The hydrologic regime and the hydroperiod are also highly diverse in this group of forests.

A4439 *Fagus grandifolia - Quercus michauxii - Platanus occidentalis* Forest Alliance

[CEGL006606] *Acer rubrum - Fraxinus pennsylvanica / Saururus cernuus* Swamp Forest

Translated Name: **Red Maple - Green Ash / Lizard's-tail Swamp Forest**
Common Name: **Chesapeake-Piedmont Red Maple / Lizard's-tail Swamp Forest**

USNVC Classification

Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Oak - Sweetgum Floodplain Forest (G034)
Alliance (A4439)	*Fagus grandifolia - Quercus michauxii - Platanus occidentalis* Forest Alliance

Element Concept

Global Summary: This red maple swamp community of the Mid-Atlantic Coastal Plain of the Chesapeake Bay and Piedmont regions occurs on poorly drained to very poorly drained soils on flats and along watercourses that are seasonally to semipermanently flooded. The organic horizon is of variable depth and overlies sandy or silt clay loam soils. This swamp has pronounced hummock-and-hollow microtopography. The tree canopy is closed to partially open and dominated by *Acer rubrum* (red maple) and *Fraxinus pennsylvanica* (green ash). Other canopy associates may include *Nyssa sylvatica* (blackgum), *Liquidambar styraciflua* (sweetgum), *Ulmus americana* (American elm), *Quercus lyrata* (overcup oak), *Quercus phellos* (willow oak), *Quercus lyrata* (overcup oak), and *Populus heterophylla* (swamp cottonwood). The shrub layer includes *Lindera benzoin* (northern spicebush), *Eubotrys racemosa* (swamp doghobble), *Ilex verticillata* (common winterberry), *Viburnum* (viburnum) spp., and *Fraxinus pennsylvanica* (green ash) saplings. The herb layer is characterized by *Saururus cernuus* (lizard's-tail), *Peltandra virginica* (green arrow-arum), *Boehmeria cylindrica* (small-spike false nettle), *Triadenum walteri* (greater marsh St. Johnswort), *Cinna arundinacea* (sweet woodreed), *Pilea pumila* (Canadian clearweed), *Impatiens capensis* (orange jewelweed), *Osmunda regalis* (royal fern), *Leersia oryzoides* (rice cutgrass), *Leersia virginica* (whitegrass), *Glyceria striata* (fowl mannagrass), *Commelina virginica* (Virginia dayflower), *Rumex verticillatus* (swamp dock), *Carex* (sedge) spp., and *Polygonum arifolium* (halberdleaf tearthumb).

Environmental Description

National Capital Parks-East Environment: This red maple - green ash bottomland swamp forest was sample at two locations in the park. It occurs in poorly drained backswamps positioned along the lower reaches of small streams that feed larger tidal tributaries such as Piscataway Creek and the Potomac River. Habitats are predominately seasonally flooded but longer periods of inundation may occur during the growing season. The microtopography of stands sampled is minor, but present hollows did contain standing water and patch dominant hydrophytes. Soils are classified as Bibb silt loams and are moderately nutrient-rich with high levels of Ca (1670 ppm), Mg (116 ppm), and total base saturation (65%). The unvegetated ground surface is dominated by leaf litter

along with fair amounts of bare soil, standing water and wood. Evidence of disturbance includes the presence of exotic plants.

Global Environment: This swamp forest occurs in backswamps, watercourses, flats and depressions that are flooded for significant portions of the growing season. These areas receive some nutrient inputs from adjacent uplands or overland flooding and have soils that are moderately calcareous. The substrate is deep muck with a pronounced hummock-and-hollow microtopography.

VEGETATION DESCRIPTION

National Capital Parks-East Vegetation: Sampled stands contain an open (20-40% cover) canopy (20-35 m tall) codominated by *Fraxinus pennsylvanica* (green ash) and *Acer rubrum* (red maple). Low-cover canopy and subcanopy associates include *Platanus occidentalis* (American sycamore), *Ulmus americana* (American elm), *Acer negundo* (box-elder), *Salix nigra* (black willow), and planted *Taxodium distichum* (bald-cypress). The shrub layer is moderately dense (up to 40%) and includes species such as *Lindera benzoin* (northern spicebush), *Ilex verticillata* (common winterberry), *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), and *Viburnum prunifolium* (blackhaw). Vines characteristic of this type include *Toxicodendron radicans* (eastern poison-ivy), *Smilax rotundifolia* (roundleaf greenbrier), *Parthenocissus quinquefolia* (Virginia creeper), and the non-native invasive *Clematis terniflora* (sweet autumn virginsbower). Due to the microtopography, the herbaceous layer is generally diverse and includes species such as *Cinna arundinacea* (sweet woodreed), *Impatiens capensis* (orange jewelweed), *Polygonum punctatum* (dotted smartweed), *Polygonum arifolium* (halberdleaf tearthumb), and *Pilea pumila* (Canadian clearweed) on hummocks. The hollows support *Saururus cernuus* (lizard's-tail), *Peltandra virginica* (green arrow-arum), *Woodwardia areolata* (netted chainfern), *Dulichium arundinaceum* (threeway sedge), and *Carex lupuliformis* (false hop sedge). Seven exotic/invasive species were reported from the two sampled plots, including *Microstegium vimineum* (Nepalese browntop) and *Murdannia keisak* (wartremoving herb). In addition, this forest community supports MD-state critically imperiled *Carex lupuliformis* (false hop sedge).

Global Vegetation: This forest type is characterized by a well-developed tree canopy codominated by *Acer rubrum* (red maple) and *Fraxinus pennsylvanica* (green ash) in variable proportions. Other canopy associates may include *Nyssa sylvatica* (blackgum), *Quercus phellos* (willow oak), *Quercus lyrata* (overcup oak), *Ulmus americana* (American elm), and *Populus heterophylla* (swamp cottonwood). At the southern end of the range, *Nyssa biflora* (swamp tupelo) and *Taxodium distichum* (bald-cypress) may be minor associates. The shrub layer is of variable cover but usually not dense. The most common species are *Lindera benzoin* (northern spicebush), *Eubotrys racemosa* (swamp doghobble), *Vaccinium corymbosum* (highbush blueberry), *Ilex verticillata* (common winterberry), *Carpinus caroliniana* (American hornbeam), *Rosa palustris* (swamp rose), and *Viburnum dentatum* (southern arrow-wood). Other shrub associates may include *Rhododendron viscosum* (swamp azalea), *Cephalanthus occidentalis* (common buttonbush), *Alnus serrulata* (hazel alder), and *Cornus amomum* (silky dogwood). The herb layer is diverse and generally characterized by abundant *Saururus cernuus* (lizard's-tail), typically in hollows. Other associates are many and varied but generally include *Peltandra virginica* (green arrow-arum), *Impatiens capensis* (orange jewelweed), *Pontederia cordata* (pickerelweed), *Boehmeria cylindrica* (small-spike false nettle), *Glyceria* (mannagrass) spp., *Cinna arundinacea* (sweet woodreed), *Bidens connata* (purplestem beggarticks), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Carex stricta* (upright sedge), *Carex lurida* (shallow sedge), *Carex crinita* (fringed sedge), *Triadenum walteri* (greater marsh St. Johnswort), *Lobelia cardinalis* (cardinalflower), *Lycopus virginicus* (Virginia water horehound), *Pilea pumila* (Canadian clearweed), *Carex tribuloides* (blunt broom sedge), *Polygonum punctatum* (dotted smartweed), *Polygonum arifolium* (halberdleaf tearthumb), *Cicuta maculata* (spotted water hemlock), *Leersia oryzoides* (rice cutgrass), *Galium obtusum* (bluntleaf bedstraw), *Commelina virginica* (Virginia dayflower), and others. Vines may include *Toxicodendron radicans* (eastern poison-ivy), *Smilax rotundifolia* (roundleaf greenbrier), *Campsis radicans* (trumpet creeper), and *Parthenocissus quinquefolia* (Virginia creeper). Mosses are generally sparse to absent, except on logs and tree bases above the high-water line.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash)
Herb (field)	Flowering forb	*Saururus cernuus* (lizard's-tail)

Characteristic Species

National Capital Parks-East: *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), *Impatiens capensis* (orange jewelweed), *Peltandra virginica* (green arrow-arum), *Saururus cernuus* (lizard's-tail)
Global: *Acer rubrum* (red maple), *Bidens connata* (purplestem beggarticks), *Boehmeria cylindrica* (small-spike false nettle), *Carex crinita* (fringed sedge), *Carex lurida* (shallow sedge), *Carex stricta* (upright sedge), *Carex tribuloides* (blunt broom sedge), *Carpinus caroliniana* (American hornbeam), *Cicuta maculata* (spotted water hemlock), *Cinna arundinacea* (sweet woodreed), *Eubotrys racemosa* (swamp doghobble), *Fraxinus pennsylvanica* (green ash), *Galium obtusum* (bluntleaf bedstraw), *Ilex verticillata* (common winterberry), *Impatiens capensis* (orange jewelweed), *Leersia oryzoides* (rice cutgrass), *Lindera benzoin* (northern spicebush), *Lobelia cardinalis* (cardinalflower), *Lycopus virginicus* (Virginia water horehound), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Peltandra virginica* (green arrow-arum), *Pilea pumila* (Canadian clearweed), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum punctatum* (dotted smartweed), *Pontederia cordata* (pickerelweed), *Rosa palustris* (swamp rose), *Saururus cernuus* (lizard's-tail), *Thelypteris palustris* (eastern marsh fern), *Triadenum walteri* (greater marsh St. Johnswort), *Vaccinium corymbosum* (highbush blueberry), *Viburnum dentatum* (southern arrow-wood)

Other Noteworthy Species

National Capital Parks-East: Vulnerable Plants: *Carex lupuliformis* (false hop sedge, G4, MD-critically imperiled); **Invasive/Exotic Plants**: *Clematis terniflora* (sweet autumn virginsbower), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Murdannia keisak* (wartremoving herb, Medium/Low), *Rosa multiflora* (multiflora rose, Medium/Low)

Conservation Status Rank

Global Rank & Reasons: G3G4 (14-Feb-2012). This association is geographically restricted to the Mid-Atlantic Coastal Plain and in limited areas of the Piedmont. It occurs in small patches, generally less than 20 acres. As of December 2011, it is ranked as S3 in Maryland and S3S4 in Virginia, where it is reportedly widespread in the backswamps of the Coastal Plain. In New Jersey, this type is documented from Great Swamp on the transition from Inner Coastal Plain to Piedmont. This type also is likely to occur in Delaware but its classification requires further resolution there. Beaver impoundments have been observed to threaten this vegetation.

Related Concepts

Global Similar Types:
- *Acer (rubrum, saccharinum) - Fraxinus pennsylvanica - Ulmus americana / Boehmeria cylindrica* Floodplain Forest (CEGL006548)
- *Acer rubrum / Alnus serrulata - Lindera benzoin / Glyceria striata - Impatiens capensis* Seep Forest (CEGL007031)

Global Related Concepts:
- *Acer rubrum - Fraxinus pennsylvanica / Saururus cernuus* Forest (Thomson et al. 1999) =
- *Fraxinus pennsylvanica - Acer rubrum / Cinna arundinacea - Saururus cernuus - Boehmeria cylindrica* Forest (Fleming and Patterson 2003) =
- *Fraxinus pennsylvanica / Asimina triloba - Lindera benzoin - Ilex (decidua, verticillata) / Triadenum walteri - Saururus cernuus* Forest (Walton et al. 2001) =
- *Fraxinus pennsylvanica / Boehmeria cylindrica - Saururus cernuus* Forest (Fleming 2002a) =
- *Fraxinus pennsylvanica / Cinna arundinacea - Poa trivialis* Semipermanently Flooded Forest (McCoy and Fleming 2000) =
- Red Maple - Green Ash - Lizard's Tail Swamp (CML2) (Windisch 2014a) =

Classification

Status: Standard
Classification Confidence: 2 - Moderate
National Capital Parks-East Classification Comments: Chesapeake-Piedmont Red Maple / Lizard's-tail Swamp Forest is sometimes referred to as Red Maple / Lizard's-tail Swamp.
Global Classification Comments: Classification is supported by analysis of a 1250-plot regional dataset compiled for the NCR and MAR national parks vegetation mapping projects. In that analysis, this association was represented by 22 Maryland and Virginia plots.

ELEMENT DISTRIBUTION

National Capital Parks-East Range: This forest association was sampled at Fort Washington and Harmony Hall, both in Prince Georges County, Maryland. There are also stands and mapped polygons documented at Piscataway and Oxon Hill Farm.
Global Range: This red maple - green ash swamp community occurs in the Coastal Plain of the Chesapeake Bay region and rarely in the adjacent Piedmont from New Jersey to North Carolina.
Nations: US
States/Provinces: DC:SNR, DE:S3, MD:SNR, NC:SNR, NJ:SNR, VA:S3S4
TNC Ecoregions: 52:C, 57:C, 58:C, 61:C, 62:C
USFS Ecoregions (2007): 232Ad:CCC, 232Ha:CC?, 232Hb:CCC, 232Hd:CCP, 232Ib:CCC, 232Je:C??
Federal Lands: DOD (Fort Belvoir); NPS (Colonial, National Capital-East); USFWS (Chesapeake Marshlands, Great Swamp, Patuxent, Supawna Meadows)

ELEMENT SOURCES

National Capital Parks-East Plots: (2 plots: NACE.218, NACE.225).
National Capital Parks-East Description Author(s): J.W. Harrison, mod. M.J. Russo
Global Description Author(s): D. Thomson, J. Meininger, L.A. Sneddon, G.P. Fleming
References: Breden et al. 2001, Coxe 2009, Eastern Ecology Working Group n.d.*, Fleming 2001a, Fleming 2002a, Fleming 2002b, Fleming and Moorhead 1998, Fleming and Patterson 2003, Fleming and Patterson 2011b, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Harrison and Stango 2003, McCoy and Fleming 2000, Meininger 1998, Patterson 2008c, Schafale 2012, Thomson et al. 1999, Walton et al. 2001, Windisch 2014a

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[CEGL006603] *Platanus occidentalis - (Liquidambar styraciflua, Liriodendron tulipifera) / Asimina triloba* Floodplain Forest

Translated Name: **American Sycamore - (Sweetgum, Tuliptree) / Pawpaw Floodplain Forest**
Common Name: **Coastal Plain Streamside Forest**

USNVC CLASSIFICATION

Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Oak - Sweetgum Floodplain Forest (G034)
Alliance (A4439)	*Fagus grandifolia - Quercus michauxii - Platanus occidentalis* Forest Alliance

ELEMENT CONCEPT

Global Summary: This Inner Coastal Plain streamside forest of the Mid-Atlantic region occurs along braided and intermittent streams on active and former stream channels. Flooding frequency is annual, and soils are alluvial clay loams or sandy clay loams. The tree canopy is dominated by *Platanus occidentalis* (American sycamore), *Liquidambar styraciflua* (sweetgum), *Betula nigra* (river birch), *Liriodendron tulipifera* (tuliptree), and *Acer rubrum* (red maple). Less frequent associates may include *Quercus michauxii* (swamp chestnut oak), *Ulmus americana* (American elm), and *Quercus phellos* (willow oak). The subcanopy is of variable cover and is characterized by *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Lindera benzoin* (northern spicebush), and *Ilex opaca* (American holly), with *Cornus florida* (flowering dogwood) found less frequently. Typical vines include *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax rotundifolia* (roundleaf greenbrier). The most abundant herbs are *Boehmeria cylindrica* (small-spike false nettle) and *Arisaema triphyllum* (Jack in the pulpit). Other herbaceous associates include *Geum virginianum* (cream avens), *Carex debilis* (white edge sedge), *Lycopus virginicus* (Virginia water horehound), *Impatiens capensis* (orange jewelweed), *Pilea pumila* (Canadian clearweed), *Claytonia virginica* (Virginia springbeauty), *Ranunculus abortivus* (littleleaf buttercup), and *Cardamine concatenata* (cutleaf toothwort). The vine *Campsis radicans* (trumpet creeper) may also be present.

ENVIRONMENTAL DESCRIPTION

National Capital Parks-East Environment: This forested community occurs in floodplains along braided and intermittent streams on active and former stream channels.
Global Environment: This streamside forest occurs along braided and intermittent streams on active and former stream channels. Flooding frequency is annual, and soils are alluvial clay loams or sandy clay loams.

VEGETATION DESCRIPTION

National Capital Parks-East Vegetation: The canopy is typically dominated by *Platanus occidentalis* (American sycamore) and *Liriodendron tulipifera* (tuliptree), and usually contains *Liquidambar styraciflua* (sweetgum). It may also include *Acer negundo* (box-elder), *Celtis occidentalis* (common hackberry), *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), *Prunus serotina var. serotina* (black cherry), and *Ulmus americana* (American elm). The subcanopy may be dominated by *Acer negundo* (box-elder) and also includes *Celtis occidentalis* (common hackberry), *Liquidambar styraciflua* (sweetgum), *Platanus occidentalis* (American sycamore), *Robinia pseudoacacia* (black locust), and *Ulmus americana* (American elm). Shrubs include *Asimina triloba* (pawpaw), *Lindera benzoin* (northern spicebush), and the exotics *Ligustrum* (privet) sp. and *Rosa multiflora* (multiflora rose). Vines include *Campsis radicans* (trumpet creeper), the exotic *Lonicera japonica* (Japanese honeysuckle), *Smilax* (greenbrier) sp., and *Toxicodendron radicans* (eastern poison-ivy). The most abundant native herbs are *Arisaema triphyllum* (Jack in the pulpit) and *Boehmeria cylindrica* (small-spike false nettle). Other herbs include *Carex radiata* (eastern star sedge), *Elymus riparius* (riverbank wildrye), *Elymus virginicus* (Virginia wildrye), *Geum canadense* (white avens), *Hydrophyllum virginianum* (eastern waterleaf), *Pilea pumila* (Canadian clearweed), *Polygonum punctatum* (dotted smartweed), *Polygonum virginianum* (jumpseed), *Potentilla canadensis* (dwarf cinquefoil), *Sanicula canadensis* (Canadian blacksnakeroot), *Verbesina alternifolia* (wingstem), and *Viola striata* (striped cream violet). Several exotic herbs may be present, including *Alliaria petiolata* (garlic mustard), *Duchesnea indica* (Indian strawberry), *Microstegium vimineum* (Nepalese browntop) (which may occur in dense patches), *Perilla frutescens* (beefsteakplant), and *Polygonum cespitosum var. longisetum* (oriental ladysthumb).
Global Vegetation: In stands of this type, the tree canopy is typically dominated by *Platanus occidentalis* (American sycamore), *Liquidambar styraciflua* (sweetgum), *Betula nigra* (river birch), *Liriodendron tulipifera* (tuliptree), and *Acer rubrum* (red maple). Less frequent associates may include *Quercus michauxii* (swamp chestnut oak), *Ulmus americana* (American elm), and *Quercus phellos* (willow oak). The subcanopy is of variable cover and is characterized by *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Lindera benzoin* (northern spicebush), and *Ilex opaca* (American holly), with *Cornus florida* (flowering dogwood) found less frequently. Typical vines include *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax rotundifolia* (roundleaf greenbrier), as well as *Campsis radicans* (trumpet creeper). The most abundant herbs are *Boehmeria cylindrica* (small-spike false nettle) and *Arisaema triphyllum* (Jack in the pulpit). Other herbaceous associates include *Geum virginianum* (cream avens), *Carex debilis* (white edge sedge), *Lycopus virginicus* (Virginia water horehound), *Impatiens capensis* (orange jewelweed), *Pilea pumila* (Canadian clearweed), *Claytonia virginica* (Virginia springbeauty), *Ranunculus abortivus* (littleleaf buttercup), and *Cardamine concatenata* (cutleaf toothwort).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore)

CHARACTERISTIC SPECIES

National Capital Parks-East: *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore)
Global: *Asimina triloba* (pawpaw), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore)

OTHER NOTEWORTHY SPECIES

National Capital Parks-East: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Ligustrum* sp., *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (21-Mar-2000). This community requires further evaluation. Global rank is based on the Maryland state rank.

RELATED CONCEPTS

Global Similar Types:

- *Betula nigra - Platanus occidentalis / Impatiens capensis* Floodplain Forest (CEGL006184)
- *Fraxinus pennsylvanica - Platanus occidentalis - Celtis laevigata / Chasmanthium latifolium* Piedmont Floodplain Forest (CEGL007013)
- *Platanus occidentalis - Liquidambar styraciflua / Carpinus caroliniana - Asimina triloba* Floodplain Forest (CEGL007340) formerly attributed to ECO58.

Global Related Concepts:

- *Platanus occidentalis - (Liquidambar styraciflua - Liriodendron tulipifera) / Asimina triloba* Forest (Thomson et al. 1999) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
National Capital Parks-East Classification Comments: Based on discussions of the classifications of some observation points in the NACE database, there may be some confusion in the classification of occurrences in the field among Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073), Upper Southeast Sweetgum - Tuliptree Small Stream Forest (CEGL004418), Coastal Plain Streamside Forest (CEGL006603), Northern Piedmont Small Stream Floodplain Forest (CEGL006492), Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest (CEGL006548), and Chesapeake-Piedmont Red Maple / Lizard's-tail Swamp Forest (CEGL006606).

ELEMENT DISTRIBUTION

National Capital Parks-East Range: The vast majority of the known points and mapped polygons of this type are in the southern part, at Piscataway, Fort Washington, and Harmony Hall (Prince Georges County, Maryland). There are some geographic outliers at Patuxent North (in Anne Arundel County, Maryland).
Global Range: This forest is found in the Inner Coastal Plain of the Chesapeake Bay region of Maryland, in the Upper Coastal Plain and Piedmont of Delaware, and in New Jersey.
Nations: US
States/Provinces: DC:SNR, DE?:SNA, MD:SNR, NJ?:SNA, PA?:SNA, VA?:SNA
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions (2007): 232Ac:CCP, 232Ad:CCC, 232Ha:CC?, 232Je:C??
Federal Lands: NPS (National Capital-East); USFWS (Patuxent)

ELEMENT SOURCES

National Capital Parks-East Plots: None.
National Capital Parks-East Description Author(s): M. Pyne
Global Description Author(s): D. Thomson, L.A. Sneddon, E. Largay
References: Coxe 2009, Eastern Ecology Working Group n.d.*, Harrison 2004, Harrison 2011, Thomson et al. 1999

[CEGL006605] *Quercus (phellos, palustris, michauxii) - Liquidambar styraciflua / Cinna arundinacea* Floodplain Forest

Translated Name: **(Willow Oak, Pin Oak, Swamp Chestnut Oak) - Sweetgum / Sweet Woodreed Floodplain Forest**
Common Name: **Coastal Plain Oak Floodplain Forest**

USNVC CLASSIFICATION

Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Oak - Sweetgum Floodplain Forest (G034)
Alliance (A4439)	*Fagus grandifolia - Quercus michauxii - Platanus occidentalis* Forest Alliance

ELEMENT CONCEPT

Global Summary: This floodplain swamp forest occurs in backswamps and topographic depressions within alluvial floodplains of large streams and small rivers. Along smaller headwater streams, it may occur in low, poorly drained floodplains with braided channels and depressions. Standing water is present for much of the year on loam or clay loam soils. The overstory is dominated by variable mixtures of *Quercus phellos* (willow oak), *Quercus palustris* (pin oak), *Quercus michauxii* (swamp chestnut oak), *Liquidambar styraciflua* (sweetgum), and *Acer rubrum* (red maple). The proportion of the latter two species typically increases with disturbance. The understory is commonly quite open

and contains young *Acer rubrum* (red maple), several climbing vines, *Carpinus caroliniana* (American hornbeam), *Ilex opaca var. opaca* (American holly), *Asimina triloba* (pawpaw), *Viburnum dentatum* (southern arrow-wood), *Ilex verticillata* (common winterberry), and other species. The herb layer is usually well-developed, with a prominent graminoid component. Common herbaceous patch-dominants include *Cinna arundinacea* (sweet woodreed), *Carex debilis var. debilis* (white edge sedge), *Carex intumescens* (greater bladder sedge), *Glyceria striata* (fowl mannagrass), and *Carex tribuloides* (blunt broom sedge).

ENVIRONMENTAL DESCRIPTION

George Washington Memorial Parkway Environment: These forests occupy poorly drained areas in the Coastal Plain region of the park.

National Capital Parks-East Environment: This mixed oak - sweetgum floodplain swamp forest was sample at five locations in the park. It is positioned in poorly drained depressions within broad alluvial floodplains of Piscataway Creek and the Potomac River. Stands are temporarily flooded and subject to infrequent overbank flooding. The soils are classified as Fallsington sandy loam, a unit that typically contains varying amounts of silt and clay. Soils sampled are acidic (mean pH=4.6, N=3 plots) with low base cation and saturation levels. The unvegetated ground surface is dominated by leaf litter along with small amounts of wood and bare soil; one site had 90% cover of standing water at the time of sampling. Evidence of disturbance includes past logging, deer grazing/browsing, and the presence of exotic plants. Most recognized stands occur on Pleistocene fluvial deposits and Holocene alluvium.

Prince William Forest Park Environment: This association was observed and mapped on the western edge of the park along poorly drained level swampy areas along tributaries to South Fork of Quantico Creek.

Global Environment: This floodplain swamp forest occurs in backswamps and topographic depressions within alluvial floodplains of large streams and small rivers. Along smaller headwater streams, it may occur in low, poorly drained floodplains with braided channels and depressions. Sites are probably overflowed annually, and depressions retain standing water well into the growing season. Soils are somewhat to very poorly drained loams or clay loams that are strongly to extremely acidic and infertile.

VEGETATION DESCRIPTION

George Washington Memorial Parkway Vegetation: Overstory trees that may dominate include *Quercus phellos* (willow oak) (willow oak), *Quercus palustris* (pin oak) (pin oak), *Quercus michauxii* (swamp chestnut oak) (swamp chestnut oak), *Acer rubrum* (red maple) and *Liquidambar styraciflua.* Other canopy trees may include *Fraxinus pennsylvanica* (green ash) (green ash), *Nyssa sylvatica* (blackgum) (blackgum), and *Ulmus americana* (American elm) (American elm). Canopies dominated by *Acer rubrum* (red maple) and *Liquidambar styraciflua* are indicative of more disturbed stands. The shrub layer tends to be open and various grasses and sedges typically dominate the herb layer in scattered patches.

National Capital Parks-East Vegetation: This association is characterized by moderate to dense (40-90% cover), variable mixtures of *Quercus shumardii* (Shumard oak) (MD-state imperiled), *Quercus phellos* (willow oak), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), *Liquidambar styraciflua* (sweetgum), and *Acer rubrum* (red maple) in the canopy (20-35+ m tall). Low-cover canopy and subcanopy associates include *Quercus michauxii* (swamp chestnut oak), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Acer negundo* (box-elder), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore), and *Ulmus americana* (American elm). The shrub layer is variable in density ranging from sparse to moderately dense (up to 40%). Of the stands sampled, *Carpinus caroliniana* (American hornbeam), *Asimina triloba* (pawpaw), and *Viburnum prunifolium* (blackhaw) attain the highest cover in the shrub layer. Other associated shrub species include *Lindera benzoin* (northern spicebush), *Euonymus americanus* (bursting-heart), *Ulmus americana* (American elm), and *Acer negundo* (box-elder). Vines of *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), *Campsis radicans* (trumpet creeper), and *Toxicodendron radicans* (eastern poison-ivy) are frequent at low cover and may be found trailing along the ground or climbing into the shrub and tree canopies. The herbaceous layer is diverse and comprised of patch-dominant species with *Cinna arundinacea* (sweet woodreed), *Arisaema triphyllum* (Jack in the pulpit), and *Boehmeria cylindrica* (small-spike false nettle) the most abundant. Other associates include *Leersia virginica* (whitegrass), *Polygonum punctatum* (dotted smartweed), *Carex louisianica* (Louisiana sedge), *Carex albolutescens* (greenwhite sedge), *Lycopus virginicus* (Virginia water horehound), *Juncus effusus* (common rush), *Pilea pumila* (Canadian clearweed), *Scutellaria integrifolia* (helmet flower), *Carex squarrosa* (squarrose sedge) and *Symphyotrichum lateriflorum* (calico aster). Non-native species reported from sampled stands include *Microstegium vimineum* (Nepalese browntop), *Lonicera japonica* (Japanese honeysuckle), and *Celastrus orbiculatus* (oriental bittersweet). In addition, this community supports MD-state critically imperiled *Scutellaria nervosa* (veiny skullcap) and *Quercus shumardii* (Shumard oak).

Prince William Forest Park Vegetation: Overstory trees that may dominate include *Quercus palustris* (pin oak) (pin oak), *Quercus phellos* (willow oak) (willow oak), *Quercus michauxii* (swamp chestnut oak) (swamp chestnut oak), *Acer rubrum* (red maple) and *Liquidambar styraciflua.* Other canopy trees may include *Fraxinus pennsylvanica* (green ash) (green ash), *Nyssa sylvatica* (blackgum) (blackgum), and *Ulmus americana* (American elm) (American elm). Canopies dominated by *Acer rubrum* (red maple) and *Liquidambar styraciflua* are indicative of more disturbed stands. The shrub layer tends to be open may be dominated by *Acer rubrum* (red maple) and *Carpinus caroliniana* (American hornbeam), and various grasses and sedges typically dominate the herb layer in scattered patches.
Global Vegetation: The overstory is dominated by variable mixtures of *Quercus phellos* (willow oak), *Quercus palustris* (pin oak), *Quercus michauxii* (swamp chestnut oak), *Liquidambar styraciflua* (sweetgum), and *Acer rubrum* (red maple). The proportion of the latter two species typically increases with disturbance. Other canopy associates include *Fraxinus pennsylvanica* (green ash), *Nyssa sylvatica* (blackgum), *Ulmus americana* (American elm), *Quercus pagoda* (cherrybark oak), *Quercus lyrata* (overcup oak), and *Betula nigra* (river birch). Climbing vines of *Smilax rotundifolia* (roundleaf greenbrier), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), and *Campsis radicans* (trumpet creeper) are common and characteristic. The subcanopy and shrub layers tend to be open and composed of young recruitment of *Acer rubrum* (red maple), along with *Carpinus caroliniana* (American hornbeam) (usually dominant), *Ilex opaca var. opaca* (American holly), *Asimina triloba* (pawpaw), *Euonymus americanus* (bursting-heart), *Viburnum dentatum* (southern arrow-wood), *Ilex verticillata* (common winterberry), and *Lindera benzoin* (northern spicebush). The herb layer is usually well-developed, with a prominent graminoid component. Common herbaceous patch-dominants include *Cinna arundinacea* (sweet woodreed), *Carex debilis var. debilis* (white edge sedge), *Carex intumescens* (greater bladder sedge), *Glyceria striata* (fowl mannagrass), and *Carex tribuloides* (blunt broom sedge). Additional characteristic herbs include *Boehmeria cylindrica* (small-spike false nettle), *Arisaema triphyllum* (Jack in the pulpit), *Lycopus virginicus* (Virginia water horehound), *Athyrium filix-femina ssp. asplenioides* (asplenium ladyfern), *Impatiens capensis* (orange jewelweed), *Leersia virginica* (whitegrass), *Onoclea sensibilis* (sensitive fern), *Symphyotrichum lateriflorum* (calico aster), and *Rubus hispidus* (bristly dewberry). Many other species occur at low constancy and cover. Mean species richness of 47 Maryland and Virginia plot samples was 38 taxa per 400 m2.

MOST ABUNDANT SPECIES

Global Stratum	**Lifeform**	**Species**
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum* (red maple)
Tree canopy	Broad-leaved deciduous tree	*Liquidambar styraciflua* (sweetgum), *Quercus michauxii* (swamp chestnut oak), *Quercus palustris* (pin oak), *Quercus phellos* (willow oak)
Tree subcanopy	Broad-leaved deciduous tree	*Carpinus caroliniana* (American hornbeam)
Shrub/sapling (tall & short)	Liana	*Campsis radicans* (trumpet creeper), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy)
Herb (field)	Graminoid	*Carex debilis* var. *debilis* (white edge sedge), *Carex intumescens* (greater bladder sedge), *Carex tribuloides* (blunt broom sedge), *Cinna arundinacea* (sweet woodreed), *Glyceria striata* (fowl mannagrass)

CHARACTERISTIC SPECIES

National Capital Parks-East: *Acer negundo* (box-elder), *Acer rubrum* (red maple), *Arisaema triphyllum* (Jack in the pulpit), *Asimina triloba* (pawpaw), *Boehmeria cylindrica* (small-spike false nettle), *Carex albolutescens* (greenwhite sedge), *Carex louisianica* (Louisiana sedge), *Carex squarrosa* (squarrose sedge), *Carpinus caroliniana* (American hornbeam), *Cinna arundinacea* (sweet woodreed), *Euonymus americanus* (bursting-heart), *Lindera benzoin* (northern spicebush), *Liquidambar styraciflua* (sweetgum), *Lycopus virginicus* (Virginia water horehound), *Nyssa sylvatica* (blackgum), *Quercus bicolor* (swamp white oak), *Quercus michauxii* (swamp chestnut oak), *Quercus palustris* (pin oak), *Quercus phellos* (willow oak), *Quercus shumardii* (Shumard oak), *Scutellaria*

integrifolia (helmet flower), *Symphyotrichum lateriflorum* (calico aster), *Ulmus americana* (American elm), *Viburnum prunifolium* (blackhaw)
Prince William Forest Park: *Carex debilis* (white edge sedge), *Carex radiata* (eastern star sedge), *Carpinus caroliniana* (American hornbeam), *Fraxinus pennsylvanica* (green ash), *Leersia virginica* (whitegrass), *Liquidambar styraciflua* (sweetgum), *Lycopus virginicus* (Virginia water horehound), *Nyssa sylvatica* (blackgum), *Quercus palustris* (pin oak)
Global: *Acer rubrum* (red maple), *Campsis radicans* (trumpet creeper), *Carex debilis* var. *debilis* (white edge sedge), *Carex intumescens* (greater bladder sedge), *Carex tribuloides* (blunt broom sedge), *Carpinus caroliniana* (American hornbeam), *Cinna arundinacea* (sweet woodreed), *Glyceria striata* (fowl mannagrass), *Liquidambar styraciflua* (sweetgum), *Parthenocissus quinquefolia* (Virginia creeper), *Quercus michauxii* (swamp chestnut oak), *Quercus palustris* (pin oak), *Quercus phellos* (willow oak), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy)

OTHER NOTEWORTHY SPECIES

National Capital Parks-East: **Vulnerable Plants**: *Carex louisianica* (Louisiana sedge, G5, MD-vulnerable), *Quercus shumardii* (Shumard oak, G5, MD-imperiled), *Scutellaria nervosa* (veiny skullcap, G5, MD-critically imperiled); **Invasive/Exotic Plants**: *Allium vineale* (wild garlic, Medium/Insignificant), *Clematis terniflora* (sweet autumn virginsbower), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Poa annua* (annual bluegrass, Medium/Insignificant), *Rosa multiflora* (multiflora rose, Medium/Low), *Stellaria media* (common chickweed, Low)
Prince William Forest Park: **Invasive/Exotic Plants**: *Lonicera japonica* (Japanese honeysuckle, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (23-Feb-2007). This is a moderately well-distributed forest type. Some examples are at least partly protected in national parks. More information on threats is needed but include logging, deer grazing/browsing, and the presence of exotic plants.

RELATED CONCEPTS

Global Similar Types:
- *Quercus phellos - Quercus (palustris, lyrata) / Ilex decidua / Carex typhina* Floodplain Forest (CEGL006498)

Global Related Concepts:
- *Acer rubrum - Liquidambar styraciflua - Quercus (palustris, phellos)* Forest (Fleming 2002a) =
- *Acer rubrum - Liquidambar styraciflua - Quercus (palustris, phellos)* Seasonally Flooded Forest (Patterson pers. comm.) **?**
- *Acer rubrum - Quercus (phellos, palustris) / Cinna arundinacea* Forest (Fleming and Patterson 2003) =
- *Quercus (palustris, phellos) - Acer rubrum - Cinna arundinacea* Forest (Thomson et al. 1999) =
- *Quercus (palustris, phellos) - Acer rubrum / Campsis radicans - Aster lateriflorus* Seasonally Flooded Forest (McCoy and Fleming 2000) =
- *Quercus michauxii - Ulmus americana / Bignonia capreolata / Athyrium filix-femina - Rubus flagellaris - Carex tribuloides* Forest (Walton et al. 2001) =

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
George Washington Memorial Parkway Classification Comments: Within this park, Coastal Plain Oak Floodplain Forest is also referred to as Oak Floodplain Swamp.
National Capital Parks-East Classification Comments: Within this park, Coastal Plain Oak Floodplain Forest is also referred to as Oak Floodplain Swamp.
Prince William Forest Park Classification Comments: Within this park, Coastal Plain Oak Floodplain Forest is also referred to as Oak Floodplain Swamp.
Global Classification Comments: This association is supported by analysis of a 1250-plot regional dataset assembled for the NCR and Mid-Atlantic national parks vegetation mapping project. In that analysis, this type was represented by a group of 37 Maryland and 10 northern Virginia plots.

ELEMENT DISTRIBUTION

George Washington Memorial Parkway Range: The Coastal Plain Oak Floodplain Forest was observed in a swampy area between Belle Haven Marina and Dyke Marsh. It is mapped in two small polygons.

National Capital Parks-East Range: The Coastal Plain Oak Floodplain Forest was sampled at Hard Bargain Farm and along the Patuxent River and Baltimore-Washington Parkway in Prince Georges County, and along the Little Patuxent River and Baltimore-Washington Parkway in Anne Arundel County, Maryland. Most of the mapped polygons and known points of this type at NACE are located at Piscataway (Prince Georges County, Maryland). There are some geographic outliers at Patuxent North (along the Baltimore-Washington Parkway in Anne Arundel County, Maryland).
Prince William Forest Park Range: The Coastal Plain Oak Floodplain Forest was observed and mapped on the western edge of the park along tributaries to South Fork of Quantico Creek.
Global Range: This community is found in the Chesapeake Bay region. It is most characteristic of the Coastal Plain but also extends into the extreme eastern part of the Piedmont.
Nations: US
States/Provinces: DC:SNR, DE:S1, MD:SNR, NJ:SNR, VA:S3?
TNC Ecoregions: 52:C, 58:C, 62:C
USFS Ecoregions (2007): 221Dd:CCC, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ac:CCP, 232Ad:CCC, 232Ha:CC?, 232Je:C??
Federal Lands: DOD (Fort Belvoir); NPS (Fredericksburg-Spotsylvania, George Washington Parkway, National Capital-East, Petersburg, Prince William); USFWS (Patuxent)

ELEMENT SOURCES

George Washington Memorial Parkway Plots: none
National Capital Parks-East Plots: (5 plots: NACE.015, NACE.016, NACE.215, NACE.216, NACE.217).
Prince William Forest Park Plots: PRWI 047
George Washington Memorial Parkway Description Author(s): J. Teague
National Capital Parks-East Description Author(s): J.W. Harrison, mod. M.J. Russo
Prince William Forest Park Description Author(s): J. Teague
Global Description Author(s): D. Thomson, L.A. Sneddon, G.P. Fleming
References: Coxe 2009, Eastern Ecology Working Group n.d.*, Fleming 2002a, Fleming 2002b, Fleming and Patterson 2003, Fleming and Patterson 2011b, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Harrison and Stango 2003, McCoy and Fleming 2000, Patterson 2008e, Patterson pers. comm., Taverna and Patterson 2008, Thomson et al. 1999, Walton et al. 2001

A3626 *Liriodendron tulipifera - Quercus alba - Liquidambar styraciflua* Piedmont Floodplain Forest Alliance

This southeastern alliance includes a variety of bottomland communities of moderately wet floodplains of the lower Piedmont, extending north and west into the Chesapeake Bay region, the Cumberland Plateau and the southern Ridge and Valley. Stands typically contain some combination of *Quercus alba* (white oak), *Liriodendron tulipifera* (tuliptree), and *Liquidambar styraciflua* (sweetgum). Canopy and subcanopy associates vary with geography and substrate, but may include *Acer floridanum* (southern sugar maple), *Acer rubrum* (red maple), *Aesculus sylvatica* (painted buckeye), *Betula nigra* (river birch), *Carpinus caroliniana ssp. caroliniana* (American hornbeam), *Carya cordiformis* (bitternut hickory), *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Ilex opaca var. opaca* (American holly), *Juglans nigra* (black walnut), *Morus rubra var. rubra* (red mulberry), *Nyssa sylvatica* (blackgum), *Ostrya virginiana* (hophornbeam), *Oxydendrum arboreum* (sourwood), *Platanus occidentalis* (American sycamore), *Prunus serotina var. serotina* (black cherry), *Quercus nigra* (water oak), *Quercus rubra var. rubra* (northern red oak), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). Some characteristic shrubs include *Arundinaria gigantea* (giant cane), *Asimina triloba* (pawpaw), *Ilex opaca* (American holly), and *Lindera benzoin* (northern spicebush). Characteristic herbs include *Arisaema triphyllum* (Jack in the pulpit) and *Polystichum acrostichoides* (Christmas fern).

[CEGL004418] *Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin / Arisaema triphyllum* Floodplain Forest

Translated Name: **Sweetgum - Tuliptree / Northern Spicebush / Jack-in-the-Pulpit Floodplain Forest**
Common Name: **Upper Southeast Sweetgum - Tuliptree Small Stream Forest**

USNVC Classification

Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Oak - Sweetgum Floodplain Forest (G034)
Alliance	*Liriodendron tulipifera - Quercus alba - Liquidambar styraciflua* Piedmont Floodplain Forest

Alliance (A3626)

Element Concept

Global Summary: These low-elevation forests develop along relatively acidic soils on small streams in the Coastal Plain of Maryland and Virginia, extending west across the Virginia and North Carolina Piedmont to the Cumberland Plateau and Ridge and Valley. The topographic features of floodplains can heavily influence the makeup of individual examples of this association. The canopy, subcanopy, shrub, and herbaceous layers often are well-developed. Dominant canopy species always include *Liquidambar styraciflua* (sweetgum) and *Liriodendron tulipifera* (tuliptree), while *Acer floridanum* (southern sugar maple) (in the eastern part of the range), *Platanus occidentalis* (American sycamore), and *Acer rubrum var. rubrum* (red maple) may also make up significant amounts of the canopy. This community type exists as a continuum between two subtypes, i.e., the tuliptree subtype and the sweetgum subtype. In some examples, only one or the other dominates the canopy, but in many examples, both are equally dominant. Common species in the canopy and understory include *Ilex opaca var. opaca* (American holly), *Aesculus sylvatica* (painted buckeye), *Betula nigra* (river birch), *Carpinus caroliniana ssp. caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), *Carya cordiformis* (bitternut hickory), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Halesia tetraptera var. tetraptera* (mountain silverbell), *Juglans nigra* (black walnut), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Morus rubra var. rubra* (red mulberry), *Nyssa sylvatica* (blackgum), *Ostrya virginiana* (hophornbeam), *Oxydendrum arboreum* (sourwood), *Pinus echinata* (shortleaf pine), *Prunus serotina var. serotina* (black cherry), *Quercus alba* (white oak), *Quercus rubra var. rubra* (northern red oak), *Ulmus rubra* (slippery elm), *Ulmus americana* (American elm), and *Ulmus alata* (winged elm). *Euonymus americanus* (bursting-heart), *Asimina triloba* (pawpaw), *Lindera benzoin var. benzoin* (northern spicebush), and *Corylus americana* (American hazelnut) are common in the shrub layer. The herbaceous layer is species-rich and often has good sedge development. The exotics *Microstegium vimineum* (Nepalese browntop), *Glechoma hederacea* (ground ivy), *Rosa multiflora* (multiflora rose), *Ligustrum sinense* (Chinese privet), and *Lonicera japonica* (Japanese honeysuckle) are common in this community.

Environmental Description

National Capital Parks-East Environment: This sweetgum - tuliptree forest was sample twice in the park. Sites are flat to gently undulating alluvial floodplains with mesic, moderately well-drained clay loam soils. The unvegetated ground surface is dominated by leaf litter along with some wood and bare soil. Evidence of disturbance includes trails/roads and the presence of exotic plants.

Prince William Forest Park Environment: Upper Southeast Sweetgum - Tuliptree Small Stream Forest is a deciduous forest occurring on temporarily flooded, well-drained alluvial floodplains of small streams throughout Prince William Forest Park. The soils are relatively acidic, and overflow by flood events is infrequent and of short duration.

Global Environment: These forests develop along small streams or in small patches on river floodplains. Soils are relatively acidic and relatively well-drained. Topographic differences from one floodplain to another, such as gradient and height above the creek, as well as floodplain microtopography (i.e., depositional landforms such as natural levees and sloughs) may influence the variation of vegetation within this association. However, in most floodplains supporting this type, the distinct alluvial landforms are poorly developed or occur at very small scales. At some sites, evidence of infrequent flooding includes fluvial topography, mixed exposed sand, light flotsam and leaf litter accumulations, and lack of soil horizon development.

Vegetation Description

National Capital Parks-East Vegetation: The dense (up to 90% cover) canopy (20-35+ m tall) and sparse (20-40%) subcanopy (10-20 m) are codominated by *Liquidambar styraciflua* (sweetgum) and/or *Liriodendron tulipifera* (tuliptree); additional tree species include *Acer negundo* (box-elder), *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), *Liquidambar styraciflua* (sweetgum), and *Nyssa sylvatica* (blackgum). The sparse (20-40%) shrub layers (0.5-10 m) are composed of *Carpinus caroliniana* (American hornbeam), *Ilex opaca var. opaca* (American holly), *Lindera benzoin* (northern spicebush), canopy species, and exotic *Berberis* (barberry) spp. The herbaceous layer can be quite dense and diverse; common and/or abundant herbs and vines include *Thelypteris*

noveboracensis (New York fern), *Polystichum acrostichoides* (Christmas fern), *Dennstaedtia punctilobula* (eastern hayscented fern), *Rubus hispidus* (bristly dewberry), *Arisaema triphyllum* (Jack in the pulpit), *Boehmeria cylindrica* (small-spike false nettle), *Glyceria striata* (fowl mannagrass), *Mitchella repens* (partridgeberry), and *Potentilla canadensis* (dwarf cinquefoil). Vines of *Parthenocissus quinquefolia* (Virginia creeper), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), and *Toxicodendron radicans* (eastern poison-ivy) may be found trailing along the ground or climbing into the tree and shrub canopies. Eight invasive/exotic species were reported from the two sampled plots. *Microstegium vimineum* (Nepalese browntop) may be present, possibly in dense stands.

Prince William Forest Park Vegetation: In mature examples of this association, the vegetation layers often are well-developed, with *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore), and *Acer rubrum* (red maple) usually the most abundant overstory trees. A number of other trees can occur as inconsistent or low-cover associates, including *Liquidambar styraciflua* (sweetgum), *Fagus grandifolia* (American beech), *Betula nigra* (river birch), *Nyssa sylvatica* (blackgum), *Quercus rubra* (northern red oak), and *Celtis occidentalis* (common hackberry). Disturbed stands often have a higher proportion of *Betula nigra* (river birch) in the canopy. *Carpinus caroliniana* (American hornbeam) often dominates the shrub layer with *Ilex opaca var. opaca* (American holly), *Asimina triloba* (pawpaw), *Acer rubrum* (red maple), and *Cornus florida* (flowering dogwood). The vines *Vitis vulpina* (frost grape), *Lonicera japonica* (Japanese honeysuckle), and *Smilax rotundifolia* (roundleaf greenbrier) are often present in the low-shrub layer and can climb into the canopy. The herb stratum is species-rich and composed of both mesophytic and hydrophytic species; it often has high cover of *Carex* (sedge) spp. Characteristic species include *Thelypteris noveboracensis* (New York fern), *Arisaema triphyllum* (Jack in the pulpit), *Amphicarpaea bracteata* (American hogpeanut), *Brachyelytrum erectum* (bearded shorthusk), *Dichanthelium dichotomum* (cypress panicgrass), *Boehmeria cylindrica* (small-spike false nettle), *Festuca subverticillata* (nodding fescue), and *Circaea lutetiana* (broadleaf enchanter's nightshade), among others.

Global Vegetation: The canopy, subcanopy, shrub, and herbaceous layers of stands of this association are often well-developed. Dominant canopy species always include *Liquidambar styraciflua* (sweetgum) and *Liriodendron tulipifera* (tuliptree), while *Acer floridanum* (southern sugar maple) (in the southern part of the range), *Platanus occidentalis* (American sycamore), and *Acer rubrum var. rubrum* (red maple) may also make up significant amounts of the canopy. This community type exists as a continuum between two subtypes, i.e., the tuliptree subtype and the sweetgum subtype. In some examples, only one or the other dominates the canopy. However, in many examples, both are equally dominant. Other common species in the canopy and understory include *Ilex opaca var. opaca* (American holly), *Aesculus sylvatica* (painted buckeye), *Carpinus caroliniana ssp. caroliniana* (American hornbeam), *Carya cordiformis* (bitternut hickory), *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Juglans nigra* (black walnut), *Betula nigra* (river birch), *Morus rubra var. rubra* (red mulberry), *Ostrya virginiana* (hophornbeam), *Oxydendrum arboreum* (sourwood), *Pinus echinata* (shortleaf pine), *Prunus serotina var. serotina* (black cherry), *Quercus alba* (white oak), *Quercus rubra var. rubra* (northern red oak), *Ulmus rubra* (slippery elm), *Ulmus americana* (American elm), *Ulmus alata* (winged elm), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Nyssa sylvatica* (blackgum), *Fraxinus americana* (white ash), *Halesia tetraptera var. tetraptera* (mountain silverbell), *Arundinaria gigantea* (giant cane), and *Fraxinus pennsylvanica* (green ash). *Euonymus americanus* (bursting-heart), *Lindera benzoin var. benzoin* (northern spicebush), and *Corylus americana* (American hazelnut) are common and dominant in the shrub layer. Other shrub species that may be present include *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum nudum var. nudum* (possumhaw), *Viburnum prunifolium* (blackhaw), *Viburnum rufidulum* (rusty blackhaw), *Hamamelis virginiana* (American witch-hazel), *Asimina triloba* (pawpaw), and *Ilex decidua* (possum-haw), among others. On the most acidic sites of the Maryland Coastal Plain, *Clethra alnifolia* (coastal sweet-pepperbush), *Vaccinium corymbosum* (highbush blueberry), and *Magnolia virginiana* (sweetbay) may be present. Vines are prominent and include *Vitis rotundifolia* (muscadine), *Apios americana* (groundnut), *Campsis radicans* (trumpet creeper), *Aristolochia macrophylla* (pipevine), *Bignonia capreolata* (crossvine), *Dioscorea quaternata* (fourleaf yam), *Gelsemium sempervirens* (evening trumpetflower), *Parthenocissus quinquefolia* (Virginia creeper), *Passiflora lutea* (yellow passionflower), *Smilax bona-nox* (saw greenbrier), *Smilax glauca* (cat greenbrier), *Smilax hugeri* (Huger's carrionflower), *Smilax rotundifolia* (roundleaf greenbrier), and *Toxicodendron radicans ssp. radicans* (eastern poison-ivy). The herbaceous layer is species-rich and often has good sedge development. Common species in this layer include *Thalictrum thalictroides* (rue-anemone), *Trillium cuneatum* (little sweet Betsy), *Arisaema triphyllum* (Jack in the pulpit), *Asplenium platyneuron var. platyneuron* (ebony spleenwort), *Botrychium virginianum* (rattlesnake fern), *Carex* (sedge) spp., *Carex impressinervia* (ravine sedge), *Carex striatula* (lined sedge), *Cinna arundinacea* (sweet woodreed), *Collinsonia canadensis* (richweed), *Deparia acrostichoides* (silver false spleenwort), *Dichanthelium clandestinum* (deertongue), *Elymus virginicus* (Virginia wildrye), *Eurybia divaricata* (white wood aster), *Galium circaezans*

(licorice bedstraw), *Geum canadense* (white avens), *Medeola virginiana* (Indian cucumber), *Packera aurea* (golden ragwort), *Poa alsodes* (grove bluegrass), *Polygonatum pubescens* (hairy Solomon's seal), *Polystichum acrostichoides* (Christmas fern), *Rudbeckia laciniata* (cutleaf coneflower), *Scutellaria integrifolia* (helmet flower), *Symphyotrichum prenanthoides* (crookedstem aster), and *Viola striata* (striped cream violet). *Thelypteris noveboracensis* (New York fern) is a common patch-dominant in the northern part of the range and the Uwharrie Mountains of North Carolina. *Carex kraliana* (Kral's sedge), which is evidently near the northern limit of its (primarily southeastern United States) range and is presently known from only two Maryland sites, has been found in this vegetation type at Thomas Stone NHS. A specimen collected at Thomas Stone NHS was cited as a paratype in the description of the species (Naczi et al. 2002). The exotics *Microstegium vimineum* (Nepalese browntop), *Glechoma hederacea* (ground ivy), *Rosa multiflora* (multiflora rose), *Ligustrum sinense* (Chinese privet), and *Lonicera japonica* (Japanese honeysuckle) are common in this community. Other exotics that colonize quickly in disturbed and fragmented versions of this association include *Wisteria sinensis* (Chinese wisteria), *Clematis terniflora* (sweet autumn virginsbower), *Hedera helix* (English ivy), and *Elaeagnus* (oleaster) sp.

Global Dynamics: The topographic features characteristic of larger-stream floodplains are poorly differentiated in the small-stream habitats of this type, and vegetation zonation is absent to poorly defined. It is unclear what processes create pure sweetgum versus pure tuliptree forests, but dominance is most likely a factor of seed source and amount of flooding (sweetgum may be able to tolerate higher water levels than tuliptree). *~Liquidambar styraciflua - (Liriodendron tulipifera)* Ruderal Wet Forest (CEGL007330)$$ is very similar to this community but is usually less than 40 years old and very even-aged with a heavy infestation of invasive exotics and fewer native species in the shrub and herb layer.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree)

CHARACTERISTIC SPECIES

National Capital Parks-East: *Arisaema triphyllum* (Jack in the pulpit), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree)

Prince William Forest Park: *Carpinus caroliniana* (American hornbeam), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore), *Thelypteris noveboracensis* (New York fern)

Global: *Arisaema triphyllum* (Jack in the pulpit), *Asplenium platyneuron* (ebony spleenwort), *Botrychium virginianum* (rattlesnake fern), *Campsis radicans* (trumpet creeper), *Carex striatula* (lined sedge), *Cinna arundinacea* (sweet woodreed), *Corylus americana* (American hazelnut), *Elymus virginicus* (Virginia wildrye), *Euonymus americanus* (bursting-heart), *Galium circaezans* (licorice bedstraw), *Geum canadense* (white avens), *Lindera benzoin* (northern spicebush), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Medeola virginiana* (Indian cucumber), *Polystichum acrostichoides* (Christmas fern), *Scutellaria integrifolia* (helmet flower), *Smilax rotundifolia* (roundleaf greenbrier), *Thalictrum thalictroides* (rue-anemone), *Toxicodendron radicans* (eastern poison-ivy), *Trillium cuneatum* (little sweet Betsy)

OTHER NOTEWORTHY SPECIES

National Capital Parks-East: Invasive/Exotic Plants: *Berberis thunbergii* (Japanese barberry, High/Medium), *Berberis vulgaris* (common barberry, Medium/Low), *Glechoma hederacea* (ground ivy, Low), *Ligustrum sinense* (Chinese privet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Rosa multiflora* (multiflora rose, Medium/Low)

Prince William Forest Park: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)

Global: Vulnerable Plants: *Carex impressinervia* (ravine sedge, G2), *Collinsonia tuberosa* (deepwoods horsebalm, G3G4); **Invasive/Exotic Plants**: *Clematis terniflora* (sweet autumn virginsbower), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Ligustrum sinense* (Chinese privet, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low), *Wisteria sinensis* (Chinese wisteria, Medium); **Other Plants**: *Carex kraliana* (Kral's sedge, G5, is evidently near the northern limit of its (primarily southeastern United States) range and is presently known from only two Maryland sites, has been found in this vegetation type at Thomas Stone NHS and was cited as a paratype in the description of the species (Naczi et al. 2002).)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (14-Feb-2011). **GReasons:** This community is widespread from the Coastal Plain of Maryland and Virginia through the Piedmont of Virginia and North Carolina to the Cumberland Plateau. Very few streams supporting this type have impoundments or diversions, and most are protected by wetland regulations. However, few, if any, pristine examples remain, and all are highly threatened by invasive exotic species that have colonized most of the remaining examples of this association. Most of these communities, at least in the Piedmont, would probably not be treated as jurisdictional wetlands and would not be protected by wetland regulations. They aren't flooded or saturated for that long. They are still somewhat protected by the probability of flooding and might be subject to riparian or floodplain restrictions in some places. Some are too small to have been attractive for cultivation but others were cleared long ago. Most probably are too small to be attractive for major impoundments or diversions, though smaller impoundments are common. Many of them were impounded to power mills in the past several centuries. Gary Fleming (pers. comm.) noted that in the Virginia Piedmont it is hard to find good examples that aren't heavily altered. Fairly decent examples do not seem that hard to find in the North Carolina Piedmont.

RELATED CONCEPTS

Global Similar Types:

- *Betula nigra - Acer rubrum - (Liquidambar styraciflua) / Microstegium vimineum* Ruderal Floodplain Forest (CEGL006976)
- *Fraxinus pennsylvanica - Platanus occidentalis - Celtis laevigata / Chasmanthium latifolium* Piedmont Floodplain Forest (CEGL007013)
- *Liquidambar styraciflua - (Liriodendron tulipifera)* Ruderal Wet Forest (CEGL007330) occurs in the same habitat but is a highly impacted version of this forest that occurs on old farm fields and other second-growth areas.
- *Liquidambar styraciflua - Quercus (phellos, nigra, alba) / Carpinus caroliniana* Floodplain Forest (CEGL007006)
- *Liquidambar styraciflua* Ruderal Forest (CEGL007216)
- *Liriodendron tulipifera - Acer negundo - (Platanus occidentalis) / Carpinus caroliniana / Polygonum virginianum* Floodplain Forest (CEGL006492)
- *Liriodendron tulipifera - Quercus alba - (Liquidambar styraciflua) / Ilex opaca / Polystichum acrostichoides* Piedmont Floodplain Forest (CEGL004900)

Global Related Concepts:

- *Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin* Temporarily Flooded Forest (McCoy and Fleming 2000) **=**
- *Liquidambar styraciflua - Quercus palustris / Carpinus caroliniana / Carex intumescens* Forest (Meininger and McCarthy 1998) **?**
- *Liquidambar styraciflua / Lindera benzoin / Arisaema triphyllum ssp. triphyllum* Temporarily Flooded Forest (Coulling 1999) **=**
- *Liriodendron tulipifera - Fagus grandifolia / Thelypteris noveboracensis* Forest (Fleming and Patterson 2003) **=**
- Maple-Gum Association of the Western Shore District (Shreve et al. 1910) **>**

CLASSIFICATION

Status: Standard

Classification Confidence: 3 - Weak

National Capital Parks-East Classification Comments: Upper Southeast Sweetgum - Tuliptree Small Stream Forest is also referred to as Small Stream Sweetgum - Tuliptree Forest.

Prince William Forest Park Classification Comments: Upper Southeast Sweetgum - Tuliptree Small Stream Forest is also referred to as Small Stream Sweetgum - Tuliptree Forest. Examples of this community in Prince William Forest Park are located near the western edge of the range of *Liquidambar styraciflua* (sweetgum) at this latitude. As a result, this tree is absent from many stands in the park.

Prince William Forest Park Other Comments: The structure and composition of Upper Southeast Sweetgum - Tuliptree Small Stream Forest vary depending on disturbance history. Floodplain width can vary from narrow zones in small ravines to wider areas in lower stream reaches. In some cases, narrow occurrences were not mapped separately from the upland forest if very narrow and below minimum mapping unit (0.5 ha).

Beavers have had a significant impact on floodplain forests throughout the park. A number of beaver wetlands now occur in areas that were once Upper Southeast Sweetgum - Tuliptree Small Stream Forest. The acreage of beaver wetlands in the park will likely continue to increase (at the expense of the mature floodplain forest) if beavers are not controlled.

Global Classification Comments: Low-quality occurrences of this type may look very similar to some occurrences of *~Liquidambar styraciflua - (Liriodendron tulipifera)* Ruderal Wet Forest (CEGL007330)$$. The presence of higher quality patches of native herbs and stands of native shrubs such as *Lindera benzoin* (northern spicebush) is the best way to distinguish these two types. In addition, stands of CEGL007330 will generally be more even-aged and single species-dominated than this association (CEGL004418).

ELEMENT DISTRIBUTION

National Capital Parks-East Range: This forest association was sampled at Greenbelt Park in Prince Georges County, Maryland, and that is where most of the stands have been documented and polygons have been mapped. Stands have also been documented at Oxon Run Parkway, Patuxent North, Suitland Parkway, and the central area. There are also mapped polygons on the northern Baltimore-Washington Parkway.
Prince William Forest Park Range: Upper Southeast Sweetgum - Tuliptree Small Stream Forest occurs as narrow linear stretches of forest along all major streams (and some tributaries) in Prince William Forest Park.
Global Range: This association is found in the Chesapeake Bay Lowlands, the Piedmont, and other low-elevation interior ecoregions (e.g., parts of the Cumberland Plateau and Ridge and Valley) from Maryland and West Virginia south to the Carolinas and west into Tennessee. It is defined as being absent from the Mid-Atlantic Coastal Plain of southeastern Virginia, the Carolinas, and Georgia. Its status in the Upper East Gulf Coastal Plain is unknown.
Nations: US
States/Provinces: DC:SNR, GA:SNR, MD:SNR, NC:SNR, SC?:SNA, TN:SNR, VA:S4, WV:S1
TNC Ecoregions: 50:C, 52:C, 58:C
USFS Ecoregions (2007): 231Ad:CCC, 231Af:CC?, 231Cc:CCC, 231Ib:CCC, 231Ic:CCC, 231Id:CCP, 231If:CCC, 232Ad:CCC, 232Ha:CC?, 232Je:C??, M221Ca:CCC
Federal Lands: DOD (Fort Belvoir); NPS (Chickamauga-Chattanooga, Colonial, Cowpens, Fredericksburg-Spotsylvania, Gauley River, Guilford Courthouse, Kennesaw Mountain, Kings Mountain, National Capital-East, Petersburg, Prince William, Richmond, Thomas Stone); USFS (Sumter (Piedmont)?, Sumter?, Uwharrie); USFWS (Patuxent)

ELEMENT SOURCES

National Capital Parks-East Plots: (2 plots: NACE.011, NACE.012).
Prince William Forest Park Plots: PRWI.24, PRWI.30, PRWI.42.
National Capital Parks-East Description Author(s): M.J. Russo, mod. M. Pyne
Prince William Forest Park Description Author(s): K. Taverna
Global Description Author(s): R.K. Peet, R. White, M. Pyne, G.P. Fleming, S.C. Gawler
References: Coulling 1999, Fleming 2002b, Fleming and Patterson 2003, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Harrison 2004, Lea et al. 2012, McCoy and Fleming 2000, McManamay 2015, Meininger and McCarthy 1998, Naczi et al. 2002, Nelson 1986, Patterson 2008c, Patterson 2008e, Patterson 2008f, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Shreve et al. 1910, Southeastern Ecology Working Group n.d.*, Taverna and Patterson 2008, Vanderhorst et al. 2010, WVNHP unpubl. data, White 2004, White and Govus 2005, White and Pyne 2003

A3632 *Quercus phellos - Quercus nigra* Coastal Plain Floodplain Forest Alliance

The forests of this alliance are typically dominated by some combination of *Quercus phellos* (willow oak), *Quercus nigra* (water oak), and/or *Quercus laurifolia* (laurel oak), and are found throughout the southern coastal plains and some adjacent areas. Dominant and associated species vary with geographic location and landscape setting. Associated canopy species include *Acer rubrum* (red maple), *Carya tomentosa* (mockernut hickory), *Carya aquatica* (water hickory), *Carya glabra* (pignut hickory), *Celtis laevigata* (sugarberry), *Fraxinus pennsylvanica* (green ash), *Liquidambar styraciflua* (sweetgum), *Magnolia virginiana* (sweetbay), *Nyssa biflora* (swamp tupelo), *Pinus glabra* (spruce pine), *Pinus taeda* (loblolly pine), *Quercus michauxii* (swamp chestnut oak), *Quercus pagoda* (cherrybark oak), *Quercus similis* (bottomland post oak), *Quercus texana* (Nuttall oak), *Taxodium distichum* (bald-cypress), and *Ulmus alata* (winged elm). These forests may occur on topographically higher portions of large, relatively high-gradient floodplains or in small, relatively low-gradient floodplains in which the landforms are too small and/or too poorly developed to create much consistent local topographic relief. These forests are found in the Atlantic and East Gulf coastal plains, and usually occur more frequently in association with blackwater / low-sediment / low-nutrient rivers and streams than with brownwater ones. They occur on very acidic to mildly alkaline soils, such as Portland, Tensas, and Hebert silt loams.

[CEGL006494] *Quercus phellos - Liquidambar styraciflua / Claytonia virginica* Floodplain Forest

Translated Name: **Willow Oak - Sweetgum / Virginia Springbeauty Floodplain Forest**
Common Name: **Potomac Gorge Willow Oak Floodplain Forest**

USNVC Classification

Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Oak - Sweetgum Floodplain Forest (G034)
Alliance	*Quercus phellos* - *Quercus nigra* Coastal Plain Floodplain Forest Alliance (A3632)

Element Concept

Global Summary: This association is restricted to a discrete area of the Potomac River floodplain at the downstream end of the Potomac Gorge in the District of Columbia. It occupies the interior part of the floodplain adjacent to the C&O Canal. Soils are quite rocky, with bedrock frequently exposed. Soils are a gravelly silt loam or loam, and the mean flooding recurrence interval for this site is approximately 14 years. The vegetation is a closed forest strongly dominated by large and apparently even-aged *Quercus phellos* (willow oak). *Liquidambar styraciflua* (sweetgum) is frequent in the subcanopy and is second in abundance in the tree layer. *Acer negundo* (box-elder) and *Nyssa sylvatica* (blackgum) are also frequent in the subcanopy. Other bottomland and some upland trees occur as minor associates, including *Acer rubrum* (red maple), *Carya cordiformis* (bitternut hickory), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Liriodendron tulipifera* (tuliptree), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), and *Ulmus americana* (American elm). The shrub layer cover is open to moderately dense with *Viburnum prunifolium* (blackhaw) most abundant. Woody vines are moderately important at 5% cover. The herb layer is quite diverse but heavily dominated by invasive exotics, including *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), *Lonicera japonica* (Japanese honeysuckle), and many others. Small remnant populations of native herbs such as *Allium canadense* (meadow garlic), *Amphicarpaea bracteata* (American hogpeanut), *Arisaema triphyllum* (Jack in the pulpit), and *Claytonia virginica* (Virginia springbeauty) are consistent with a well-drained floodplain.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This willow oak - sweetgum forest was sampled at three plot locations in the park. These include a flat alluvial plain with clay loam soil, and a gently undulating stream terrace with moderately well-drained sandy loam soil. The unvegetated surface of the former site is dominated by leaf litter (85% cover) with some wood (10%) and bare soil (5%). Evidence of disturbance includes grazing/browsing and the presence of exotic species. This community occurs in an area where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.
George Washington Memorial Parkway Environment: This willow oak - sweetgum forest was sampled at three plot locations in the park. These include a flat alluvial plain with clay loam soil, and a gently undulating stream terrace with moderately well-drained sandy loam soil. The unvegetated surface of the former site is dominated by leaf litter (85% cover) with some wood (10%) and bare soil (5%). Evidence of disturbance includes grazing/browsing and the presence of exotic species. This community occurs in an area where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.
Global Environment: This association is restricted to a discrete area of the Potomac River floodplain at the downstream end of the Potomac Gorge. It occupies the interior part of the floodplain adjacent to the C&O Canal. Soils are quite rocky, with bedrock frequently exposed (2% cover). Median soil depth was 4 cm. Soils are a gravelly silt loam or loam (mean particle size (phi): 2.6) and would likely be classified as Entisols or Inceptisols. The mean flooding recurrence interval for this site is approximately 14 years (from Log Pearson III approximation). Percent inundation (from 68 year record) is 0.04%, and annual probability of flooding (Log Pearson III approximation) is 7% (Lea 2000). Soil samples collected from two plot samples were strongly to extremely acidic, with moderately low base status.

Vegetation Description

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderate (60% cover) emergent (>35 m tall) canopy of one stand and the sparse to very dense (40-80+% cover) tree canopy, 20-35 m tall, are dominated by *Quercus phellos* (willow oak); additional species include *Acer rubrum* (red maple), *Diospyros virginiana* (common persimmon), *Fraxinus pennsylvanica* (green ash), and *Liquidambar styraciflua* (sweetgum). The very sparse to moderate (10-60%) subcanopy (10-20 m) includes *Nyssa sylvatica* and *Acer negundo* (box-elder). The very sparse to moderate (5-60%) tall-shrub (6-10 m) and short-shrub (1-6 m) layers include *Acer negundo* (box-elder), *Carpinus caroliniana* (American hornbeam), and *Viburnum prunifolium* (blackhaw). The herbaceous layer (20-60%) is

dominated by exotic species. *Claytonia caroliniana* (Carolina springbeauty), and *Arisaema triphyllum* (Jack in the pulpit) are common native species. Vines of *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Vitis aestivalis* (summer grape), and *Vitis vulpina* (frost grape) climb into the shrub and tree layers. A total of 19 exotic species were reported from sampled stands. This community also supports DC-imperiled *Quercus imbricaria* (shingle oak). This community occurs in an area where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.

George Washington Memorial Parkway Vegetation: The moderate (60% cover) emergent (>35 m tall) canopy of one stand and the sparse to very dense (40-80+% cover) tree canopy, 20-35 m tall, are dominated by *Quercus phellos* (willow oak); additional species include *Acer rubrum* (red maple), *Diospyros virginiana* (common persimmon), *Fraxinus pennsylvanica* (green ash), and *Liquidambar styraciflua* (sweetgum). The very sparse to moderate (10-60%) subcanopy (10-20 m) includes *Nyssa sylvatica* and *Acer negundo* (box-elder). The very sparse to moderate (5-60%) tall-shrub (6-10 m) and short-shrub (1-6 m) layers include *Acer negundo* (box-elder), *Carpinus caroliniana* (American hornbeam), and *Viburnum prunifolium* (blackhaw). The herbaceous layer (20-60%) is dominated by exotic species. *Claytonia caroliniana* (Carolina springbeauty), and *Arisaema triphyllum* (Jack in the pulpit) are common native species. Vines of *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Vitis aestivalis* (summer grape), and *Vitis vulpina* (frost grape) climb into the shrub and tree layers. A total of 19 exotic species were reported from sampled stands. This community also supports DC-imperiled *Quercus imbricaria* (shingle oak). This community occurs in an area where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.

Global Vegetation: The vegetation is a closed forest strongly dominated by large and apparently even-aged *Quercus phellos* (willow oak). *Liquidambar styraciflua* (sweetgum) is frequent in the subcanopy and is second in abundance in the tree layer. *Acer negundo* (box-elder) and *Nyssa sylvatica* (blackgum) are also frequent in the subcanopy. Other bottomland and some upland trees occur as minor associates, including *Fraxinus americana* (white ash), *Ulmus americana* (American elm), *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), *Carya cordiformis* (bitternut hickory), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), and *Liriodendron tulipifera* (tuliptree). The shrub layer cover is open to moderately dense with *Viburnum prunifolium* (blackhaw) most abundant. Woody vines are moderately important. The herb layer is quite diverse but heavily dominated by invasive exotics, including *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), *Lonicera japonica* (Japanese honeysuckle), and many others. Small remnant populations of native herbs such as *Arisaema triphyllum* (Jack in the pulpit), *Amphicarpaea bracteata* (American hogpeanut), *Claytonia virginica* (Virginia springbeauty), and *Allium canadense* (meadow garlic) are consistent with a well-drained floodplain.

Global Dynamics: Both *Quercus phellos* (willow oak) and *Liquidambar styraciflua* (sweetgum) are rare in the Potomac Gorge and are much more characteristic of the Coastal Plain at this latitude. The dynamics of this association are difficult to explain, but the even-aged character of the stand and its location adjacent to an area (C&O Canal) that has seen extensive disturbance both suggest an old successional forest. It seems likely that the floodplain occupied by this type was formerly cleared or at least heavily impacted during the construction of the canal, since the opposite side is a steep bluff that would not have provided any staging areas for the construction. The presence of large, in-place outcrops (confirmed by a geologist) in the floodplain is also quite unusual and contrasts sharply with a few localized depressions that support species such as *Quercus palustris* (pin oak) and *Quercus bicolor* (swamp white oak). Since both *Quercus phellos* (willow oak) and *Liquidambar styraciflua* (sweetgum) are also characteristic of depressions and this forest occupies the "backswamp" position in the floodplain, another hypothesis is that more of the area was originally low and poorly drained but has been covered by relatively recent flood-deposited alluvium. This might also account for the source of *Quercus phellos* (willow oak) and *Liquidambar styraciflua* (sweetgum) if they invaded a cleared or heavily disturbed site many decades ago. The disturbed, exotic-dominated herb layer adds to the difficulties of interpretation.

MOST ABUNDANT SPECIES

Global

Stratum	**Lifeform**	**Species**
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liquidambar styraciflua* (sweetgum)
Tree canopy	Broad-leaved deciduous tree	*Quercus phellos* (willow oak)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Liquidambar styraciflua* (sweetgum), *Quercus phellos* (willow oak)
George Washington Memorial Parkway: *Liquidambar styraciflua* (sweetgum), *Quercus phellos* (willow oak)
Global: *Claytonia virginica* (Virginia springbeauty), *Liquidambar styraciflua* (sweetgum), *Quercus phellos* (willow oak)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Quercus imbricaria* (shingle oak, G5, DC-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Berberis thunbergii* (Japanese barberry, High/Medium), *Berberis vulgaris* (common barberry, Medium/Low), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Euonymus alatus* (burningbush, Low), *Euonymus fortunei* (winter creeper, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Ligustrum sinense* (Chinese privet, High/Medium), *Liriope muscari* (big blue lilyturf), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Prunus avium* (sweet cherry, High/Low), *Ranunculus ficaria* (fig buttercup, Medium/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Veronica hederifolia* (ivyleaf speedwell), *Viburnum plicatum* (Japanese snowball)
George Washington Memorial Parkway: Vulnerable Plants: *Quercus imbricaria* (shingle oak, G5, DC-imperiled); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Berberis thunbergii* (Japanese barberry, High/Medium), *Berberis vulgaris* (common barberry, Medium/Low), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Euonymus alatus* (burningbush, Low), *Euonymus fortunei* (winter creeper, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Hedera helix* (English ivy, High/Medium), *Ligustrum sinense* (Chinese privet, High/Medium), *Liriope muscari* (big blue lilyturf), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Prunus avium* (sweet cherry, High/Low), *Ranunculus ficaria* (fig buttercup, Medium/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Veronica hederifolia* (ivyleaf speedwell), *Viburnum plicatum* (Japanese snowball)
Global: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR

RELATED CONCEPTS

Global Related Concepts:
- *Quercus phellos - Liquidambar styraciflua - Nyssa sylvatica / Smilax rotundifolia* Forest (Lea 2000) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Chesapeake & Ohio Canal National Historical Park Classification Comments: Within this park, Potomac Gorge Willow Oak Floodplain Forest is also referred to as Willow Oak Floodplain Forest.
George Washington Memorial Parkway Classification Comments: Within this park, Potomac Gorge Willow Oak Floodplain Forest is also referred to as Willow Oak Floodplain Forest.
Global Classification Comments: This vegetation type is enigmatic and supported by three plot samples that perform as a discrete group in any quantitative analysis. Lea (2000) hypothesized that this vegetation was an outlier of a Coastal Plain vegetation type occurring at the lower end of the Potomac Gorge. However, in the analysis of a 1250-plot regional dataset assembled for the NCR and MAR national parks vegetation mapping projects, these plots performed as an outlier group that showed no relationship to other types, even those dominated by the same species.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled just downstream from Fletcher's Boathouse and in Washington, DC (Canal mile 3). This community occurs in an area where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.

George Washington Memorial Parkway Range: This community was sampled just downstream from Fletcher's Boathouse and in Washington, DC (Canal mile 3). This community occurs in an area where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.
Global Range: This association is known only from an approximately 15-hectare area at the lower end of the Potomac Gorge in the District of Columbia.
Nations: US
States/Provinces: DC:SNR
TNC Ecoregions: 61:C
USFS Ecoregions (2007): 221Db:CCC
Federal Lands: NPS (C&O Canal, George Washington Parkway)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (3 plots - shared with GWMP): CHOH.203, CHOH.232, POTO_003.01.
George Washington Memorial Parkway Plots: (3 plots - shared with CHOH): CHOH.203, CHOH.232, POTO_003.01. This community occurs in an area where the boundaries of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway overlap.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): M.J. Russo
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d., Lea 2000, Lea 2000*

G759. SOUTHERN ASH - ELM - WILLOW FLOODPLAIN FOREST

This group is composed of deciduous floodplain or swamp forests found primarily in the coastal plains of the southeastern United States. These forests are typically dominated by some combination of *Fraxinus pennsylvanica* (green ash), *Populus deltoides* (eastern cottonwood), *Salix caroliniana* (coastal plain willow), *Salix nigra* (black willow), and *Ulmus americana* (American elm). In addition, some examples contain or are codominated by *Acer negundo* (box-elder), *Betula nigra* (river birch), *Liquidambar styraciflua* (sweetgum), and/or *Platanus occidentalis* (American sycamore). The composition and physiognomy of the shrub and herbaceous layers are quite variable due to the broad geographic area in which this group occurs, as well as the dynamics of the frequent disturbances. Common shrubs include *Cornus drummondii* (roughleaf dogwood), *Ilex vomitoria* (yaupon), *Lindera benzoin* (northern spicebush), *Smilax* (greenbrier) spp., and *Toxicodendron radicans* (eastern poison-ivy). Sites are typically on sandbars, riverfronts, and levees of rivers and small streams, though some examples occur on the edges of lakes, and one alliance occurs primarily in the swales of Atlantic coastal dunes.

A3705 *Fraxinus pennsylvanica - Acer rubrum - Juniperus virginiana var. silicicola* Tidal Floodplain Forest Alliance

Stands are typically dominated or codominated by *Acer rubrum var. trilobum* (red maple), *Fraxinus pennsylvanica* (green ash), and *Juniperus virginiana var. silicicola* (southern red-cedar), with *Fraxinus profunda* (pumpkin ash), *Nyssa aquatica* (water tupelo), *Nyssa biflora* (swamp tupelo), *Persea palustris* (swamp bay), *Pinus taeda* (loblolly pine), *Quercus laurifolia* (laurel oak), and *Ulmus americana* (American elm). Examples may also contain *Nekemias arborea* (peppervine), *Bacopa monnieri* (herb of grace), *Ilex verticillata* (common winterberry), *Kosteletzkya virginica* (Virginia saltmarsh mallow), *Morella cerifera* (wax-myrtle), *Polygonum arifolium* (halberdleaf tearthumb), *Sambucus nigra ssp. canadensis* (American black elderberry), *Sicyos angulatus* (oneseed bur cucumber), and *Sabal minor* (dwarf palmetto). Woody vines are an important component of these forests; species include *Nekemias arborea* (peppervine), *Berchemia scandens* (Alabama supplejack), *Bignonia capreolata* (crossvine), *Campsis radicans* (trumpet creeper), *Cocculus carolinus* (Carolina coralbead), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Trachelospermum difforme* (climbing dogbane), *Vitis rotundifolia* (muscadine), and others. Some herbs may include *Bacopa monnieri* (herb of grace), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Cyperus* (flatsedge) spp., *Eleocharis* (spikerush) spp., *Hydrocotyle* (marsh-pennywort) sp., *Lythrum lineare* (wand lythrum), *Pluchea rosea* (rosy camphorweed), *Samolus valerandi ssp. parviflorus* (seaside brookweed), *Bolboschoenus robustus* (sturdy bulrush), *Solidago sempervirens var. mexicana* (seaside goldenrod), and *Typha angustifolia* (narrowleaf cattail). These are forests with some degree of tidal influence found in the Atlantic and Gulf coastal plains from Delaware south to Alabama. Some of the

vegetation types included here are near the conceptual boundary among tidal, saturated, and temporarily flooded hydrologies.

[CEGL006287] *Fraxinus profunda - Nyssa biflora - (Fraxinus pennsylvanica) / Ilex verticillata / Polygonum arifolium* Tidal Forest

Translated Name: **Pumpkin Ash - Swamp Tupelo - (Green Ash) / Common Winterberry / Halberd-leaf Tearthumb Tidal Forest**

Common Name: **Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest**

USNVC Classification

Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Southern Ash - Elm - Willow Floodplain Forest (G759)
Alliance	*Fraxinus pennsylvanica - Acer rubrum - Juniperus virginiana var. silicicola* Tidal Floodplain Forest Alliance (A3705)

Element Concept

Global Summary: This open- to closed-canopy swamp forest occurs on fresh tidal rivers from Delaware to Virginia and is best developed in the Chesapeake Bay drainage. It occurs at the upper reaches of tidal influence (and somewhat beyond in some cases) and generally receives diurnal or irregular tidal flooding. The canopy is dominated by few tree species, generally *Fraxinus profunda* (pumpkin ash), *Fraxinus pennsylvanica* (green ash), and *Nyssa biflora* (swamp tupelo). Other canopy associates vary among occurrences and often include *Nyssa sylvatica* (blackgum), *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Magnolia virginiana* (sweetbay), *Ulmus americana* (American elm), and *Pinus taeda* (loblolly pine). The shrub layer is well-developed and includes *Lindera benzoin* (northern spicebush), *Clethra alnifolia* (coastal sweet-pepperbush), *Eubotrys racemosa* (swamp doghobble), *Ilex verticillata* (common winterberry), *Ilex opaca* (American holly), *Ilex laevigata* (smooth winterberry), *Alnus serrulata* (hazel alder), *Rhododendron viscosum* (swamp azalea), *Viburnum dentatum* (southern arrow-wood), *Viburnum nudum* (possumhaw), *Viburnum recognitum* (southern arrow-wood), *Viburnum prunifolium* (blackhaw), *Amelanchier canadensis* (Canadian serviceberry), *Morella cerifera* (wax-myrtle), *Vaccinium corymbosum* (highbush blueberry), *Vaccinium fuscatum* (black highbush blueberry), *Itea virginica* (Virginia sweetspire), *Rosa palustris* (swamp rose), *Magnolia virginiana* (sweetbay), and *Cornus foemina* (stiff dogwood). *Alnus maritima* (seaside alder) is also characteristic in Outer Coastal Plain stands in Maryland and Delaware. Vines may be dense and include *Smilax rotundifolia* (roundleaf greenbrier), *Smilax laurifolia* (laurel greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Apios americana* (groundnut), *Parthenocissus quinquefolia* (Virginia creeper), *Bignonia capreolata* (crossvine), and *Dioscorea villosa* (wild yam). The herbaceous layer is variable in composition and richness. Common associates include *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum sagittatum* (arrowleaf tearthumb), *Peltandra virginica* (green arrow-arum), *Saururus cernuus* (lizard's-tail), *Carex bromoides* (brome-like sedge), *Impatiens capensis* (orange jewelweed), *Boehmeria cylindrica* (small-spike false nettle), *Carex intumescens* (greater bladder sedge), *Leersia oryzoides* (rice cutgrass), *Commelina virginica* (Virginia dayflower), *Cicuta maculata* (spotted water hemlock), *Arisaema triphyllum* (Jack in the pulpit), *Thalictrum pubescens* (king-of-the-meadow), *Thelypteris palustris* (eastern marsh fern), *Woodwardia areolata* (netted chainfern), *Carex stricta* (upright sedge), *Zizania aquatica* (annual wildrice), *Cinna arundinacea* (sweet woodreed), *Osmunda cinnamomea* (cinnamon fern), and *Osmunda regalis* (royal fern). The invasive exotic *Murdannia keisak* (wartremoving herb) can also occur in this association. In addition, stands that have suffered significant loss of canopy trees (presumably due to stress from sea-level rise) may be intermediate in appearance and composition between swamp forest and herbaceous marsh. This association is differentiated from tidal swamps to the north by the presence of species of southern affinity, including *Magnolia virginiana* (sweetbay), *Nyssa biflora* (swamp tupelo), and *Pinus taeda* (loblolly pine).

Environmental Description

George Washington Memorial Parkway Environment: Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest is a tidal forest bordering the main channels of the Potomac River on slightly higher landscape positions than, and adjacent to, tidal freshwater marshes. The swamp forest is subject to diurnal tidal flooding. Soil is generally organic-rich and typically has a deep organic horizon over silty alluvial deposits. Pronounced hummock-and-hollow

microtopography is characteristic. Hollows are inundated by diurnal tides; hummocks may be only irregularly flooded, and the tops of hummocks are only rarely submerged.

National Capital Parks-East Environment: This pumpkin ash swamp association occupies low-lying points and margins of freshwater tidal creeks and rivers. Inundation varies from regular to irregular tidal flooding. Stands are not very expansive and occupy only a few acres along Piscataway Creek between Mockley Point and Wharf Road, and near the mouths of small tidal creeks at Harmony Hall and Fort Foote. Substrates are predominately tidal mucks rich in organics and also containing minor amounts of sand, silt, and gravel. This association is positioned higher in elevation than adjacent emergent marsh types, i.e., Freshwater Tidal Mixed High Marsh (CEGL006325) and Atlantic Coast Brackish Tidal Marsh (CEGL004188).

Global Environment: This association occurs along fresh reaches of tidal rivers, usually receiving diurnal or irregular tidal flooding. There is distinct hummock-and-hollow microtopography with hollows flooded during higher tides. Development and persistence of this association appears to be limited downstream by halinity and upstream by the availability of sufficient sediment. Hence, tidal hardwood swamps are associated primarily with the upper (higher halinity) end of the freshwater portion of the halinity gradient and typically occur on higher landscape positions adjacent to tidal freshwater marshes. Soil is generally organic-rich and contains a frequently deep organic horizon over silty alluvial deposits. Pronounced hummock-and-hollow microtopography is characteristic. Hollows are inundated by diurnal tides; hummocks may be only irregularly flooded, and the tops of hummocks are only rarely (< annually) submerged (Rheinhardt 1992).

VEGETATION DESCRIPTION

George Washington Memorial Parkway Vegetation: This freshwater tidal swamp is a semi-open to closed forest with the canopy dominated by few tree species. *Fraxinus pennsylvanica* (green ash) is the most abundant canopy species and dominates most stands. Additional canopy associates vary with site and length of inundation but can include *Acer rubrum* (red maple), *Ulmus americana* (American elm), *Nyssa biflora* (swamp tupelo), *Fraxinus profunda* (pumpkin ash), and *Liquidambar styraciflua* (sweetgum). The woody vines *Parthenocissus quinquefolia* (Virginia creeper) and *Toxicodendron radicans* (eastern poison-ivy) can have high cover and frequently grow into the subcanopy layer. The shrub stratum is extraordinarily diverse and often quite dense (>50% shrub cover over a given area). Common shrub species include *Itea virginica* (Virginia sweetspire), *Viburnum dentatum* (southern arrow-wood), *Ilex verticillata* (common winterberry), *Lindera benzoin* (northern spicebush), *Alnus serrulata* (hazel alder), and *Cornus amomum* (silky dogwood). The herbaceous layer is variable in composition and density. Common species include *Polygonum arifolium* (halberdleaf tearthumb), *Bidens laevis* (smooth beggarticks), *Apios americana* (groundnut), *Cicuta maculata* (spotted water hemlock), *Peltandra virginica* (green arrow-arum), *Impatiens capensis* (orange jewelweed), *Boehmeria cylindrica* (small-spike false nettle), *Amphicarpaea bracteata* (American hogpeanut), and *Pilea fontana* (lesser clearweed). The invasive exotics *Murdannia keisak* (wartremoving herb) and *Clematis terniflora* (sweet autumn virginsbower) (a vine) can also be quite abundant in the herb layer.

National Capital Parks-East Vegetation: This diverse and structurally complex tidal swamp has an open canopy dominated by *Fraxinus profunda* (pumpkin ash). Canopies are >25m in height and poorly developed, with *Fraxinus profunda* (pumpkin ash) accounting for approximately 25% cover. The subcanopy is sparse and contains species such as *Acer rubrum* (red maple), *Fraxinus profunda* (pumpkin ash), and *Fraxinus pennsylvanica* (green ash) at low cover. These swamps typically have a relatively open shrub stratum that is variable in species richness. The most constant shrub species include *Cornus amomum* (silky dogwood), *Ilex verticillata* (common winterberry), *Alnus serrulata* (hazel alder), *Viburnum recognitum* (southern arrow-wood), and *Rosa palustris* (swamp rose). Other notable taxa in this stratum include *Lindera benzoin* (northern spicebush), *Ulmus americana* (American elm), *Viburnum prunifolium* (blackhaw), and *Eubotrys racemosa* (swamp doghobble). Depending on landscape position and proximity to habitats with non-tidal hydrology (i.e., backswamps), stands may occasionally contain a few individuals of *Acer negundo* (box-elder) and *Platanus occidentalis* (American sycamore). Lianas and herbaceous vines are also common in multiple strata and can abound in light gaps and on stand edges. Vines common in these woodlands include species such as *Toxicodendron radicans* (eastern poison-ivy), *Smilax rotundifolia* (roundleaf greenbrier), *Apios americana* (groundnut), *Parthenocissus quinquefolia* (Virginia creeper), and *Mikania scandens* (climbing hempvine). Species richness in the herbaceous layer is exceptionally high and can be attributed to microtopographic features (i.e., hummock-and-hollow), elevation and duration of tidal flooding. Regularly flooded hollows primarily support flood-tolerant swamp species such as *Polygonum sagittatum* (arrowleaf tearthumb), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum punctatum* (dotted smartweed), *Impatiens capensis* (orange jewelweed), and *Peltandra virginica* (green arrow-arum). Species such as *Viola cucullata* (marsh blue violet), *Cicuta maculata* (spotted water hemlock), *Onoclea sensibilis* (sensitive fern), and *Boehmeria cylindrica* (small-spike false nettle) prefer establishment on slightly drier, elevated hummocks.

Global Vegetation: The canopy of this freshwater tidal swamp is dominated by few tree species, generally *Fraxinus profunda* (pumpkin ash), *Fraxinus pennsylvanica* (green ash), and *Nyssa biflora* (swamp tupelo). Other canopy associates vary among occurrences and often include *Nyssa sylvatica* (blackgum), *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Magnolia virginiana* (sweetbay), *Ulmus americana* (American elm), and *Pinus taeda* (loblolly pine). The shrub layer is well-developed and includes *Lindera benzoin* (northern spicebush), *Clethra alnifolia* (coastal sweet-pepperbush), *Eubotrys racemosa* (swamp doghobble), *Ilex verticillata* (common winterberry), *Ilex opaca* (American holly), *Ilex laevigata* (smooth winterberry), *Alnus serrulata* (hazel alder), *Rhododendron viscosum* (swamp azalea), *Viburnum dentatum* (southern arrow-wood), *Viburnum nudum* (possumhaw), *Viburnum recognitum* (southern arrow-wood), *Viburnum prunifolium* (blackhaw), *Amelanchier canadensis* (Canadian serviceberry), *Morella cerifera* (wax-myrtle), *Vaccinium corymbosum* (highbush blueberry), *Vaccinium fuscatum* (black highbush blueberry), *Itea virginica* (Virginia sweetspire), *Rosa palustris* (swamp rose), and *Cornus foemina* (stiff dogwood). *Alnus maritima* (seaside alder) is also characteristic in Outer Coastal Plain stands in Maryland and Delaware. Rheinhardt (1992) noted that the richness of subcanopy and shrub species rivals that of any temperate forest in eastern North America. Vines may also be dense and include *Apios americana* (groundnut), *Dioscorea villosa* (wild yam), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), *Smilax laurifolia* (laurel greenbrier), and *Toxicodendron radicans* (eastern poison-ivy). The herbaceous layer is variable in composition and richness. Common associates include *Arisaema triphyllum* (Jack in the pulpit), *Boehmeria cylindrica* (small-spike false nettle), *Carex bromoides* (brome-like sedge), *Carex intumescens* (greater bladder sedge), *Carex stricta* (upright sedge), *Cicuta maculata* (spotted water hemlock), *Cinna arundinacea* (sweet woodreed), *Commelina virginica* (Virginia dayflower), *Impatiens capensis* (orange jewelweed), *Leersia oryzoides* (rice cutgrass), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Peltandra virginica* (green arrow-arum), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum sagittatum* (arrowleaf tearthumb), *Saururus cernuus* (lizard's-tail), *Thalictrum pubescens* (king-of-the-meadow), *Thelypteris palustris* (eastern marsh fern), *Woodwardia areolata* (netted chainfern), and *Zizania aquatica* (annual wildrice). Invasive exotics such as *Murdannia keisak* (wartremoving herb) and *Clematis terniflora* (sweet autumn virginsbower) may also occur in this association. On the Pamunkey River in east-central Virginia, several herbaceous species, particularly *Agalinis purpurea* (purple false foxglove) and *Rhynchospora macrostachya* (tall horned beaksedge), appear to be more common and characteristic of these disturbed stands than in either undisturbed tidal swamp forests or marshes.
Global Dynamics: *Fraxinus pennsylvanica* (green ash) and *Nyssa biflora* (swamp tupelo) tend to sort out where there is longer inundation and a mean water table near the hummock surface. *Acer rubrum* (red maple) and *Liquidambar styraciflua* (sweetgum) tend to occur where the mean water table is relatively lower (Rheinhardt 1992). Duration of flooding is a poorer predictor of canopy composition than mean depth of flooding. Certain sites exhibit crown stress and tree mortality from sea-level rise, resulting in a shift from forest to woodland physiognomy and the apparent invasion by herbaceous species characteristic of emergent marshes. On the Pamunkey River in east-central Virginia, several herbaceous species, particularly *Agalinis purpurea* (purple false foxglove) and *Rhynchospora macrostachya* (tall horned beaksedge), appear to be more common and characteristic of these disturbed stands than in either undisturbed tidal swamp forests or marshes.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fraxinus pennsylvanica* (green ash), *Fraxinus profunda* (pumpkin ash), *Nyssa biflora* (swamp tupelo)

CHARACTERISTIC SPECIES

George Washington Memorial Parkway: *Fraxinus pennsylvanica* (green ash), *Itea virginica* (Virginia sweetspire), *Nyssa biflora* (swamp tupelo), *Polygonum arifolium* (halberdleaf tearthumb), *Viburnum dentatum* (southern arrow-wood)
National Capital Parks-East: *Fraxinus profunda* (pumpkin ash)
Global: *Alnus maritima* (seaside alder), *Fraxinus pennsylvanica* (green ash), *Fraxinus profunda* (pumpkin ash), *Ilex verticillata* (common winterberry), *Nyssa biflora* (swamp tupelo), *Polygonum arifolium* (halberdleaf tearthumb)

OTHER NOTEWORTHY SPECIES

George Washington Memorial Parkway: Invasive/Exotic Plants: *Clematis terniflora* (sweet autumn virginsbower), *Murdannia keisak* (wartremoving herb, Medium/Low)

Global: Vulnerable Plants: *Alnus maritima* (seaside alder, G3); **Invasive/Exotic Plants**: *Clematis terniflora* (sweet autumn virginsbower), *Murdannia keisak* (wartremoving herb, Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (03-Dec-1998). This tidal hardwood swamp community has a restricted range, being confined to tidal rivers of Virginia, Maryland, and Delaware. It is estimated that there are fewer than 100 occurrences and 85,000 acres rangewide. The community is threatened by damming of rivers which results in restricting tidal influence and thus community structure and composition. It is also threatened by agricultural practices, particularly by pesticide and fertilizer runoff.

RELATED CONCEPTS

Global Similar Types:

- *Acer rubrum - Fraxinus pennsylvanica / Polygonum* spp. Floodplain Forest (CEGL006165) is the northern analog of this association.
- *Acer rubrum / Alnus maritima ssp. maritima* Swamp Woodland (CEGL006317)
- *Taxodium distichum - Nyssa biflora - Fraxinus profunda / Peltandra virginica - (Bignonia capreolata)* Tidal Forest (CEGL006850)

Global Related Concepts:

- *Acer rubrum - Fraxinus (pennsylvanica, profunda)* Tidal Forest (Clancy 1996) =
- *Acer rubrum - Fraxinus pennsylvanica* Tidal Forest (Bowman 2000) =
- *Fraxinus (pennsylvanica, profunda) / Ilex verticillata / Polygonum punctatum - Peltandra virginica - Saururus cernuus* Tidally Flooded Forest (McCoy and Fleming 2000) =
- *Fraxinus profunda - Nyssa biflora / Ilex verticillata - Alnus serrulata / Polygonum arifolium* Tidal Forest (Coulling 2002) =
- *Fraxinus profunda - Nyssa biflora / Ilex verticillata / Polygonum arifolium* Tidal Forest (Walton et al. 2001) =
- Ash-blackgum swamp (Rheinhardt 1992) <
- Maple-sweetgum swamp (Rheinhardt 1992) <

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
George Washington Memorial Parkway Classification Comments: Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest, also referred to within the park as Freshwater Tidal Swamp or Freshwater Tidal Forest, is easily distinguished as it is the only tidal swamp forest in the park. All other tidal vegetation in the park is dominated by herbaceous species. However, on Roosevelt Island, this community occurs adjacent to, and intergrades with, Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest (CEGL006548) at the upstream limits of tidal influence. At this hydrological boundary, it may be difficult to distinguish these two swamp forests.
National Capital Parks-East Classification Comments: Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest is also referred to within the park as Freshwater Tidal Swamp or Freshwater Tidal Forest.
Global Classification Comments: This association is differentiated from tidal swamps to the north by the presence of species of southern affinity, including *Magnolia virginiana* (sweetbay), *Nyssa biflora* (swamp tupelo), and *Pinus taeda* (loblolly pine). This type is documented by more than 60 plots from the Chester, Choptank, James, Mattaponi, Nanticoke, Pamunkey, Pocomoke, and Potomac river drainages in Maryland, Delaware, and Virginia.

ELEMENT DISTRIBUTION

George Washington Memorial Parkway Range: This association is found scattered throughout the park along the edge of the Potomac River, with the greatest density of stands at Dyke Marsh. It is fairly well-represented in the park, but stands are small compared to those on some other tidal rivers.
National Capital Parks-East Range: Stands were sampled along Piscataway Creek between Mockley Point and Wharf Road, at the mouth of tidal creeks at Fort Foote and Harmony Hall in Maryland, and along Hunting Creek in Virginia.
Global Range: This association is restricted to tidal rivers in Delaware, Maryland, and Virginia.
Nations: US
States/Provinces: DC:SNR, DE:S3S4, MD:S4, VA:S3
TNC Ecoregions: 57:P, 58:C
USFS Ecoregions (2007): 232Ad:CCC, 232Ha:CC?, 232Hb:CCC, 232Hd:CCP, 232Ib:CCC, 232Je:C??
Federal Lands: DOD (Fort Belvoir); NPS (George Washington Parkway, National Capital-East); USFWS (Chesapeake Marshlands)

ELEMENT SOURCES

National Capital Parks-East Inventory Notes: MD data collected by MD NHP during 2003-2004 EPA funded classification study of forested tidal wetlands (Harrison 2004).
George Washington Memorial Parkway Plots: GWMP.27, GWMP.31.
National Capital Parks-East Plots: (3 plots: PISC001, PISC002, COAVA.9).
George Washington Memorial Parkway Description Author(s): K. Taverna and G. Fleming
National Capital Parks-East Description Author(s): J.W. Harrison
Global Description Author(s): S.L. Neid and G.P. Fleming
References: Bowman 2000, Clancy 1996, Coulling 2002, Coxe 2009, Eastern Ecology Working Group n.d.*, Fleming 2001a, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Harrison, J. pers. comm., McCoy and Fleming 2000, Rheinhardt 1991, Rheinhardt 1992, Tiner 1985a, Walton et al. 2001

M310. Southeastern North American Ruderal Flooded & Swamp Forest

This forest macrogroup represents vegetation growing on bottomland, riparian, and other wetland sites which have been subjected to anthropogenic disturbance and are dominated by trees which are characteristic of disturbed wetland sites and altered flooding regimes, such as *Acer rubrum* (red maple), *Celtis laevigata* (sugarberry), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Pinus elliottii var. elliottii* (slash pine), *Pinus taeda* (loblolly pine), and *Quercus nigra* (water oak). Also included are sites which may not have been subject to anthropogenic disturbance but have become dominated by invasive exotic trees or tall shrubs which are prolific seed-producers, such as *Ligustrum sinense* (Chinese privet), *Melaleuca quinquenervia* (punktree), *Schinus terebinthifolius* (Brazilian peppertree), and *Triadica sebifera* (Chinese tallow). Some of these forests, whether composed of exotic or native generalist trees, also have an exotic plant-dominated field (herb) stratum. Managed tree plantations in wetland sites are not included here, for instance of *Pinus elliottii var. elliottii* (slash pine) or *Pinus taeda* (loblolly pine). However, if these planted wetland stands are not managed and take on a more spontaneous, irregular structure and composition, such as becoming mixed with broad-leaved deciduous trees, they may be included here. The disturbances and resulting composition of these ruderal forests are typically distinct from native wetland forests subject to natural disturbances such as flooding, tornados, and hurricanes. This macrogroup is found in warm temperate areas in the south-central and southeastern United States, from New Jersey to Florida, and west to Arkansas and Texas.

G553. SOUTHEASTERN NATIVE RUDERAL FLOODED & SWAMP FOREST

This forest group represents vegetation growing on wetland sites which have been subjected to anthropogenic disturbance and are dominated by native trees which are characteristic of disturbed wetland sites, such as *Acer rubrum* (red maple), *Celtis laevigata* (sugarberry), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), and *Pinus taeda* (loblolly pine). Managed tree plantations are not included here, except for planted stands which are not managed and have become mixed with other trees. This group does not include stands managed as monocultures of one tree species, for forestry or in orchards. Wetland forests are subject to natural disturbances such as flooding, tornados, and hurricanes. Successional forests in functioning natural landscapes may regenerate following natural disturbances; those forests are not considered ruderal and are not included here.

A3343 *Acer rubrum - Liriodendron tulipifera* Ruderal Flooded & Swamp Forest Alliance

These broad-leaved deciduous forests are successional or ruderal and occur in wetlands, bottomlands, and temporarily or seasonally flooded riparian areas. They are dominated by trees such as *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Liquidambar styraciflua* (sweetgum), *Nyssa biflora* (swamp tupelo), and on wetter sites *Fraxinus pennsylvanica* (green ash), *Salix nigra* (black willow), and even *Taxodium distichum* (bald-cypress) in areas which have long hydroperiods. Exotic trees can be present, but are not dominant in these ruderal wetlands, including *Albizia julibrissin* (silktree), *Melia azedarach* (Chinaberrytree), *Morus alba* (white mulberry), and in the Gulf Coastal Plain *Triadica sebifera* (Chinese tallow). A shrub midstory is typical, mostly of broad-leaved, deciduous shrubs. In general there are more broad-leaved, evergreen shrubs further south and closer to the coast. *Morella cerifera* (wax-myrtle) is a very common nitrogen-fixing shrub in the Southern Coastal Plain. Herbaceous species are sparse, but can include certain ferns, graminoids and forbs. Understory exotic plants (of various growth forms) such as *Ligustrum sinense* (Chinese privet), *Lonicera japonica* (Japanese honeysuckle), and *Microstegium vimineum* (Nepalese browntop) commonly occur in forests of this alliance. This alliance occurs in the

south-central and southeastern United States. The many different kinds of sites have varied duration and depth of flooding.

[CEGL007330] *Liquidambar styraciflua - (Liriodendron tulipifera)* Ruderal Wet Forest

Translated Name: **Sweetgum - (Tuliptree) Ruderal Wet Forest**
Common Name: **Ruderal Sweetgum Wet Forest**

USNVC Classification

Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southeastern North American Ruderal Flooded & Swamp Forest (M310)
Group	Southeastern Native Ruderal Flooded & Swamp Forest (G553)
Alliance	*Acer rubrum - Liriodendron tulipifera* Ruderal Flooded & Swamp Forest Alliance (A3343)

Element Concept

Global Summary: This widespread association of the southeastern United States is dominated by *Liquidambar styraciflua* (sweetgum), but can be dominated by *Liriodendron tulipifera* (tuliptree) in some cases, and occurs on heavily disturbed sites such as wetland old fields that have been recovering for the past 10-60 years. This is a successional community that develops following clearcutting or other disturbance along floodplains of major creeks and other temporarily flooded areas. As this community ages, it often begins to approach the composition of more natural ~*Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin / Arisaema triphyllum* Floodplain Forest (CEGL004418)$$. This association is known from the Piedmont, Interior Low Plateau, Inner South Atlantic Coastal Plain, Upper East Gulf Coastal Plain, and possibly other provinces. *Acer rubrum* (red maple) may be a major component of the canopy and subcanopy and may even partially dominate in some instances. In more mature examples, other canopy/subcanopy species which may occur to a lesser extent and often as scattered emergents are *Quercus alba* (white oak), *Quercus phellos* (willow oak), *Quercus nigra* (water oak), *Nyssa sylvatica* (blackgum), and *Cornus florida* (flowering dogwood). Stands in the Inner Coastal Plain of South Carolina typically contain *Persea palustris* (swamp bay) and *Magnolia virginiana* (sweetbay). Some stands, as on the Chattahoochee River in Georgia, may contain *Acer negundo* (box-elder) as a codominant canopy/subcanopy component. The shrub layer can contain *Carpinus caroliniana* (American hornbeam), *Itea virginica* (Virginia sweetspire), *Vitis rotundifolia* (muscadine), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), and/or *Rubus* (blackberry) sp., in addition to canopy/subcanopy species. *Lonicera japonica* (Japanese honeysuckle) is often abundant in the understory. On disturbed sites, the shrub layer is often dominated by *Ligustrum sinense* (Chinese privet), and the ground layer is typically solid *Microstegium vimineum* (Nepalese browntop) or a tangle of *Smilax rotundifolia* (roundleaf greenbrier) and *Rubus* (blackberry) sp. The herbaceous layer may include *Chasmanthium laxum* (slender woodoats), *Carex* (sedge) spp., *Boehmeria cylindrica* (small-spike false nettle), and *Botrychium biternatum* (sparselobe grapefern), sometimes growing on hummocks in standing water.

Environmental Description

George Washington Memorial Parkway Environment: Ruderal Sweetgum Wet Forest is a successional deciduous forest that develops following clearcutting or other disturbances along well-drained floodplains of the Potomac River and its tributaries and other temporarily flooded areas.
National Capital Parks-East Environment: This is a successional deciduous forest that develops following clearcutting or other disturbances along well-drained floodplains and other temporarily flooded areas.
Global Environment: This association occurs on disturbed sites such as wetland old fields. This is a successional community that develops following clearcutting or other disturbance along floodplains of major creeks and other temporarily flooded areas. These are productive stream terraces subject to occasional flooding (Jones et al. 1981b).

Vegetation Description

George Washington Memorial Parkway Vegetation: This disturbed association generally has an even-aged canopy dominated by the early-successional species *Liquidambar styraciflua* (sweetgum) and/or *Liriodendron tulipifera* (tuliptree), often in mixtures with *Acer negundo* (box-elder), *Quercus phellos* (willow oak), *Quercus palustris* (pin oak), *Fraxinus pennsylvanica* (green ash), and other floodplain trees. The shrub layer often contains *Carpinus caroliniana* (American hornbeam), *Lindera benzoin* (northern spicebush), *Rubus* (blackberry) spp., and exotic shrubs such as *Rosa multiflora* (multiflora rose). Native and exotic vines are often rampant in the understory and climbing up trees. Native vines include *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), *Vitis* (grape) spp., and *Smilax rotundifolia* (roundleaf greenbrier). Common exotic vines

include *Celastrus orbiculatus* (oriental bittersweet), *Hedera helix* (English ivy), *Lonicera japonica* (Japanese honeysuckle), *Vinca minor* (common periwinkle), and *Wisteria sinensis* (Chinese wisteria). The herb layer in highly disturbed examples can have dense *Microstegium vimineum* (Nepalese browntop) (exotic) or a tangle of vines and briars. The herb layer of less disturbed sites may include *Thelypteris noveboracensis* (New York fern), *Boehmeria cylindrica* (small-spike false nettle), *Circaea lutetiana* (broadleaf enchanter's nightshade), *Impatiens capensis* (orange jewelweed), *Cinna arundinacea* (sweet woodreed), and various species of *Carex* (sedge).
National Capital Parks-East Vegetation: The canopy and subcanopy are a mixture of *Liquidambar styraciflua* (sweetgum) and *Liriodendron tulipifera* (tuliptree), with *Acer rubrum* (red maple), *Platanus occidentalis* (American sycamore), *Quercus palustris* (pin oak), and *Ulmus* (elm) spp. The tall-shrub stratum includes *Fraxinus pennsylvanica* (green ash) (which may be common), with *Acer rubrum* (red maple) and *Liquidambar styraciflua* (sweetgum). Shrubs include *Asimina triloba* (pawpaw), *Lindera benzoin* (northern spicebush), and *Rubus* (blackberry) sp. Some stands have a ground layer with *Boehmeria cylindrica* (small-spike false nettle) and abundant *Microstegium vimineum* (Nepalese browntop). The ground surface may have bare ground hollows that could hold water.
Global Vegetation: The canopy of this association is dominated by *Liquidambar styraciflua* (sweetgum) but can be dominated by *Liriodendron tulipifera* (tuliptree) in some cases. *Acer rubrum* (red maple) may be a major component of the canopy and subcanopy and may even partially dominate in some instances (TNC 1998a). In more mature examples, other canopy/subcanopy species which may occur to a lesser extent and often as scattered emergents are *Quercus alba* (white oak), *Quercus phellos* (willow oak), *Quercus nigra* (water oak), *Fraxinus americana* (white ash), *Carya* (hickory) spp., *Nyssa sylvatica* (blackgum), and *Cornus florida* (flowering dogwood). Stands in the Inner Coastal Plain of South Carolina typically contain *Persea palustris* (swamp bay) and *Magnolia virginiana* (sweetbay) (Jones et al. 1981b). The shrub layer contains *Carpinus caroliniana* (American hornbeam), *Itea virginica* (Virginia sweetspire), *Vitis rotundifolia* (muscadine), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), and *Rubus* (blackberry) sp., in addition to canopy/subcanopy species. *Lonicera japonica* (Japanese honeysuckle) is often abundant in the understory. On disturbed sites, the shrub layer is often dominated by *Ligustrum sinense* (Chinese privet), and the ground layer is typically solid *Microstegium vimineum* (Nepalese browntop) or a tangle of *Smilax rotundifolia* (roundleaf greenbrier) and *Rubus* (blackberry) sp. The herbaceous layer may include *Chasmanthium laxum* (slender woodoats), *Carex* (sedge) spp., *Boehmeria cylindrica* (small-spike false nettle), and *Botrychium biternatum* (sparselobe grapefern), sometimes growing on hummocks in standing water. Various *Carex* (sedge) species may be present.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Liquidambar styraciflua* (sweetgum)

CHARACTERISTIC SPECIES

George Washington Memorial Parkway: *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree)
National Capital Parks-East: *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree)
Global: *Boehmeria cylindrica* (small-spike false nettle), *Liriodendron tulipifera* (tuliptree), *Smilax rotundifolia* (roundleaf greenbrier)

OTHER NOTEWORTHY SPECIES

George Washington Memorial Parkway: Invasive/Exotic Plants: *Celastrus orbiculatus* (oriental bittersweet, High/Medium), *Hedera helix* (English ivy, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low); **Other Plants**: *Toxicodendron radicans* (eastern poison-ivy, G5)
National Capital Parks-East: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (08-Aug-2000). This is a successional community which develops following clearcutting or other disturbance along floodplains of major creeks and other temporarily flooded areas.

RELATED CONCEPTS

Global Similar Types:

- *Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin / Arisaema triphyllum* Floodplain Forest (CEGL004418) may be difficult to distinguish from older versions of this community; trees are older, uneven-aged, and the herbaceous layer more diverse in this association (CEGL004418).
- *Liriodendron tulipifera - Quercus alba - (Liquidambar styraciflua) / Ilex opaca / Polystichum acrostichoides* Piedmont Floodplain Forest (CEGL004900)
- *Quercus alba - Carya ovata - Liriodendron tulipifera - (Quercus phellos) / Cornus florida* Forest (CEGL007709)
- *Quercus phellos - Quercus alba / Vaccinium fuscatum - (Viburnum nudum) / Carex barrattii* Wet Forest (CEGL007364)

Global Related Concepts:

- Sweet gum-red maple-red bay community (Jones et al. 1981b) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
George Washington Memorial Parkway Classification Comments: Ruderal Sweetgum Wet Forest, also referred to as Successional Sweetgum Wet Forest or Successional Sweetgum Floodplain Forest, can be distinguished from Ruderal Tuliptree Forest (Rich Type) (CEGL007220) and Ruderal Tuliptree Forest (Typic Type) (CEGL007221) by its location along waterways and the prevalence of species more typical of floodplain habitats such as *Fraxinus pennsylvanica* (green ash), *Carpinus caroliniana* (American hornbeam), *Impatiens capensis* (orange jewelweed), and *Boehmeria cylindrica* (small-spike false nettle).
National Capital Parks-East Classification Comments: Ruderal Sweetgum Wet Forest is also referred to as Successional Sweetgum Wet Forest or Successional Sweetgum Floodplain Forest.
Global Classification Comments: At Arnold Air Force Base (Tennessee), this community is found primarily in the vicinity of Hunt Creek, Heron Pond, and Sinking Pond in areas that have experienced logging. Prior to logging, these areas would probably have had canopies dominated by *Quercus phellos* (willow oak) or *Quercus alba* (white oak), with the overall community structure being that of *~Quercus alba - Carya ovata - Liriodendron tulipifera - (Quercus phellos) / Cornus florida* Forest (CEGL007709)$$ or possibly *~Quercus phellos - Quercus alba / Vaccinium fuscatum - (Viburnum nudum) / Carex barrattii* Wet Forest (CEGL007364)$$. The sweet gum-red maple-red bay community of Jones et al. (1981b) (2 stands sampled) is included here.

ELEMENT DISTRIBUTION

George Washington Memorial Parkway Range: Ruderal Sweetgum Wet Forest occurs as small patches scattered in the southern half of the park, mostly in non-tidal areas of the Potomac River and Hunting Creek floodplains. The largest stands are located in the vicinity of Dyke Marsh.
National Capital Parks-East Range: This successional floodplain type is primarily known from Piscataway, but some small areas have been mapped along the northern Baltimore-Washington Parkway.
Global Range: This widespread association is known from the Piedmont, Southern Ridge and Valley, Interior Low Plateau, South Atlantic and Mid-Atlantic coastal plains, Upper East Gulf Coastal Plain, Chesapeake Bay, and possibly other provinces.
Nations: US
States/Provinces: AL:SNA, DC:SNA, GA:SNR, KY:SNA, MD:SNA, MS:SNA, NC:SNA, NJ?:SNA, SC:SNA, TN:SNA, VA:SNA
TNC Ecoregions: 43:C, 44:C, 50:C, 52:C, 56:C, 57:C, 58:C
USFS Ecoregions (2007): 221Hc:CCC, 223Dg:CCC, 223Eb:CCC, 223Eg:CCC, 231Aa:CCP, 231Ab:CCC, 231Ba:CCC, 231Bd:CCC, 231Be:CCC, 231Bk:CCC, 231Cc:CCC, 231Cd:CCC, 231D:CC, 231Hb:CCC, 231Hc:CCC, 231Hi:CCC, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ad:CCC, 232Cg:CCC, 232Ha:CC?, 232Je:C??
Federal Lands: DOD (Arnold, Fort Benning?); DOE (Savannah River Site); NPS (Big South Fork, Chattahoochee River, Chickamauga-Chattanooga?, Cowpens, Fort Donelson, Fredericksburg-Spotsylvania, George Washington Parkway, Horseshoe Bend, Kings Mountain, Little River Canyon, Mammoth Cave, Natchez Trace, National Capital-East, Shiloh); USFS (Bankhead?, Bienville?, Daniel Boone, De Soto?, Delta?, Francis Marion?, Holly Springs?, Homochitto?, Oconee?, St. Francis, Sumter (Piedmont)?, Talladega (Oakmulgee)?, Talladega?, Tombigbee?, Tuskegee?); USFWS (Patuxent)

ELEMENT SOURCES

George Washington Memorial Parkway Plots: None.
National Capital Parks-East Plots: None.
George Washington Memorial Parkway Description Author(s): K. Taverna and G.P. Fleming

National Capital Parks-East Description Author(s): M. Pyne
Global Description Author(s): A.S. Weakley and R. White
References: GNHP unpubl. data 2018, Jones et al. 1981b, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman et al. 2011, Patterson 2008e, Pyne et al. 2010, Schotz et al. 2008, Southeastern Ecology Working Group n.d.*, TNC 1998a, Taverna and Patterson 2008, White 2004, White 2005, White and Govus 2005

2. Shrub & Herb Vegetation

Grasslands, shrublands, open tree savannas, marshes, bogs and fens dominated by broadly mesomorphic (including scleromorphic) shrub and herb growth forms (including *broad-leaved*, *needle-leaved*, and *sclerophyllous shrubs*, and *forb* and *graminoid herbs*) with an irregular horizontal canopy structure, mesomorphic trees typically <10% cover (but tropical tree savannas typically <40%), tropical to boreal and subalpine climates, and wet to dry substrate conditions.

2.B.2. Temperate Grassland & Shrubland

Temperate Grassland, Meadow & Shrubland is dominated by perennial grasses, forbs and shrubs typical of moderately dry to moist habitats and is found in the mid-latitude regions of all continents (23° to 55°N and S), varying from large open grassland landscapes to droughty hillside meadows in forested landscapes.

2.B.2.NC. EASTERN NORTH AMERICAN GRASSLAND & SHRUBLAND

This division consists of open grasslands and shrublands in the northern and central regions of eastern Canada and the United States. Vegetation occurs on a variety of soil types and depth, with acidic to basic pH, that range in depth from deep loams to exposed rock. Vegetation types are colloquially known as alvars, balds, barrens, flatrocks, and glades, and often contain a prairie-like flora, but with distinctive eastern elements.

M506. Appalachian Rocky Felsic & Mafic Scrub & Grassland

This vegetation macrogroup encompasses a variety of grass- and shrub-dominated communities, sometimes with scattered and/or stunted trees, known colloquially as balds, barrens, flatrocks, rock outcrops, rocky domes, and rocky summits. They are found in the Appalachian and Piedmont regions of the eastern United States (with outliers in adjacent Canada), from higher to lower elevations. A suite of species tolerant of dry and rocky conditions are characteristic. At lower elevations this includes *Danthonia spicata* (poverty oatgrass), *Dichanthelium* (rosette grass) spp., and *Schizachyrium scoparium* (little bluestem), with trees including *Pinus virginiana* (Virginia pine), *Quercus montana* (chestnut oak), *Quercus stellata* (post oak), and/or *Quercus velutina* (black oak). At higher elevations this includes *Carex pensylvanica* (Pennsylvania sedge), *Danthonia compressa* (flattened oatgrass), *Huperzia selago* (fir clubmoss), *Minuartia groenlandica* (Greenland stitchwort), *Sibbaldiopsis tridentata* (shrubby fivefingers), and *Trichophorum cespitosum* (tufted bulrush). Shrubs may include *Kalmia latifolia* (mountain laurel), *Rhododendron catawbiense* (Catawba rosebay), and *Vaccinium corymbosum* (highbush blueberry). Appalachian oak barrens are dominated by grasses and shrubs, typically with scattered trees, including *Juniperus virginiana var. virginiana* (eastern red-cedar), *Quercus marilandica* (blackjack oak), *Quercus montana* (chestnut oak), *Quercus stellata* (post oak), and/or *Quercus velutina* (black oak) found on rocky substrates of a range of soil chemistries in the broadly-conceived Appalachian region. Appalachian balds may be dominated by shrubs or by graminoids and low forbs and are found on higher peaks in the Southern Appalachians. The most characteristic species are *Carex pensylvanica* (Pennsylvania sedge), *Danthonia compressa* (flattened oatgrass), *Rhododendron catawbiense* (Catawba rosebay), and *Sibbaldiopsis tridentata* (shrubby fivefingers). Granitic domes, flatrocks, and associated solution pools are found in the southern Piedmont of the United States. This vegetation is dominated by *Croton michauxii var. ellipticus* (Willdenow's croton), *Minuartia glabra* (Appalachian stitchwort), *Packera tomentosa* (woolly ragwort), *Schizachyrium scoparium* (little bluestem), and *Phemeranthus* (flameflower) spp., with *Diamorpha smallii* (elf orpine) having high cover in some examples. The pools are distinctive and contain *Amphianthus pusillus* (little amphianthus).

G180. APPALACHIAN MAFIC GLADE

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* (pitch pine), *Pinus virginiana* (Virginia pine), *Juniperus virginiana var. virginiana* (eastern red-cedar), and/or *Quercus alba* (white oak), *Quercus marilandica* (blackjack oak), and *Quercus stellata* (post oak) in the often stunted canopy. Trees can include *Fraxinus americana* (white ash), *Ulmus alata* (winged elm), and *Cercis canadensis* (eastern redbud) 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

This Appalachian shale barrens vegetation is dominated by native graminoids such as *Andropogon* (bluestem) sp., *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Piptochaetium avenaceum* (blackseed speargrass), *Schizachyrium scoparium* (little bluestem), and *Sporobolus compositus* (composite dropseed), with some scattered *Juniperus virginiana var. virginiana* (eastern red-cedar), *Quercus montana* (chestnut oak), *Quercus stellata* (post oak), and/or *Quercus velutina* (black oak) 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.

[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 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 association is a woodland dominated by *Fraxinus americana* (white ash) and *Carya glabra* (pignut hickory), 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* (red hickory), *Quercus montana* (chestnut oak), *Quercus rubra var. rubra* (northern red oak), *Juniperus virginiana* (eastern red-cedar), and *Pinus virginiana* (Virginia pine). Subcanopy species include *Celtis tenuifolia* (dwarf hackberry), *Celtis occidentalis* (common hackberry), *Cercis canadensis var. canadensis* (eastern redbud), *Ostrya virginiana* (hophornbeam), and *Ulmus rubra* (slippery elm). The shrub stratum includes *Rhus aromatica var. aromatica* (fragrant sumac), *Ptelea trifoliata* (common hoptree), *Viburnum rafinesqueanum* (downy arrow-wood), *Rhus typhina* (staghorn sumac), *Toxicodendron radicans* (eastern poison-ivy), and *Vaccinium pallidum* (Blue Ridge blueberry). Typical species of

the herb stratum include *Muhlenbergia sobolifera* (rock muhly), *Helianthus divaricatus* (woodland sunflower), *Pycnanthemum incanum* (hoary mountainmint), *Elymus hystrix* (eastern bottlebrush grass), *Carex pensylvanica* (Pennsylvania sedge), *Polygonum tenue* (pleatleaf knotweed), *Woodsia ilvensis* (rusty woodsia), *Woodsia obtusa* (bluntlobe cliff fern), *Phacelia dubia* (smallflower phacelia), *Symphyotrichum oblongifolium* (aromatic aster), *Solidago arguta var. harrisii* (Harris' goldenrod), *Selaginella rupestris* (northern selaginella), *Cheilanthes lanosa* (hairy lipfern), *Danthonia spicata* (poverty oatgrass), *Cardamine parviflora var. arenicola* (sand bittercress), *Draba ramosissima* (branched draba), *Sedum glaucophyllum* (cliff stonecrop), and others.

Environmental Description

Catoctin Mountain Park Environment: These woodlands are generally small patches embedded within Central Appalachian Basic Oak - Hickory Forest (Western Piedmont / Lower Blue Ridge Type) (CEGL008514). Soils are thin, sandy loam, often stony, and exposed rock outcrops and boulders are common. Slopes range from gentle to moderately steep. Nearly all stands occur on south- or east-facing slopes at elevations ranging from 365-555 m (1200-1820 feet).

Chesapeake & Ohio Canal National Historical Park Environment: This white ash - oak woodland was sampled at plots in eight locations in the park. Sites are steep to very steep upper sideslopes with west aspects. The soils are rapidly to well-drained sandy loam which may be gravelly or rocky. The unvegetated surface is dominated by leaf litter (67-82% cover) with some exposed bedrock (0-20%), large rocks (3-10%), wood (1-3%), bare soil (0-5%), and mosses and lichens (0-20%); one site has 25% standing water. Evidence of disturbance includes erosion, deer trails and grazing/browsing, and the presence of exotic species.

Harpers Ferry National Historical Park Environment: Central Appalachian Basic Woodland typically occurs at Harpers Ferry on south-facing slopes with exposed outcrops of metabasalt, metasiltstone, or phyllite. Habitats are usually dry, exposed, middle and upper slope sites with high cover of bedrock and bouldery debris. Soils collected from plots are, on average, strongly acidic with high Mg and Ca levels.

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

Catoctin Mountain Park Vegetation: Many stands of this vegetation are weedy and appear disturbed due to downed trees. Trees are often open-grown, gnarled and stunted, and snags are common, *Fraxinus americana* (white ash) in particular. Canopy cover ranges from approximately 20-60%. The most frequent canopy species are *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash), *Quercus montana* (chestnut oak), and *Quercus alba* (white oak). Other associated canopy trees may include *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Amelanchier arborea* (common serviceberry), *Betula lenta* (sweet birch), *Carya ovalis* (red hickory), *Carya ovata* (shagbark hickory), and *Quercus rubra* (northern red oak). Understory trees and shrubs are generally absent to very low cover, usually consisting of smaller individuals of canopy species, or *Sassafras albidum* (sassafras). The ground layer is often grassy, up to 70% cover. The ground surface is composed of litter, downed wood, and boulders or outcrops with crustose and foliose lichens. The most frequent herbaceous species include *Asplenium platyneuron* (ebony spleenwort), *Brachyelytrum erectum* (bearded shorthusk), *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix* (eastern bottlebrush grass), *Oxalis stricta* (common yellow oxalis), and *Paronychia canadensis* (smooth forked nailwort). Other herbs include *Desmodium nudiflorum* (nakedflower ticktrefoil), *Galium circaezans* (licorice bedstraw), *Hackelia virginiana* (beggarslice), and *Muhlenbergia sobolifera* (rock muhly). *Vaccinium pallidum* (Blue Ridge blueberry) may occur as small scattered individuals. Invasive exotic species can contribute high cover, most commonly *Microstegium vimineum* (Nepalese browntop).

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderate (40-60% cover) tree canopy, 10-20 m tall, is dominated by *Fraxinus americana* (white ash), *Quercus montana* (chestnut oak), and *Quercus rubra*

(northern red oak). The sparse (20-40%) tall-shrub (6-10 m) and short-shrub (1-6 m) layer are dominated by canopy species along with *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), and *Ulmus americana* (American elm). Some other shrubs are *Celtis tenuifolia* (dwarf hackberry), *Juniperus virginiana* (eastern red-cedar), *Prunus serotina var. serotina* (black cherry), *Viburnum prunifolium* (blackhaw), The herbaceous layer (40-80+%) is dominated by *Bidens bipinnata* (Spanish needles), *Carex cephalophora* (oval-leaf sedge), *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Helianthus divaricatus* (woodland sunflower), and *Muhlenbergia sobolifera* (rock muhly). Vines of *Vitis aestivalis var. aestivalis* (summer grape) climb into the upper layers. Nonvascular species cover up to 20% of the ground surface. A total of 10 exotic species were reported from sampled stands. In addition, this community also supports Maryland state-imperiled *Amelanchier stolonifera* (running serviceberry).

Harpers Ferry National Historical Park Vegetation: Vegetation consists of open to very open woodlands with stunted canopies of 6- to 15-m tall trees. The canopy is dominated by *Fraxinus americana* (white ash) and *Carya glabra* (pignut hickory). Less constant and important canopy species include *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Carya tomentosa* (mockernut hickory), and occasionally *Pinus virginiana* (Virginia pine). The subcanopy is less dense (10-25% cover), and a mix of species occur with variable cover. Common species include *Celtis occidentalis* (common hackberry), *Ulmus rubra* (slippery elm), *Prunus serotina* (black cherry), *Amelanchier arborea* (common serviceberry), *Sassafras albidum* (sassafras), and *Nyssa sylvatica* (blackgum). The shrub layer is open with only scattered low cover of species such as *Hypericum prolificum* (shrubby St. Johnswort), *Viburnum prunifolium* (blackhaw), *Vaccinium pallidum* (Blue Ridge blueberry), *Rubus flagellaris* (northern dewberry), and the vines *Vitis aestivalis* (summer grape) and *Toxicodendron radicans* (eastern poison-ivy). The herb layer varies from moderately open to dense and contains a diversity of xerophytic grasses and forbs. Patch-dominant herbs include *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix* (eastern bottlebrush grass), *Helianthus divaricatus* (woodland sunflower), *Muhlenbergia sobolifera* (rock muhly), *Pycnanthemum incanum* (hoary mountainmint), and *Solidago ulmifolia* (elmleaf goldenrod).

Global Vegetation: *Fraxinus americana* (white ash) is the characteristic, consistently dominant or codominant canopy species, usually contributing at least 25% cover. *Carya glabra* (pignut hickory) and, less frequently, *Carya ovata* (shagbark hickory) and *Carya ovalis* (red hickory) are common codominant overstory associates. *Quercus montana* (chestnut oak), *Quercus rubra* (northern red oak), *Juniperus virginiana* (eastern red-cedar), *Pinus virginiana* (Virginia pine), and *Juglans nigra* (black walnut) are minor canopy trees. Understory and shrub layers vary in density, with *Ulmus rubra* (slippery elm), *Celtis occidentalis* (common hackberry), *Ostrya virginiana* (hophornbeam), *Cercis canadensis* (eastern redbud), and *Rosa carolina* (Carolina rose) 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* (rock muhly), *Helianthus divaricatus* (woodland sunflower), *Solidago ulmifolia* (elmleaf goldenrod), *Carex pensylvanica* (Pennsylvania sedge), *Elymus hystrix* (eastern bottlebrush grass), and *Phacelia dubia* (smallflower phacelia). Unusual stands that occur on concave slopes at two Virginia sites have herb layers dominated by *Chasmanthium latifolium* (Indian woodoats). Less abundant but relatively constant (50%) herbs include *Acalypha virginica* (Virginia threeseed mercury), *Ambrosia artemisiifolia* (annual ragweed), *Antennaria plantaginifolia* (woman's tobacco), *Arabis laevigata* (smooth rockcress), *Danthonia spicata* (poverty oatgrass), *Dichanthelium boscii* (Bosc's panicgrass), *Dichanthelium linearifolium* (slimleaf panicgrass), *Eupatorium sessilifolium* (upland boneset), *Geum virginianum* (cream avens), *Heuchera americana* (American alumroot), *Lespedeza frutescens* (shrubby lespedeza), *Polygonum scandens var. cristatum* (climbing false buckwheat), *Pycnanthemum incanum* (hoary mountainmint), *Saxifraga virginiensis* (early saxifrage), and *Woodsia obtusa* (bluntlobe cliff fern). Less frequent but locally abundant or important herbaceous species include *Schizachyrium scoparium* (little bluestem), *Senna marilandica* (Maryland senna), *Symphyotrichum laeve var. concinnum* (smooth blue aster), *Symphyotrichum oblongifolium* (aromatic aster), and *Tradescantia ohiensis* (bluejacket); the last species is prominent at, but confined to, the southernmost sites for this community in Giles and Grayson counties. *Solidago juncea* (early goldenrod), *Carex muehlenbergii var. enervis* (Muhlenberg's sedge), *Lespedeza virginica* (slender lespedeza), and *Dichanthelium depauperatum* (starved panicgrass) 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* (white ash) is the sole canopy dominant of this variant, with minor associates of *Quercus montana* (chestnut oak), *Tilia americana* (American basswood), *Ulmus rubra* (slippery elm), and *Carya ovata* (shagbark hickory). The shrub layer contains young reproduction of the canopy species, as well as *Celtis occidentalis* (common hackberry), *Ostrya virginiana* (hophornbeam), *Rosa carolina* (Carolina rose), and *Crataegus pruinosa* (waxyfruit hawthorn). Scrambling vines of *Parthenocissus*

quinquefolia (Virginia creeper), *Vitis aestivalis* (summer grape), and *Toxicodendron radicans* (eastern poison-ivy) are abundant. The herb layer is moderately dense to dense (>60% cover) despite the abundant rock cover. The lithophytes *Dryopteris marginalis* (marginal woodfern), *Sedum glaucophyllum* (cliff stonecrop), *Carex communis* (fibrousroot sedge), and *Saxifraga virginiensis* (early saxifrage) contribute the greatest herbaceous cover. Species richness of plot-sampled stands ranges from 46 to 103 taxa per 400 m2 (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* (Asiatic dayflower) and the shrub *Symphoricarpos orbiculatus* (coralberry), introduced from farther west, are problematic invasives at some sites. *Symphoricarpos orbiculatus* (coralberry) is particularly aggressive and is capable of covering large areas with dense colonies in a matter of years, once established.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya glabra* (pignut hickory), *Quercus montana* (chestnut oak)
Herb (field)	Graminoid	*Carex pensylvanica* (Pennsylvania sedge), *Muhlenbergia sobolifera* (rock muhly)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Asplenium platyneuron* (ebony spleenwort), *Brachyelytrum erectum* (bearded shorthusk), *Carex pensylvanica* (Pennsylvania sedge), *Carya glabra* (pignut hickory), *Carya tomentosa* (mockernut hickory), *Danthonia spicata* (poverty oatgrass), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Dichanthelium boscii* (Bosc's panicgrass), *Elymus hystrix* (eastern bottlebrush grass), *Fraxinus americana* (white ash), *Muhlenbergia sobolifera* (rock muhly), *Paronychia canadensis* (smooth forked nailwort), *Quercus alba* (white oak), *Quercus montana* (chestnut oak)

Chesapeake & Ohio Canal National Historical Park: *Carya glabra* (pignut hickory), *Fraxinus americana* (white ash)

Harpers Ferry National Historical Park: *Carex pensylvanica* (Pennsylvania sedge), *Carya glabra* (pignut hickory), *Danthonia spicata* (poverty oatgrass), *Fraxinus americana* (white ash), *Muhlenbergia sobolifera* (rock muhly)

Global: *Carex pensylvanica* (Pennsylvania sedge), *Carya glabra* (pignut hickory), *Dichanthelium linearifolium* (slimleaf panicgrass), *Elymus hystrix* (eastern bottlebrush grass), *Fraxinus americana* (white ash), *Helianthus divaricatus* (woodland sunflower), *Muhlenbergia sobolifera* (rock muhly), *Phacelia dubia* (smallflower phacelia), *Pycnanthemum incanum* (hoary mountainmint), *Solidago ulmifolia* (elmleaf goldenrod), *Woodsia obtusa* (bluntlobe cliff fern)

OTHER NOTEWORTHY SPECIES

Catoctin Mountain Park: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Amelanchier stolonifera* (running serviceberry, G5, MD-imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Hypericum perforatum* (common St. Johnswort, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Poa compressa* (Canada bluegrass, High/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Setaria pumila* (yellow foxtail, Low/Insignificant), *Taraxacum officinale* (common dandelion), *Verbascum thapsus* (common mullein, Medium)

Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium)

Global: Vulnerable Plants: *Cuscuta coryli* (hazel dodder, G5?, VA state-rare), *Potentilla arguta* (tall cinquefoil, G5, VA state-rare), *Pycnanthemum clinopodioides* (basil mountainmint, G1G2), *Sporobolus compositus* (composite dropseed, G5, VA state-rare), *Taenidia montana* (mountain pimpernel, 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, tomentosa) - Fraxinus americana - (Juniperus 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 - Celtis tenuifolia - Cercis canadensis / Sporobolus clandestinus - Danthonia sericea* Woodland (CEGL008499)
- *Juniperus virginiana - Fraxinus americana / Carex pensylvanica - Cheilanthes lanosa* Open Woodland (CEGL006037)
- *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.

Global Related Concepts:

- *Fraxinus americana - Carya glabra / Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland (Fleming and Taverna 2006) **=**
- *Fraxinus americana - Carya glabra / Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland (Fleming and Patterson 2009a) **=**
- *Fraxinus americana - Carya glabra / Muhlenbergia sobolifera - Helianthus divaricatus - Solidago ulmifolia* Woodland (Fleming and Coulling 2001) **=**
- *Fraxinus americana / Dryopteris marginalis - Sedum glaucophyllum - Carex communis* Woodland (Fleming and Coulling 2001) **<**
- *Fraxinus americana / Elymus hystrix - Sedum glaucophyllum* Association (Rawinski et al. 1996) **<**
- *Fraxinus americana / Toxicodendron radicans - Phacelia dubia - Rubus flagellaris - Carex communis* Woodland (Coulling and Rawinski 1999) **<**
- Greenstone Glade (Fleming 1993) **>**
- White ash - Shagbark hickory woodlands (CAP pers. comm. 1998) **?**

CLASSIFICATION

Status: Standard

Classification Confidence: 1 - Strong

Catoctin Mountain Park Classification Comments: Central Appalachian Basic Woodland is sometimes referred to as Basic Woodland.

Chesapeake & Ohio Canal National Historical Park Classification Comments: Central Appalachian Basic Woodland is sometimes referred to as Basic Woodland.

Harpers Ferry National Historical Park Classification Comments: Central Appalachian Basic Woodland, sometimes referred to as Basic Woodland, is clearly distinguishable in the park, occurring as open woodlands dominated by *Fraxinus americana* (white ash) and *Carya glabra* (pignut hickory) and a herbaceous layer dominated by xerophytic grasses and forbs. The other woodland communities in the park, Northeastern Red-cedar Limestone Glade (CEGL006047) (also referred to as Limestone Red-cedar Glade) and Central Appalachian Chestnut Oak - Virginia Pine Woodland (CEGL008540) (also referred to as Xeric Chestnut Oak - Virginia Pine Woodland), are quite different in terms of dominant species. CEGL006047 occurs as small grassy openings with scattered woody species dominated by *Juniperus virginiana var. virginiana* (eastern red-cedar). CEGL008540 is dominated by *Quercus prinus* and *Pinus virginiana* (Virginia pine) with an herbaceous layer dominated by xerophytic grasses and forbs.

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

Catoctin Mountain Park Range: This association occurs most frequently in the south-central portion of the park, on the Catoctin Formation.
Chesapeake & Ohio Canal National Historical Park Range: This community was sampled in the Outer Piedmont (Triassic Basins) near Blockhouse Point (Canal mile 21), where the Potomac River cuts through Catoctin Mountain at Point of Rocks (between Canal miles 48 and 49), and in the Blue Ridge at Harpers Ferry (Canal mile 60-62)
Harpers Ferry National Historical Park Range: The majority of stands of Central Appalachian Basic Woodland are located in the southern end of Maryland Heights, on the steep slopes above the Potomac River. Four small additional stands are located on the southern half of the park, along the Potomac and Shenandoah rivers and on the crest of Short Hill Mountain.
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:SNR, VA:S2, WV?:SNA
TNC Ecoregions: 51:C, 52:C, 59:C, 61:?
USFS Ecoregions (2007): 221Dd:CCP, 221De:CCC, 231Ib:CCC, 231Ic:CCC, M221Aa:CCP, 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

Catoctin Mountain Park Plots: CATO.21, CATO.26, CATO.36.
Chesapeake & Ohio Canal National Historical Park Plots: (8 plots): CHOH.007, CHOH.008, CHOH.558, HAFE_014, HAFE_018, HAFE_203, HAFE_302, HAFE_303.
Harpers Ferry National Historical Park Plots: HAFE.203, HAFE.302, HAFE.303.
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo and C.W. Nordman
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
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 Taverna 2006, Fleming et al. 2007a, Fleming et al. 2017, Fleming pers. comm., Harrison 2004, Lea 2004, Rawinski et al. 1996, Southeastern Ecology Working Group n.d., WVNHP unpubl. data, Young et al. 2006, Young et al. 2009

[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 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 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* (eastern red-cedar) and *Fraxinus americana* (white ash), with other associates including *Carya glabra* (pignut hickory), *Quercus montana* (chestnut oak), *Quercus stellata* (post oak), *Celtis tenuifolia* (dwarf hackberry), *Amelanchier arborea* (common serviceberry), *Quercus rubra* (northern red oak), and *Pinus virginiana* (Virginia pine). *Rhus aromatica* (fragrant sumac) is a characteristic shrub. The herbaceous layer is very diverse. *Carex pensylvanica* (Pennsylvania sedge) is constant and dominant. *Danthonia spicata* (poverty oatgrass) is frequent but sparse. Other characteristic species include *Cheilanthes lanosa* (hairy lipfern), *Woodsia obtusa* (bluntlobe cliff fern), *Phacelia dubia* (smallflower phacelia), *Deschampsia flexuosa* (wavy hairgrass), *Solidago arguta var. harrisii* (Harris' goldenrod), *Schizachyrium scoparium* (little bluestem), *Phlox subulata* (moss phlox), *Silene antirrhina* (sleepy silene), *Elymus hystrix* (eastern bottlebrush grass), *Tradescantia virginiana* (Virginia spiderwort), *Helianthus divaricatus* (woodland sunflower), *Polygonum scandens var. cristatum* (climbing false buckwheat), *Polygonatum biflorum* (smooth Solomon's seal), *Triodanis perfoliata* (clasping Venus' looking-glass), *Pycnanthemum incanum* (hoary mountainmint), *Allium cernuum* (nodding onion), and *Arenaria serpyllifolia* (thymeleaf sandwort). 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* (hairy lipfern), *Phacelia dubia* (smallflower phacelia), *Tradescantia virginiana* (Virginia spiderwort), and *Triodanis perfoliata* (clasping Venus' looking-glass). In addition, *Fraxinus americana* (white ash) and *Celtis tenuifolia* (dwarf hackberry) occur at a higher frequency in this association than in other shale-barren types.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: On steep southwest facing bluff just above Potomac River, at 150 m (500 feet) elevation. This site is next to an old railroad and may have burned in fires started by embers from the locomotives. The association is mapped as Shale Barren Woodland Map Class (COMP_SBWO), which includes four associations. Aspect ranges from southeast to west, to northwest but are mostly south and southwest facing.

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

Chesapeake & Ohio Canal National Historical Park Vegetation: Canopy trees include *Fraxinus americana* (white ash), *Quercus alba* (white oak), *Quercus muehlenbergii* (chinquapin oak), *Quercus montana* (chestnut oak), and *Quercus rubra. Cercis canadensis var. canadensis*, and *Juniperus virginiana* are subcanopy trees. Herbaceous plants include *Allium cernuum* (nodding onion), *Ambrosia artemisifolia*, *Hedeoma pulegioides* (American false pennyroyal), *Poa compressa* (Canada bluegrass), *Rosa carolina var. carolina* (Carolina rose), and *Solidago harrisii.*

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* (eastern red-cedar) and *Fraxinus americana* (white ash), with other associates including *Carya glabra* (pignut hickory), *Quercus montana* (chestnut oak), *Quercus stellata* (post oak), *Celtis tenuifolia* (dwarf hackberry), *Amelanchier arborea* (common serviceberry), *Quercus rubra* (northern red oak), and *Pinus virginiana* (Virginia pine). *Rhus aromatica* (fragrant sumac) is a characteristic shrub. The herbaceous layer is very diverse. *Carex pensylvanica* (Pennsylvania sedge) is constant and dominant. *Danthonia spicata* (poverty oatgrass) is frequent but sparse. Other characteristic species include *Cheilanthes lanosa* (hairy lipfern), *Woodsia obtusa* (bluntlobe cliff fern), *Phacelia dubia* (smallflower phacelia), *Deschampsia flexuosa* (wavy hairgrass), *Solidago arguta var. harrisii* (Harris' goldenrod), *Schizachyrium scoparium* (little bluestem), *Phlox subulata* (moss phlox), *Silene antirrhina* (sleepy silene), *Elymus hystrix* (eastern bottlebrush grass), *Tradescantia virginiana* (Virginia spiderwort), *Helianthus divaricatus* (woodland sunflower), *Polygonum scandens var. cristatum* (climbing false buckwheat), *Polygonatum biflorum* (smooth Solomon's seal), *Triodanis perfoliata* (clasping Venus' looking-glass), *Pycnanthemum incanum* (hoary mountainmint), *Allium cernuum* (nodding onion), and *Arenaria serpyllifolia* (thymeleaf sandwort). 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* (downy pagoda-plant), *Clematis albicoma* (whitehair leather flower), *Deschampsia flexuosa* (wavy hairgrass), *Draba ramosissima* (branched draba), *Eriogonum allenii* (shale barren buckwheat), *Melica nitens* (threeflower melicgrass), *Minuartia michauxii* (Michaux's stitchwort), *Oenothera argillicola* (shale barren evening-primrose), *Packera antennariifolia* (shale barren ragwort), and *Trifolium virginicum* (Kates Mountain clover). Occurrences on mafic outcrops tend to have stratified graminoid dominance, with *Schizachyrium scoparium* (little bluestem) forming a taller layer over *Carex pensylvanica* (Pennsylvania sedge). Species documented only on metabasalt and amphibolite, including *Cyperus lupulinus* (Great Plains flatsedge), *Trichostema brachiatum* (fluxweed), *Muhlenbergia capillaris* (hairawn muhly), *Polygonum tenue* (pleatleaf knotweed), *Oligoneuron rigidum var. rigidum* (stiff goldenrod), *Sporobolus clandestinus* (rough dropseed), and *Phemeranthus teretifolius* (quill fameflower), are probably associated with high-magnesium soils weathered from this substrate. *Quercus stellata* (post oak) 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* (whorled milkweed), *Symphyotrichum oblongifolium* (aromatic aster), *Bouteloua curtipendula* (sideoats grama), *Lithospermum canescens* (hoary puccoon), *Paronychia montana* (mountain nailwort), *Selaginella rupestris* (northern selaginella), *Taenidia montana* (mountain pimpernel), and *Triosteum perfoliatum* (feverwort).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Juniperus virginiana* (eastern red-cedar)
Herb (field)	Graminoid	*Carex pensylvanica* (Pennsylvania sedge)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Cercis canadensis* var. *canadensis* (eastern redbud), *Fraxinus americana* (white ash), *Juniperus virginiana* (eastern red-cedar)
Global: *Allium cernuum* (nodding onion), *Arenaria serpyllifolia* (thymeleaf sandwort), *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa* (wavy hairgrass), *Elymus hystrix* (eastern bottlebrush grass), *Fraxinus americana* (white ash), *Helianthus divaricatus* (woodland sunflower), *Juniperus virginiana* (eastern red-cedar), *Phacelia dubia* (smallflower phacelia), *Phlox subulata* (moss phlox), *Polygonatum biflorum* (smooth Solomon's seal), *Polygonum scandens* var. *cristatum* (climbing false buckwheat), *Pycnanthemum incanum* (hoary mountainmint), *Rhus aromatica* (fragrant sumac), *Silene antirrhina* (sleepy silene), *Solidago arguta* var. *harrisii* (Harris' goldenrod), *Tradescantia virginiana* (Virginia spiderwort), *Triodanis perfoliata* (clasping Venus' looking-glass), *Woodsia obtusa* (bluntlobe cliff fern)

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Arabis serotina* (shale barren rockcress, G2), *Clematis coactilis* (Virginia whitehair leather flower, G3), *Clematis viticaulis* (Millboro leather flower, G1), *Melica nitens* (threeflower melicgrass, G5,

state-rare), *Oligoneuron rigidum* var. *rigidum* (stiff goldenrod, G5T5, state-rare), *Taenidia montana* (mountain pimpernel, G3), *Trifolium virginicum* (Kates Mountain clover, G3, endemic or near-endemic shale barren plant); **Invasive/Exotic Plants**: *Arenaria serpyllifolia* (thymeleaf sandwort); **Other Plants**: *Cheilanthes lanosa* (hairy lipfern, G5), *Schizachyrium scoparium* (little bluestem, 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* (poverty brome), *Bromus tectorum* (cheatgrass), *Bromus japonicus*, *Centaurea stoebe ssp. micranthos* (spotted knapweed), *Lonicera japonica* (Japanese honeysuckle), *Verbascum thapsus* (common mullein), *Alliaria petiolata* (garlic mustard), and *Ailanthus altissima* (tree of heaven).

RELATED CONCEPTS

Global Similar Types:

- *(Pinus 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.
- *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* (eastern red-cedar) 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 - Quercus montana / 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 montana - Carya glabra / Cheilanthes lanosa - Carex pensylvanica - Camassia scilloides* Woodland (CEGL007070)

Global Related Concepts:

- *Fraxinus americana / Rhus aromatica / Schizachyrium scoparium - Cheilanthes lanosa - Carex pensylvanica* Wooded Herbaceous Vegetation (Young et al. 2007a) **=**
- *Juniperus virginiana - Fraxinus americana / Carex pensylvanica - Cheilanthes lanosa* Wooded Herbaceous Vegetation (Fleming and Patterson 2009a) **=**
- Eastern Redcedar: 46 (Eyre 1980) **>**
- Red cedar-white ash alkaline shale woodland (CAP pers. comm. 1998) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: This association is mapped as Shale Barren Woodland Map Class (COMP_SBWO), which includes four associations, Central Appalachian Circumneutral Barrens (CEGL006037), North-Central Appalachian Acidic Shale Woodland (CEGL006288), Central Appalachian Xeric Shale Woodland (Virginia Pine / Sparse Herbs Type) (CEGL008525), and Central Appalachian Xeric Shale Woodland (Chestnut Oak / Mixed Herbs Type) (CEGL008526).

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This association is one of four open woodlands mapped as Shale Barren Woodland Map Class (COMP_SBWO) along the Chesapeake & Ohio Canal at many locations in the Ridge and Valley on dry slopes (Canal mile 137-173). It is documented with a rapid assessment point at Lock 58, on a steep slope just NE of old railroad bridge.
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:SNR, PA:SNR, VA:SNR, WV:S1
TNC Ecoregions: 51:C, 59:C

USFS Ecoregions (2007): 221D:CP, M221Aa:CCP, M221Ab:CCC, M221B:C?, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal, Shenandoah); USFS (George Washington, Jefferson, Monongahela)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: 71228a (rapid assessment point)
Chesapeake & Ohio Canal National Historical Park Description Author(s): G. Fleming and C.W. Nordman
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 Taverna 2006, Fleming et al. 2007a, Harrison 2004, Harrison 2011, Lea 2003, WVNHP unpubl. data, Young et al. 2006, Young et al. 2007a, Young et al. 2009

2.B.2.NH. SOUTHEASTERN NORTH AMERICAN GRASSLAND & SHRUBLAND

This division encompasses a diversity of grass-, herb-, and shrub-dominated communities of the Southeastern Coastal Plain and locally as far west as the Edwards Plateau of Texas. Vegetation occurs on a wide variety of soil types and depths, with highly acidic to basic pH, and deep loams to bare rock, sometimes in combination with natural fire disturbances that collectively prevent tree establishment. Vegetation types are colloquially known as barrens, flatrocks, glades, and prairies.

M307. Southeastern Ruderal Grassland & Shrubland

This macrogroup comprises vegetation that occurs on sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads, etc.), or the vegetation otherwise heavily disturbed, e.g., through heavy grazing, such that the vegetation has a distinct composition and structure from other more native vegetation types. The stands may be composed of weedy generalist native or exotic species, or combinations of these. 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* (broomsedge bluestem) often is the dominant plant. Before it achieves dominance, *Ambrosia artemisiifolia* (annual ragweed), *Conyza canadensis* (Canadian horseweed), *Digitaria sanguinalis* (hairy crabgrass), and *Symphyotrichum pilosum* (hairy white oldfield aster) may be more prominent. Other perennial grasses may include *Andropogon gyrans* (Elliott's bluestem), *Andropogon ternarius* (splitbeard bluestem), and *Dichanthelium dichotomum* (cypress panicgrass). Shrubs and vines may be present or dominant, including the native genera *Baccharis* (false willow), *Cornus* (dogwood), *Prunus* (plum), and *Rubus* (blackberry), as well as the exotics *Ligustrum* (privet) spp., *Pueraria montana var. lobata* (kudzu), and *Wisteria sinensis* (Chinese wisteria). In the absence of disturbance, small trees rapidly overtake the sites and may become dominant.

G583. SOUTHEASTERN RUDERAL GRASSLAND & SHRUBLAND

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* (broomsedge bluestem) often is the dominant plant. Before it achieves dominance, *Ambrosia artemisiifolia* (annual ragweed), *Conyza canadensis* (Canadian horseweed), *Digitaria sanguinalis* (hairy crabgrass), and *Symphyotrichum pilosum* (hairy white oldfield aster) may be more prominent. Other perennial grasses may include *Andropogon gyrans* (Elliott's bluestem), *Andropogon ternarius* (splitbeard bluestem), and *Dichanthelium dichotomum* (cypress panicgrass). Shrubs and vines appear in these communities, and some genera may form stands, including the native genera *Baccharis* (false willow), *Cornus* (dogwood), *Prunus* (plum), *Rubus* (blackberry), and *Sophora secundiflora* (mescal bean) (in Texas), as well as the exotics *Ligustrum* (privet), *Pueraria* (kudzu), and *Wisteria* (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.

A4082 *Pueraria montana - Wisteria sinensis* Exotic Ruderal Vine-Shrubland Alliance

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* (kudzu) and *Wisteria sinensis* (Chinese wisteria). 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.Nh)
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* (kudzu), 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

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* (kudzu) may be limited in its ability to spread due to relatively cold climate.

Vegetation Description

Global Vegetation: This vine-dominated vegetation is dominated by *Pueraria montana var. lobata* (kudzu), a fast-growing vine native to Asia.
Global Dynamics: This association chokes out existing vegetation.

Most Abundant Species

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Liana	*Pueraria montana* var. *lobata* (kudzu)

Characteristic Species

Global: *Pueraria montana* var. *lobata* (kudzu)

Other Noteworthy Species

Global: Invasive/Exotic Plants: *Pueraria montana* var. *lobata* (kudzu)

Conservation Status Rank

Global Rank & Reasons: GNA (ruderal) (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* (kudzu), 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)

Global Related Concepts:
- Kudzu thicket (CAP pers. comm. 1998) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Chesapeake & Ohio Canal National Historical Park Classification Comments: Ruderal Kudzu Vineland is sometimes referred to as simply Kudzu Vineland. This association is included in the Successional Vine-Shrubland map class, a map class which includes two associations, Ruderal Kudzu Vineland (CEGL003882) and Ruderal Chinese Wisteria Vineland (CEGL008568), and other undescribed successional shrub/vine dominated vegetation.
Global Classification Comments: *Pueraria montana var. lobata* (kudzu), 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

Chesapeake & Ohio Canal National Historical Park Range: The association was documented by the mappers at Chesapeake & Ohio Canal, but no observation point was recorded. It is included in the Successional Vine-Shrubland Map Class (COMP_VISH). At Chesapeake & Ohio Canal, this map class is described as successional upland communities dominated by shrubs and/or vines, typically occurring on abandoned agricultural fields, powerline rights-of-way, or canopy gaps resulting from windthrow and other disturbance. Successional Vine-Shrubland Map Class (COMP_VISH) is the successional stage succeeding Successional Meadow / Grassland Map Class (COMP_SUME). Successional Vine-Shrubland Map Class (COMP_VISH) is documented with six observation points and is mapped at many locations on the Chesapeake & Ohio Canal, as far downstream as Pennyfield (Canal mile 21).
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:SNA, AR:SNA, DE:SNA, FL:SNA, GA:SNR, KY:SNA, LA:SNA, MD:SNA, MS:SNA, NC:SNA, OK:SNA, SC:SNA, TN:SNA, TX:SNA, VA:SNA, WV:SNA
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 (2007): 221Db:CCC, 221Hc:CCC, 223Ab:CCC, 223Ag:CCC, 223Ah:CCC, 223An:CCP, 231Ba:CCC, 231Ca:CCC, 231Cd:CCC, 231Ha:CCC, 231Hi:CCC, 232Bm:CCC, 234:C, M221Aa:CCP, M221Ab:CCC, M221Ca:CCP, M221Cb:CCC, M221Cc:CCP, M221Ce:CCP, M221Db:CCP, M221Dc:CCP, M221Dd:CCC, M223Aa:CCC, M223Ab: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

Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
Global Description Author(s): A.S. Weakley and S.C. Gawler
References: CAP pers. comm. 1998, Coxe 2009, Edwards 1982, Fleming and Coulling 2001, GNHP unpubl. data 2018, Hoagland 1998b, Hoagland 2000, Lea et al. 2013, Nordman et al. 2011, Pyne et al. 2010, Remo 1999, Southeastern Ecology Working Group n.d.*, Vanderhorst et al. 2007, White 2006

[CEGL008568] *Wisteria sinensis* Ruderal Vine-Shrubland

Translated Name: **Chinese Wisteria Ruderal Vine-Shrubland**

Common Name: **Ruderal Chinese Wisteria Vineland**

USNVC Classification

Division	Southeastern North American Grassland & Shrubland (2.B.2.Nh)
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 *Wisteria sinensis* (Chinese wisteria) or *Wisteria floribunda* (Japanese wisteria), or most often hybrids of the two fast-growing vines native to Asia. The community is most commonly seen in fragmented landscapes near old homesteads and other areas. The oldest colonies may consist of *Wisteria sinensis* (Chinese wisteria) or *Wisteria floribunda* (Japanese wisteria) and little else since the wisteria slowly overtops and kills all other plants It has the potential to occur in most southeastern states.

Environmental Description

Global Environment: This association occurs in a wide variety of habitats but tends to occur in areas that were formerly second-growth pine or tuliptree woodlands. Since this species invades by overtopping trees, this community tends to occur in highly fragmented areas that are near old homesteads or other past human habitations where wisteria persists. This community is rare across the landscape at this point, but there is the potential for it to occupy more land as fragmentation continues to occur.

Vegetation Description

Global Vegetation: The vegetation is dominated by *Wisteria sinensis* (Chinese wisteria) or *Wisteria floribunda* (Japanese wisteria), or most often hybrids of the two exotic vines native to Asia (Trusty et al. 2007). *Wisteria sinensis* (Chinese wisteria) and *Wisteria floribunda* (Japanese wisteria) were introduced as ornamental vines in the southern United States in the 19th century. These are not nearly as invasive as *Pueraria montana var. lobata* (kudzu), but in forests that have been disturbed by windstorm or other severe disturbances, these vines can colonize the canopy and spread to adjacent trees. In areas like this, where control has not taken place, they can colonize more than 1 hectare. All existing vegetation is eventually choked out, leaving mounds of dying or dead trees overtopped by layers of *Wisteria sinensis* (Chinese wisteria) or *Wisteria floribunda* (Japanese wisteria), or most often hybrids of the two exotic vines.
Global Dynamics: This association chokes out existing vegetation.

Most Abundant Species

Global Stratum	Lifeform	Species
Herb (field)	Liana	*Wisteria floribunda* (Japanese wisteria), *Wisteria sinensis* (Chinese wisteria)

Characteristic Species

Global: *Wisteria floribunda* (Japanese wisteria), *Wisteria sinensis* (Chinese wisteria)

Other Noteworthy Species

Global: Invasive/Exotic Plants: *Wisteria floribunda* (Japanese wisteria, Medium), *Wisteria sinensis* (Chinese wisteria, Medium)

Conservation Status Rank

Global Rank & Reasons: GNA (ruderal) (15-May-2002). This vegetation is dominated by exotic species, is of anthropogenic origin, and is thus not a conservation priority.

Related Concepts

Global Similar Types:
- *Pueraria montana var. lobata* Ruderal Vine-Shrubland (CEGL003882)

Classification

Status: Standard
Classification Confidence: 3 - Weak

Global Classification Comments: Eight populations were sampled in Alabama, Florida, Georgia, North Carolina, and South Caroline. Analyses of nuclear and chloroplast genomes amplified segments revealed that 24 of 25 collections were identified as hybrids of *Wisteria floribunda* (Japanese wisteria) and *Wisteria sinensis* (Chinese wisteria). Plant traits are not indicative of this. From this research there is indication that this long introduced and bred group of plants are well-hybridized, which imparts hybrid vigor. Still, there is certainly some value to photograph representative plants using traditional keys for identification as well as stating the case for hybridization (Trusty et al. 2007).

ELEMENT DISTRIBUTION

Global Range: This vegetation is known to occur in Delaware, North Carolina, South Carolina, Georgia, Florida, and Alabama but most likely occurs throughout the southeastern U.S.
Nations: US
States/Provinces: AL:SNA, AR:SNA, DE:SNA, FL:SNA, GA:SNA, LA?:SNA, MS?:SNA, NC:SNA, SC:SNA, TN?:SNA, VA:SNA
TNC Ecoregions: 38:P, 39:P, 40:C, 42:C, 50:C, 52:C, 61:C
USFS Ecoregions (2007): 221Db:CCC, 231Cc:CCC, 231Cf:CCC, 231Ic:CCC
Federal Lands: NPS (Antietam, C&O Canal, Catoctin Mountain, George Washington Parkway, Guilford Courthouse, Harpers Ferry, Little River Canyon, Manassas, Monocacy, Natchez Trace, National Capital-East, Ninety Six, Prince William, Rock Creek, Wolf Trap)

ELEMENT SOURCES

Global Description Author(s): R. White and C.W. Nordman
References: Schotz et al. 2008, Southeastern Ecology Working Group n.d.*, Trusty et al. 2007, White and Govus 2003, White and Pyne 2003

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

Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland includes wet riparian and swamp shrublands, wet meadows, wet prairies, and shallow and deep emergent marshes. The vegetation comprises seasonal green emergent, hydrophytic shrubs and herbs with at least 10% cover, on mucky, inundated or saturated soils across the mid-latitudes of the Northern and Southern hemispheres from 23° to 70°.

2.C.4.ND. EASTERN NORTH AMERICAN TEMPERATE FRESHWATER MARSH, WET MEADOW & SHRUBLAND

This division consists of vegetation in eastern cool-temperate North America, including the Great Plains. Stands are dominated by shrubs and/or non-hydromorphic herbaceous plants that are facultatively to obligately adapted to freshwater wetland conditions and that grow in mineral or mucky organic soils with regular (intermittent to permanent) saturated and flooded conditions.

M069. Eastern North American Marsh, Wet Meadow & Shrubland

This largely freshwater wetland macrogroup encompasses shrub swamps, marshes, wet meadows and wet prairies of temperate and boreal eastern North America, north of the southern Atlantic and Gulf coastal plains and east of the Great Plains and Yukon Territory. It is dominated by graminoids (e.g., species of the genera *Calamagrostis* (reedgrass), *Carex* (sedge), *Echinochloa* (cockspur grass), *Glyceria* (mannagrass), *Juncus* (rush), *Leersia* (cutgrass), *Schoenoplectus* (bulrush), *Scirpus* (bulrush), *Sparganium* (bur-reed), *Typha* (cattail), *Zizania)*, forbs (e.g., species of the genera *Bidens* (beggarticks), *Eupatorium* (thoroughwort), *Lobelia* (lobelia), *Polygonum* (knotweed), *Rumex* (dock), *Sagittaria* (arrowhead)), and shrubs (e.g., species of *Alnus* (alder), *Cornus* (dogwood), *Salix* (willow), *Spiraea* (meadowsweet), *Viburnum* (viburnum)) in a widely variable composition and structure. This macrogroup also contains eastern inland saline meadows characterized by *Atriplex patula* (spear saltbush), *Juncus gerardii* (saltmeadow rush), and others. Freshwater marshes and shrub swamps occur in closed or open basins that are generally flat and shallow and are frequently to nearly always flooded. Water depths during high water periods range from a few centimeters to approximately 1 m. Stands assigned to this macrogroup are associated with lakes, ponds, slow-moving streams, non-forested seepages, and/or impoundments or ditches on mineral soils with or without a well-decomposed muck layer. This vegetation spans a wide range, from southeastern and south-central

Canada southwest to the Great Lakes states and provinces, south to the Ozarks in Arkansas and east through the northern regions of the Gulf coast states to the southern Appalachian Mountains in Tennessee. It includes the Appalachian Mountain, Piedmont, and Interior Plateau regions, but not the Atlantic or Gulf coastal plains.

G125. EASTERN NORTH AMERICAN FRESHWATER MARSH

These freshwater emergent marshes are dominated by herbaceous vegetation, primarily graminoids. *Schoenoplectus* (bulrush) spp., *Typha* (cattail) spp., and *Zizania* (wildrice) 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.

A1436 *Typha angustifolia - Typha latifolia - Schoenoplectus* spp. Deep Marsh Alliance

This alliance, found across the eastern half of the United States and southern Canada, contains stands dominated or codominated by *Typha angustifolia* (narrowleaf cattail) and/or *Typha latifolia* (broadleaf cattail), either alone or in combination with other tall emergent marsh species. *Typha* (cattail) often occurs in pure stands, and can colonize areas recently exposed by either natural or human causes. *Lythrum salicaria* (purple loosestrife), an exotic species from Europe, has become a common associate of many eastern *Typha* (cattail) 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* (broadleaf cattail). 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* (water sedge), *Carex pellita* (woolly sedge), *Carex rostrata* (beaked sedge), bulrushes such as *Schoenoplectus acutus* (hardstem bulrush), *Schoenoplectus americanus* (chairmaker's bulrush), and *Schoenoplectus heterochaetus* (slender bulrush), and broad-leaved herbs such as *Asclepias incarnata* (swamp milkweed), *Hibiscus moscheutos* (crimson-eyed rosemallow), *Impatiens capensis* (orange jewelweed), *Sagittaria latifolia* (broadleaf arrowhead), *Scutellaria lateriflora* (blue skullcap), *Sparganium eurycarpum* (broadfruit bur-reed), *Thelypteris palustris* (eastern marsh fern), and *Verbena hastata* (swamp verbena). Floating aquatics such as *Lemna minor* (common duckweed) 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.

[CEGL002026] *Schoenoplectus tabernaemontani - Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Marsh

Translated Name: **Softstem Bulrush - Cattail species - (Bur-reed species, Rush species) Marsh**
Common Name: **Bulrush - Cattail - Bur-reed Shallow Marsh**

USNVC CLASSIFICATION

Division	Eastern North American Temperate 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: This shallow marsh mixed emergent community ranges broadly over the midwestern United States and adjacent Canada. It is found in basin-like depressions, backwater areas of floodplains, and shallow margins of lakes or ponds. Soils are shallow to deep, very poorly drained, consisting of peats, mucks, or mineral materials, often found in alluvium. Vegetation varies from zones dominated by tall emergents 1-2 m tall to those with hydrophytic annual and perennial forbs <1 m tall. In the tall emergent zone, *Schoenoplectus acutus* (hardstem bulrush), *Bolboschoenus fluviatilis* (river bulrush), *Schoenoplectus tabernaemontani* (softstem bulrush), *Typha angustifolia* (narrowleaf cattail), and *Typha latifolia* (broadleaf cattail) may dominate, mixed with a variety of other herbaceous species, such as *Eleocharis palustris* (common spikerush), *Juncus* (rush) spp., *Leersia oryzoides* (rice cutgrass), and *Sparganium* (bur-reed) spp. The hydrophytic annual and perennial forb zone is dominated by *Alisma subcordatum* (American water plantain), *Alisma triviale* (northern water plantain), *Sagittaria latifolia* (broadleaf arrowhead), *Sparganium eurycarpum* (broadfruit bur-reed), *Pontederia cordata* (pickerelweed), along with *Bacopa rotundifolia* (disk water-hyssop) and *Heteranthera limosa* (blue mudplantain). Occasional floating-leaved aquatics are sometimes present, including *Azolla caroliniana* (Carolina mosquitofern), *Lemna* (duckweed) spp., *Spirodela polyrrhiza* (common duckmeat), and *Utricularia macrorhiza* (common bladderwort).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This is a small patch herbaceous wetland vegetation. It is mapped along Chesapeake & Ohio Canal as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) seasonally inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.

National Capital Parks-East Environment: This is a small patch herbaceous wetland vegetation. It is mapped at National Capital Parks-East as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) seasonally inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.

Prince William Forest Park Environment: This is a small patch herbaceous wetland vegetation. It is mapped at Prince William Forest Park as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) seasonally inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.

Global Environment: This community ranges broadly over the midwestern United States. It is found in basin-like depressions, backwater areas of floodplains and shallow margins of lakes or ponds. Soils are shallow to deep, very poorly drained, consisting of peats, mucks, or mineral materials, often found in alluvium (Lauver et al. 1999).

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: Examples of this community are often dominated by moderately dense to dense stands of *Sparganium eurycarpum* (broadfruit bur-reed), with few other associates. *Leersia oryzoides* (rice cutgrass) and *Sagittaria latifolia* (broadleaf arrowhead) may occur.

National Capital Parks-East Vegetation: Stands are dominated by some combination of *Schoenoplectus tabernaemontani* (softstem bulrush), *Bolboschoenus fluviatilis* (river bulrush), *Schoenoplectus acutus* (hardstem bulrush), *Typha angustifolia* (narrowleaf cattail), and *Typha latifolia* (broadleaf cattail), either alone or in combination with other tall emergent marsh species.

Prince William Forest Park Vegetation: Examples of this community are often dominated by moderately dense to dense stands of *Sparganium eurycarpum* (broadfruit bur-reed), with few other associates. *Leersia oryzoides* (rice cutgrass) and *Sagittaria latifolia* (broadleaf arrowhead) may occur.

Global Vegetation: Vegetation varies from zones dominated by tall emergents 1-2 m tall to those with hydrophytic annual and perennial forbs <1 m tall. In the tall emergent zone, *Schoenoplectus acutus* (hardstem bulrush), *Bolboschoenus fluviatilis* (river bulrush), *Schoenoplectus tabernaemontani* (softstem bulrush), *Typha angustifolia* (narrowleaf cattail), and *Typha latifolia* (broadleaf cattail) may dominate, mixed with a variety of other herbaceous species, such as *Eleocharis palustris* (common spikerush), *Juncus* (rush) spp., *Leersia oryzoides* (rice cutgrass), and *Sparganium* (bur-reed) spp. The hydrophytic annual and perennial forb zone is dominated by *Alisma subcordatum* (American water plantain), *Alisma triviale* (northern water plantain), *Pontederia cordata* (pickerelweed), *Sagittaria latifolia* (broadleaf arrowhead), and *Sparganium eurycarpum* (broadfruit bur-reed), along with *Bacopa rotundifolia* (disk water-hyssop) and *Heteranthera limosa* (blue mudplantain). Other species that may dominate locally include *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum amphibium var. emersum* (longroot smartweed),

and *Polygonum lapathifolium* (curlytop knotweed). Occasional floating-leaved aquatics are sometimes present, including *Azolla caroliniana* (Carolina mosquitofern), *Lemna* (duckweed) spp., *Spirodela polyrrhiza* (common duckmeat), and *Utricularia macrorhiza* (common bladderwort) (Eggers and Reed 1987, Steinauer and Rolfsmeier 2003).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Bolboschoenus fluviatilis* (river bulrush), *Schoenoplectus acutus* (hardstem bulrush), *Schoenoplectus tabernaemontani* (softstem bulrush), *Typha angustifolia* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Sparganium eurycarpum* (broadfruit bur-reed)
National Capital Parks-East: *Schoenoplectus tabernaemontani* (softstem bulrush), *Sparganium eurycarpum* (broadfruit bur-reed), *Typha angustifolia* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail)
Prince William Forest Park: *Sparganium eurycarpum* (broadfruit bur-reed)
Global: *Schoenoplectus tabernaemontani* (softstem bulrush), *Typha angustifolia* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (22-Jun-1998).

RELATED CONCEPTS

Global Similar Types:
- *Sagittaria latifolia* - *Leersia oryzoides* Marsh (CEGL005240)
- *Schoenoplectus acutus* - *(Bolboschoenus fluviatilis)* Freshwater Marsh (CEGL002225)
- *Typha* spp. - *Schoenoplectus acutus* - Mixed Herbs Midwest Marsh (CEGL002229) This is the deep marsh equivalent of this type.
- *Typha* spp. - *Schoenoplectus* spp. - Mixed Herbs Great Plains Marsh (CEGL002228)

Global Related Concepts:
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (Faber-Langendoen 2001) =
- Softstem Bulrush-Broadleaf Cattail CT (Muldavin et al. 2000a) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Chesapeake & Ohio Canal National Historical Park Classification Comments: This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes four existing successional associations--Eastern Ruderal Reed Canarygrass Marsh (CEGL006044), Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026), Eastern Cattail Marsh (CEGL006153), Eastern Ruderal Common Reed Marsh (CEGL004141), and Northeastern Woolgrass Wet Meadow (CEGL006349)--as well as unclassified successional herbaceous wetlands.
National Capital Parks-East Classification Comments: This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes three existing successional associations--Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026), Eastern Cattail Marsh (CEGL006153), and Northeastern Woolgrass Wet Meadow (CEGL006349)--as well as unclassified successional herbaceous wetlands.
Prince William Forest Park Classification Comments: This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes two existing successional associations--Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026) and Northeastern Woolgrass Wet Meadow (CEGL006349)--as well as unclassified successional herbaceous wetlands.
Global Classification Comments: This is a very broadly defined type that intergrades between wet meadows and deep marshes. Shaw and Fredine (1971) (in Eggers and Reed 1987) define shallow marsh as "soils that are saturated to inundated by standing water up to 15 cm in depth, throughout most of the growing season." Depending on the

local topographic context, the type may or may not be extensive. Any number of types could be separated within this coarsely defined type, but it is not yet clear how best to make such distinctions (e.g., the forb-dominated portions, such as *Pontederia cordata* (pickerelweed) or *Sagittaria latifolia* (broadleaf arrowhead)). [See e.g., ~*Sagittaria latifolia* - *Leersia oryzoides* Marsh (CEGL005240)$$.] See also Lee et al. (1998), who separate out a *Sparganium eurycarpum* (broadfruit bur-reed) type. Taxonomically, *Schoenoplectus tabernaemontani* (softstem bulrush) is equivalent to former *Scirpus validus* (Kartesz 1999). In Minnesota, *Schoenoplectus acutus* (hardstem bulrush) may be the more common bulrush (R. Dana pers. comm. 1999). *Eleocharis* (spikerush) spp. can also be typical of this type. Dominant and characteristic plants should always be described from stands to allow for adequate characterization. In Nebraska, the pond marsh extends to south-central Nebraska (Steinauer and Rolfsmeier 2003).

Element Distribution

Chesapeake & Ohio Canal National Historical Park Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) is mapped at many locations, the length of the Chesapeake & Ohio Canal.
National Capital Parks-East Range: Successional Herbaceous Wetland Map Class (COMP_HEWE), of which this association is a component, has been observed and mapped all across NACE, with the most points and mapped polygons in the central area, including Suitland Parkway.
Prince William Forest Park Range: Successional Herbaceous Wetland Map Class (COMP_HEWE), of which this association is a component is mapped throughout the park.
Global Range: This shallow marsh mixed emergent community ranges broadly over the midwestern United States and adjacent Canada, from Ohio and Ontario west to Manitoba, south to Oklahoma and northern Arkansas, and east to Indiana.
Nations: CA,US
States/Provinces: AR:SNR, DC?:SNA, IA:SNR, IL:SNR, IN:SNR, KS:S1S2, MB:S4?, MI:SNR, MN:SNR, MO:SNR, ND:S3, NE:SNR, NM:SNR, OH:SNR, OK:SNR, ON:SNR, PA:SNR, QC?:SNA, SD:SNR, SK:SNR, VA?:SNA, WI:SNR, WV:S2, WY:SNR
TNC Ecoregions: 26:C, 33:C, 34:C, 35:C, 36:C, 37:C, 38:C, 39:C, 40:P, 42:P, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:C
USFS Ecoregions (2007): 212Hb:CC?, 212Hc:CCC, 212Hj:CCC, 212Jb:CP?, 212Jc:CPP, 212Ka:CP?, 212Kb:CPP, 212La:CPP, 212Lb:CPP, 212Lc:CPP, 212Ld:CPP, 212Le:CP?, 212Ma:CP?, 212Mb:CPP, 212Na:CPP, 212Nb:CPP, 212Nc:CPP, 212Nd:CPP, 212Qa:CPP, 212Tb:CC?, 212Tc:CC?, 212Xa:CCP, 212Xb:CC?, 212Xc:CC?, 212Xd:CC?, 212Xe:CC?, 212Ya:CCP, 221Ea:CCP, 221Ec:CCC, 221Ed:CCP, 221Ef:CCC, 221Fa:CCC, 221He:C??, 222Ha:CCP, 222Hc:CCC, 222Hf:CCC, 222Ja:CCC, 222Ji:CCC, 222Kf:CCC, 222Kg:CCC, 222Md:CPP, 222Na:CPP, 223Ak:CC?, 223An:CCP, 223Ao:CCP, 223Db:CCC, 223Ga:CCC, 223Gb:CCC, 232Ad:CCC, 234Ec:???, 251A:CP, 251Cc:CCP, 251Cd:CC?, 251Cf:CCC, 251Cj:CCC, 251Dg:CCC, 251Hc:CCC, 332E:PP
Federal Lands: NPS (Buffalo River, C&O Canal, Cuyahoga Valley, Effigy Mounds, Indiana Dunes, Isle Royale, Mississippi, National Capital-East, Prince William, Saint Croix); USFS (Chequamegon-Nicolet?, Chequamegon?, Chippewa?, Nicolet?, Ottawa?, Wayne); USFWS (Erie)

Element Sources

National Capital Parks-East Plots: None.
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
National Capital Parks-East Description Author(s): M. Pyne
Prince William Forest Park Description Author(s): E. Jones and J. Teague
Global Description Author(s): D. Faber-Langendoen
References: Baalman 1965, CDPNQ unpubl. data, Eggers and Reed 1987, Faber-Langendoen 2001, Faber-Langendoen 2001*, Greenall 1996, Hoagland 2000, Hop et al. 2005, Hop et al. 2009, Hop et al. 2012a, Hop et al. 2013, Kartesz 1999, Kost et al. 2007, Lauver et al. 1999, Lee et al. 1998, MNNHP 1993, Midwestern Ecology Working Group n.d., Minnesota DNR 2005a, Minnesota DNR 2005b, Muldavin et al. 2000a, NDNHI unpubl. data 2018, NHNM unpubl. data, Nelson 2010, ONHD unpubl. data, ONHIC unpubl. data 2018, Rolfsmeier and Steinauer 2010, SDNHP unpubl. data 2018, Shaw and Fredine 1971, Steinauer and Rolfsmeier 2003, TNC 1999b, WDNR 2015, WNDD unpubl. data, WVNHP unpubl. data, White and Madany 1978

[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 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* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail), or their hybrid *Typha x glauca* (blue cattail) dominate, either alone or in combination with other tall emergent marsh species. Associated species vary widely; sedges, such as *Carex aquatilis* (water sedge), *Carex lurida* (shallow sedge), *Carex pellita* (woolly sedge), *Carex rostrata* (beaked sedge), *Carex stricta* (upright sedge), *Scirpus cyperinus* (woolgrass), and bulrushes, such as *Schoenoplectus americanus* (chairmaker's bulrush) and *Schoenoplectus acutus* (hardstem bulrush), occur along with patchy grasses, such as *Calamagrostis canadensis* (bluejoint). Broad-leaved herbs include *Asclepias incarnata* (swamp milkweed), *Calla palustris* (water arum), *Impatiens capensis* (orange jewelweed), *Onoclea sensibilis* (sensitive fern), *Sagittaria latifolia* (broadleaf arrowhead), *Scutellaria lateriflora* (blue skullcap), *Sparganium eurycarpum* (broadfruit bur-reed), *Symplocarpus foetidus* (skunk-cabbage), *Thelypteris palustris* (eastern marsh fern), and *Verbena hastata* (swamp verbena). Floating aquatics, such as *Lemna minor* (common duckweed), 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* (sweetgale), *Ilex verticillata* (common winterberry), and *Spiraea alba* (white meadowsweet) are common. The invasive exotic plants *Lythrum salicaria* (purple loosestrife) and *Phragmites australis* (common reed) may be abundant in parts of some occurrences. This association is distinguished from other northeastern freshwater marshes by the strong dominance of *Typha* (cattail) spp.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.

Harpers Ferry National Historical Park Environment: This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.This

Manassas National Battlefield Park Environment: This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.

National Capital Parks-East Environment: This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.

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

Chesapeake & Ohio Canal National Historical Park Vegetation: Stands are dominated by *Typha angustifolia* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail), or their hybrid *Typha X glauca* (blue cattail), either alone or in combination with other tall emergent marsh species and the floating aquatic, *Lemna minor* (common duckweed).
Harpers Ferry National Historical Park Vegetation: Stands are dominated by *Typha angustifolia* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail), or their hybrid *Typha X glauca* (blue cattail), either alone or in combination with other tall emergent marsh species and the floating aquatic, *Lemna minor* (common duckweed).
Manassas National Battlefield Park Vegetation: Stands are dominated by *Typha angustifolia* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail), or their hybrid *Typha X glauca* (blue cattail), either alone or in combination with other tall emergent marsh species and the floating aquatic, *Lemna minor* (common duckweed).
National Capital Parks-East Vegetation: Stands are dominated by *Typha angustifolia* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail), or their hybrid *Typha X glauca* (blue cattail), either alone or in combination with other tall emergent marsh species and the floating aquatic, *Lemna minor* (common duckweed).
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* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail), or their hybrid *Typha x glauca* (blue cattail) dominate, either alone or in combination with other tall emergent marsh species. Associated species vary widely; sedges, such as *Carex aquatilis* (water sedge), *Carex lurida* (shallow sedge), *Carex pellita* (woolly sedge), *Carex rostrata* (beaked sedge), *Carex stricta* (upright sedge), *Scirpus cyperinus* (woolgrass), and bulrushes, such as *Schoenoplectus americanus* (chairmaker's bulrush) and *Schoenoplectus acutus* (hardstem bulrush), occur along with patchy grasses, such as *Calamagrostis canadensis* (bluejoint). Broad-leaved herbs include *Asclepias incarnata* (swamp milkweed), *Calla palustris* (water arum), *Impatiens capensis* (orange jewelweed), *Onoclea sensibilis* (sensitive fern), *Sagittaria latifolia* (broadleaf arrowhead), *Scutellaria lateriflora* (blue skullcap), *Sparganium eurycarpum* (broadfruit bur-reed), *Symplocarpus foetidus* (skunk-cabbage), *Thelypteris palustris* (eastern marsh fern), and *Verbena hastata* (swamp verbena). Floating aquatics, such as *Lemna minor* (common duckweed), 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* (sweetgale), *Ilex verticillata* (common winterberry), and *Spiraea alba* (white meadowsweet) are common. The invasive plants *Lythrum salicaria* (purple loosestrife) and *Phragmites australis* (common reed) may be abundant in parts of some occurrences.
Global Dynamics: This association is often found in impounded waters.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Herb (field)	Graminoid	*Typha angustifolia* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail), *Typha* x *glauca* (blue cattail)

CHARACTERISTIC SPECIES

Global: *Carex* spp., *Equisetum* spp., *Onoclea sensibilis* (sensitive fern), *Polygonum* spp., *Schoenoplectus acutus* (hardstem bulrush), *Schoenoplectus americanus* (chairmaker's bulrush), *Typha angustifolia* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail)

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Lythrum salicaria* (purple loosestrife, High), *Phragmites australis* (common reed, High), *Typha angustifolia* (narrowleaf cattail, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (01-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)

Global Related Concepts:
- *Typha latifolia* semipermanently-flooded grasslands (Metzler and Barrett 2006) =

- *Typha* (*angustifolia, latifolia*) - (*Scirpus* spp.) Herbaceous Vegetation (Clancy 1996) =
- Cattail marsh (CAP pers. comm. 1998) **?**
- Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984a) **?**
- Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984a) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes four existing successional associations, Eastern Ruderal Reed Canarygrass Marsh (CEGL006044), Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026), Eastern Cattail Marsh (CEGL006153), and Northeastern Woolgrass Wet Meadow (CEGL006349), as well as unclassified successional herbaceous wetlands.
Harpers Ferry National Historical Park Classification Comments: This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes two existing successional associations, Eastern Ruderal Reed Canarygrass Marsh (CEGL006044) and Eastern Cattail Marsh (CEGL006153), as well as unclassified successional herbaceous wetlands.
Manassas National Battlefield Park Classification Comments: This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes existing successional associations, Eastern Cattail Marsh (CEGL006153) and Northeastern Woolgrass Wet Meadow (CEGL006349), as well as unclassified successional herbaceous wetlands.
National Capital Parks-East Classification Comments: This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes three existing successional associations, Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026), Eastern Cattail Marsh (CEGL006153), and Northeastern Woolgrass Wet Meadow (CEGL006349), as well as unclassified successional herbaceous wetlands.
Global Classification Comments: *Typha angustifolia* (narrowleaf cattail) can grow in deeper water compared to *Typha latifolia* (broadleaf cattail), although both species reach maximum growth at a water depth of 50 cm (Grace and Wetzel 1981). *Typha* (cattail) often occurs in pure stands and can colonize areas recently exposed by either natural or human causes.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) includes successional herbaceous vegetation of non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity. It is mapped at many locations, the length of the Chesapeake & Ohio Canal.
Harpers Ferry National Historical Park Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) includes successional herbaceous vegetation of stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity. It is mapped at many locations along the Potomac and Shenandoah rivers.
Manassas National Battlefield Park Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) includes successional herbaceous vegetation of stream habitats (not depositional bars) that are periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity. It is mapped throughout the park.
National Capital Parks-East Range: Successional Herbaceous Wetland Map Class (COMP_HEWE), of which this association is a component, has been observed and mapped all across NACE, with the most points and mapped polygons in the central area, including Suitland Parkway.
Global Range: This association occurs throughout the northeastern U.S. from Maine to Virginia and possibly North Carolina.
Nations: US
States/Provinces: CT:SNR, DC?:SNA, DE:S4, MA:SNR, MD:SNR, ME:SNR, NC?:SNA, NH:SNR, NJ:S5, NY:SNR, PA:SNR, RI:SNR, VA:SNA, VT:SNR, WV?:SNA
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 (2007): 211Cb:CC?, 211Da:CCC, 211Db:CC?, 211Fa:CCP, 211Fb:CCC, 211Fc:CCC, 211Fd:CCC, 211Ga:CCC, 211Gb:CCC, 211Ia:CCC, 211Ib:CCC, 221Aa:CC?, 221Ab:CCC, 221Ae:CCC,

221Ai:CCC, 221Al:CCC, 221Ba:CCP, 221Bb:CCC, 221Bc:CCP, 221Bd:CCP, 221Da:CCC, 221Ea:C??, 221Fa:CCC, 222Ib:CCC, 222Ic:CCC, 231:C, 232Ab:CCC, 232Ac:CCP, 232Ad:CCC, M211A:CP, M211Bb:CCC, M211C:CP, M211D:CC, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be: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, Roosevelt-Vanderbilt, 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

Chesapeake & Ohio Canal National Historical Park Plots: None.
Harpers Ferry National Historical Park Plots: None.
Manassas National Battlefield Park Plots: None.
National Capital Parks-East Plots: None.
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
Harpers Ferry National Historical Park Description Author(s): J. Teague
Manassas National Battlefield Park Description Author(s): J. Teague
National Capital Parks-East Description Author(s): M. Pyne
Global Description Author(s): S.C. Gawler
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Clancy 1996, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2014a, Edinger et al. 2014b, Eichelberger 2011d, Fike 1999, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Gawler et al. 2017, Grace and Wetzel 1981, Harrison 2004, Harrison 2011, Largay and Sneddon 2017, Lubinski et al. 2003, 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, Sechler et al. 2014, Sneddon et al. 2010, Sperduto and Nichols 2004, Swain and Kearsley 2014, Thompson and Sorenson 2005, Zimmerman et al. 2012

G903. APPALACHIAN-NORTHEAST WET MEADOW & SHRUB SWAMP

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* (bluejoint), *Carex lacustris* (hairy sedge), *Carex stricta* (upright sedge), *Carex vesicaria* (blister sedge), *Carex utriculata* (Northwest Territory sedge), *Glyceria striata* (fowl mannagrass), *Leersia oryzoides* (rice cutgrass), and *Scirpus cyperinus* (woolgrass). Forbs that may be common or dominant include *Boltonia asteroides var. asteroides* (white doll's daisy), *Eutrochium fistulosum* (trumpetweed), *Eupatorium perfoliatum* (common boneset), *Impatiens capensis* (orange jewelweed), *Impatiens pallida* (pale touch-me-not), *Mentha arvensis* (wild mint), *Sagittaria latifolia* (broadleaf arrowhead), *Solidago canadensis* (Canada goldenrod), *Solidago rugosa* (wrinkleleaf goldenrod), *Symphyotrichum racemosum* (smooth white oldfield aster), and *Verbesina alternifolia* (wingstem). 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.

A3685 *Alnus* spp. - *Salix* spp. - *Cornus sericea* Shrub Swamp Alliance

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* (gray alder), *Alnus serrulata* (hazel alder), *Salix sericea* (silky willow), or *Hypericum densiflorum* (bushy St. Johnswort). Associates may include *Cornus sericea* (red-osier dogwood), *Rosa palustris* (swamp rose), *Spiraea alba var. alba* (white meadowsweet), *Spiraea alba var. latifolia* (white meadowsweet), *Viburnum nudum var. cassinoides* (withe-rod), 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.

[CEGL005082] *Alnus serrulata / Calamagrostis canadensis* Shrub Swamp

Translated Name: **Hazel Alder / Bluejoint Shrub Swamp**
Common Name: **Hazel Alder Shrub Swamp**

USNVC Classification

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Appalachian-Northeast Wet Meadow & Shrub Swamp (G903)
Alliance	*Alnus* spp. - *Salix* spp. - *Cornus sericea* Shrub Swamp Alliance (A3685)

Element Concept

Global Summary: This alder swamp is found widely throughout the northeastern United States south of near-boreal regions. These shrublands are found on muck overlying mineral soils (peat deposits are not typical) of upland marsh borders, at the edges of red maple swamps, or in acidic colluvium at bases of slopes. The pH of these systems is broadly circumneutral to somewhat calcareous. The vegetation is dominated by tall shrubs, characterized and usually dominated by *Alnus serrulata* (hazel alder), sometimes in a mixture with (or rarely replaced by) *Alnus incana* (gray alder). Associate shrubs vary somewhat with geography and include *Cornus sericea* (red-osier dogwood), *Rosa palustris* (swamp rose), *Physocarpus opulifolius* (common ninebark), *Viburnum dentatum* (southern arrow-wood), and *Salix* (willow) spp. Saplings of *Acer rubrum* (red maple) are typical. Short shrubs include *Spiraea alba var. latifolia* (white meadowsweet) and *Lindera benzoin* (northern spicebush). Less frequent shrubs include *Cephalanthus occidentalis* (common buttonbush), *Decodon verticillatus* (swamp-loosestrife), *Ilex verticillata* (common winterberry), *Rhododendron viscosum* (swamp azalea), and *Sambucus nigra ssp. canadensis* (American black elderberry). Herbaceous associates include *Calamagrostis canadensis* (bluejoint), *Osmunda regalis* (royal fern), *Glyceria striata* (fowl mannagrass), *Thelypteris palustris* (eastern marsh fern), *Galium* (bedstraw) spp., *Typha latifolia* (broadleaf cattail), *Polygonum hydropiper* (marshpepper knotweed), *Bidens cernua* (nodding beggarticks), *Galium tinctorium* (stiff marsh bedstraw), *Cicuta maculata* (spotted water hemlock), *Peltandra virginica* (green arrow-arum), and *Carex stricta* (upright sedge).

Environmental Description

Catoctin Mountain Park Environment: This small patch community is uncommon at the park. It can be found in areas that receives frequent flooding and groundwater discharge.
Global Environment: These shrublands are found on muck overlying mineral soils (peat deposits are not typical) of upland marsh borders, small upland depressions, at the edges of red maple swamps or other ponded drainages, or in colluvium at bases of slopes. The pH of these systems is broadly circumneutral to somewhat calcareous (Fike 1999).

Vegetation Description

Catoctin Mountain Park Vegetation: Herb layer is a bit weedy; similar to much of the active floodplain of Owens Creek
Global Vegetation: The vegetation is dominated by tall shrubs and characterized by *Alnus serrulata* (hazel alder), *Alnus incana* (gray alder), *Physocarpus opulifolius* (common ninebark), *Viburnum dentatum* (southern arrow-wood), *Cornus amomum* (silky dogwood), and *Salix* (willow) spp. Saplings of *Acer rubrum* (red maple) are typical. Short shrubs include *Spiraea alba var. latifolia* (white meadowsweet) and *Lindera benzoin* (northern spicebush). Other shrubs present include *Cephalanthus occidentalis* (common buttonbush), *Decodon verticillatus* (swamp-loosestrife), *Ilex verticillata* (common winterberry), *Rhododendron viscosum* (swamp azalea), and *Sambucus nigra ssp. canadensis* (American black elderberry) (Anderson 1996, Fike 1999). Herbaceous associates include *Calamagrostis canadensis* (bluejoint), *Osmunda regalis* (royal fern), *Glyceria striata* (fowl mannagrass), *Thelypteris palustris* (eastern marsh fern), *Galium* (bedstraw) spp., *Typha latifolia* (broadleaf cattail), *Polygonum hydropiper* (marshpepper knotweed), *Bidens cernua* (nodding beggarticks), *Galium tinctorium* (stiff marsh bedstraw), *Cicuta maculata* (spotted water hemlock), *Peltandra virginica* (green arrow-arum), and *Carex stricta* (upright sedge).
Global Dynamics: Many of these wetlands may have been influenced by beaver or other impoundments.

Most Abundant Species

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus incana* (gray alder)

Tall shrub/sapling	Broad-leaved deciduous shrub	*Alnus serrulata* (hazel alder), *Physocarpus opulifolius* (common ninebark), *Salix* spp., *Viburnum dentatum* (southern arrow-wood)
Herb (field)	Flowering forb	*Peltandra virginica* (green arrow-arum)
Herb (field)	Graminoid	*Calamagrostis canadensis* (bluejoint)
Herb (field)	Fern (Spore-bearing forb)	*Osmunda regalis* (royal fern)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Alnus serrulata* (hazel alder)
Global: *Alnus serrulata* (hazel alder), *Cornus amomum* (silky dogwood), *Physocarpus opulifolius* (common ninebark), *Salix* spp., *Viburnum dentatum* (southern arrow-wood)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (22-Mar-1999).

RELATED CONCEPTS

Global Similar Types:
- *Alnus incana - Cornus sericea* Midwest Shrub Swamp (CEGL007163)
- *Alnus incana* Shrub Swamp (CEGL006839)
- *Alnus serrulata* Southeastern Shrub Swamp (CEGL008474)

Global Related Concepts:
- *Acer rubrum / Triadenum walteri - Peltandra virginica - Boehmeria cylindrica* Shrub Swamp (Walton et al. 2001) =
- *Alnus incana ssp. rugosa - Salix* spp. community (Metzler and Barrett 2006) ><
- *Alnus serrulata* Eastern Shrubland (Faber-Langendoen 2001) =
- Semipermanent Impoundment (Fleming pers. comm.) >
- Smooth alder shrub thicket (CAP pers. comm. 1998) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Catoctin Mountain Park Classification Comments: Hazel Alder Shrub Swamp is also referred to as Hazel Alder Swamp. At this park, this association is mapped as part of the Successional Woody Wetland Map Class (COMP_WOWE), which also includes unclassified successional shrublands and woodlands occurring in wetlands.
Global Classification Comments: This type overlaps with ~*Alnus incana* (gray alder) Shrub Swamp (CEGL002381)$$ where the ranges abut in Ohio, Pennsylvania, southern New England, and southern New York. Where both alder species are present, this type is distinguished from the *Alnus incana* (gray alder) nominal type by the presence of species with a somewhat more Central Appalachian / Alleghenian affinity such as *Physocarpus opulifolius* (common ninebark), *Rhododendron viscosum* (swamp azalea), *Peltandra virginica* (green arrow-arum), compared to CEGL002381 which is characterized by somewhat more northern species such as *Ilex mucronata* (catberry) and *Myrica gale* (sweetgale). Where they overlap, the relative dominance of the two alder species should be expected to vary. If *Alnus serrulata* (hazel alder) is present in more than token amounts, consider this type as opposed to CEGL002381.

ELEMENT DISTRIBUTION

Catoctin Mountain Park Range: This association has been documented in the northeast part of the park along the floodplain of Owens Creek.
Global Range: This alder swamp is found widely throughout the northeastern United States, ranging from central New England south to New Jersey, Maryland, and Virginia, and west to Ohio and Pennsylvania.
Nations: CA,US
States/Provinces: CT:SNR, DE:S1, MA:SNR, MD:SNA, ME:SNR, NH:SNR, NJ:SNR, NY:SNR, OH:SNR, PA:SNR, QC?:SNA, RI:SNR, VA:S4, WV:SNR
TNC Ecoregions: 49:C, 52:C, 58:C, 59:C, 60:C, 61:C
USFS Ecoregions (2007): 211Fc:CCC, 221Aa:CC?, 221Ai:CCC, 221Bd:CCP, 221Ec:CCP, 221Ed:CCP, 221Ef:CCC, 222:?, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ha:CC?, 232Hd:CCP, 232Je:C??, M211:C, M221Ab:PPP, M221Ac:PPP
Federal Lands: NPS (Appomattox Court House, Catoctin Mountain, Delaware Water Gap, Fredericksburg-Spotsylvania, Minute Man, Petersburg, Richmond)

ELEMENT SOURCES

Catoctin Mountain Park Description Author(s): J. Teague
Global Description Author(s): L.A. Sneddon, D. Faber-Langendoen and S.C. Gawler
References: Anderson 1996, CAP pers. comm. 1998, CDPNQ unpubl. data, Coxe 2009, Eastern Ecology Working Group n.d.*, Eichelberger 2011e, Faber-Langendoen 2001, Fike 1999, Fleming et al. 2017, Fleming pers. comm., Gawler et al. 2017, Harrison 2004, Harrison 2011, Metzler and Barrett 2006, Patterson 2008a, Patterson 2008e, Patterson 2008f, Perles et al. 2007, Swain and Kearsley 2014, Taverna and Patterson 2008, Walton et al. 2001, Zimmerman et al. 2012

A1399 *Carex* spp. - *Leersia oryzoides* - *Eupatorium* spp. Wet Meadow Alliance

This alliance is found in the northeastern United States and adjacent Canada. Herbaceous species dominate and shrubs and trees are widely scattered or absent. *Leersia oryzoides* (rice cutgrass) is typically dominant with *Impatiens capensis* (orange jewelweed), *Phalaris arundinacea* (reed canarygrass), *Sagittaria latifolia* (broadleaf arrowhead), and *Scirpus atrovirens* (green bulrush) common associates or codominants. *Scirpus cyperinus* (woolgrass) has high constancy. Additional characteristic herbs include *Boehmeria cylindrica* (small-spike false nettle), *Dulichium arundinaceum* (threeway sedge), *Eupatorium* (thoroughwort) spp., *Juncus effusus* (common rush), *Mimulus ringens* (Allegheny monkeyflower), *Polygonum sagittatum* (arrowleaf tearthumb), *Scirpus cyperinus* (woolgrass), and *Typha latifolia* (broadleaf cattail). Areas with longer standing water may have aquatic species, including *Callitriche heterophylla* (twoheaded water-starwort) and *Sparganium* (bur-reed) spp. Scattered small trees include *Robinia pseudoacacia* (black locust), *Salix nigra* (black willow), and *Fraxinus pennsylvanica* (green ash). The exotic shrubs *Rhamnus cathartica* (common buckthorn) and *Rosa multiflora* (multiflora rose) are sometimes invasive in this community. Sites have been described on alluvium or poorly drained basins over sandstone, siltstone, or shale.

[CEGL006349] *Scirpus cyperinus* Wet Meadow

Translated Name: **Woolgrass Wet Meadow**
Common Name: **Northeastern Woolgrass Wet Meadow**

USNVC CLASSIFICATION

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Appalachian-Northeast Wet Meadow & Shrub Swamp (G903)
Alliance	*Carex* spp. - *Leersia oryzoides* - *Eupatorium* spp. Wet Meadow Alliance (A1399)

ELEMENT CONCEPT

Global Summary: This seasonally flooded marsh occurs in the northeastern United States. It is dominated or characterized by *Scirpus cyperinus* (woolgrass), but composition is variable. Associates include *Glyceria* (mannagrass) spp. and *Thelypteris palustris* (eastern marsh fern), as well as other species of *Scirpus* (bulrush), including *Scirpus microcarpus* (panicled bulrush) and *Scirpus atrovirens* (green bulrush).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.
Manassas National Battlefield Park Environment: This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.
National Capital Parks-East Environment: This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.
Prince William Forest Park Environment: This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars)

periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.
Global Environment: These are seasonally flooded herbaceous marshes.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: This community is dominated or characterized by *Scirpus cyperinus* (woolgrass) (woolgrass). Composition is variable and associated species may include *Juncus effuses*, *Carex crinite*, *Carex lurida* (shallow sedge), *Boehmeria cylindrica* (small-spike false nettle), *Leersia oryzoides* (rice cutgrass), *Impatiens capensis* (orange jewelweed), *Sagittaria latifolia* (broadleaf arrowhead), *Polygonum punctatum* (dotted smartweed), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum sagittatum* (arrowleaf tearthumb), *Typha latifolia* (broadleaf cattail), *Cyperus strigosus* (strawcolored flatsedge), *Scirpus atrovirens* (green bulrush), *Mimulus* spp., and *Panicum rigidulum. Phalaris arundinacea* and *Poa trivialis* are invasive species that occur. *Sparganium eurycarpum* may be frequent, but its presence may represent a transition to an associated type with a longer hydroperiod. Shrubs or small trees of *Salix nigra* may occur.
Manassas National Battlefield Park Vegetation: This community is dominated or characterized by *Scirpus cyperinus* (woolgrass) (woolgrass). Composition is variable and associated species may include *Juncus effuses*, *Carex crinite*, *Carex lurida* (shallow sedge), *Boehmeria cylindrica* (small-spike false nettle), *Leersia oryzoides* (rice cutgrass), *Impatiens capensis* (orange jewelweed), *Sagittaria latifolia* (broadleaf arrowhead), *Polygonum punctatum* (dotted smartweed), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum sagittatum* (arrowleaf tearthumb), *Typha latifolia* (broadleaf cattail), *Cyperus strigosus* (strawcolored flatsedge), *Scirpus atrovirens* (green bulrush), *Mimulus* spp., and *Panicum rigidulum. Phalaris arundinacea* and *Poa trivialis* are invasive species that occur. *Sparganium eurycarpum* may be frequent, but its presence may represent a transition to an associated type with a longer hydroperiod. Shrubs or small trees of *Salix nigra* may occur.
National Capital Parks-East Vegetation: This community is dominated or characterized by *Scirpus cyperinus* (woolgrass) (woolgrass). Composition is variable and associated species may include *Juncus effuses*, *Carex crinite*, *Carex lurida* (shallow sedge), *Boehmeria cylindrica* (small-spike false nettle), *Leersia oryzoides* (rice cutgrass), *Impatiens capensis* (orange jewelweed), *Sagittaria latifolia* (broadleaf arrowhead), *Polygonum punctatum* (dotted smartweed), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum sagittatum* (arrowleaf tearthumb), *Typha latifolia* (broadleaf cattail), *Cyperus strigosus* (strawcolored flatsedge), *Scirpus atrovirens* (green bulrush), *Mimulus* spp., and *Panicum rigidulum. Phalaris arundinacea* and *Poa trivialis* are invasive species that occur. *Sparganium eurycarpum* may be frequent, but its presence may represent a transition to an associated type with a longer hydroperiod. Shrubs or small trees of *Salix nigra* may occur.
Prince William Forest Park Vegetation: This community is dominated or characterized by *Scirpus cyperinus* (woolgrass) (woolgrass). Composition is variable and associated species may include *Juncus effuses*, *Carex crinite*, *Carex lurida* (shallow sedge), *Boehmeria cylindrica* (small-spike false nettle), *Leersia oryzoides* (rice cutgrass), *Impatiens capensis* (orange jewelweed), *Sagittaria latifolia* (broadleaf arrowhead), *Polygonum punctatum* (dotted smartweed), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum sagittatum* (arrowleaf tearthumb), *Typha latifolia* (broadleaf cattail), *Cyperus strigosus* (strawcolored flatsedge), *Scirpus atrovirens* (green bulrush), *Mimulus* spp., and *Panicum rigidulum. Phalaris arundinacea* and *Poa trivialis* are invasive species that occur. *Sparganium eurycarpum* may be frequent, but its presence may represent a transition to an associated type with a longer hydroperiod. Shrubs or small trees of *Salix nigra* may occur.
Global Vegetation: This community is dominated or characterized by *Scirpus cyperinus* (woolgrass). Composition is variable. Associates include *Glyceria* (mannagrass) spp. and *Thelypteris palustris* (eastern marsh fern), as well as other species of *Scirpus* (bulrush), including *Scirpus microcarpus* (panicled bulrush) and *Scirpus atrovirens* (green bulrush).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Herb (field)	Graminoid	*Scirpus cyperinus* (woolgrass)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Scirpus cyperinus* (woolgrass)
Manassas National Battlefield Park: *Scirpus cyperinus* (woolgrass)
National Capital Parks-East: *Scirpus cyperinus* (woolgrass)
Prince William Forest Park: *Scirpus cyperinus* (woolgrass)
Global: *Scirpus cyperinus* (woolgrass)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR

RELATED CONCEPTS

Global Similar Types:

- *Calamagrostis canadensis - Scirpus* spp. - *Dulichium arundinaceum* Wet Meadow (CEGL006519)
- *Scirpus cyperinus* Southern Ruderal Marsh (CEGL003866)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Chesapeake & Ohio Canal National Historical Park Classification Comments: Northeastern Woolgrass Wet Meadow is also referred to as Woolgrass Marsh. This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes four existing successional associations--Eastern Ruderal Reed Canarygrass Marsh (CEGL006044), Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026), Eastern Cattail Marsh (CEGL006153), and Northeastern Woolgrass Wet Meadow (CEGL006349)--as well as unclassified successional herbaceous wetlands.
Manassas National Battlefield Park Classification Comments: Northeastern Woolgrass Wet Meadow is also referred to as Woolgrass Marsh. This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes two existing successional associations--Eastern Cattail Marsh (CEGL006153) and Northeastern Woolgrass Wet Meadow (CEGL006349)--as well as unclassified successional herbaceous wetlands.
National Capital Parks-East Classification Comments: Northeastern Woolgrass Wet Meadow is also referred to as Woolgrass Marsh. At NACE, this association is part of a generic map class, Successional Herbaceous Wetland Map Class (COMP_HEWE), consisting of any disturbed, predominantly herbaceous wetland with less than 30% woody cover. It includes the following three types: Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026), Eastern Cattail Marsh (CEGL006153), and/or Northeastern Woolgrass Wet Meadow (CEGL006349), but may include other classified or unclassified successional herbaceous wetlands.
Prince William Forest Park Classification Comments: Northeastern Woolgrass Wet Meadow is also referred to as Woolgrass Marsh. This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes two existing successional associations-- Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026) and Northeastern Woolgrass Wet Meadow (CEGL006349)--as well as unclassified successional herbaceous wetlands.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) is mapped at many locations, the length of the Chesapeake & Ohio Canal.
National Capital Parks-East Range: Successional Herbaceous Wetland Map Class (COMP_HEWE), of which this association is a component, has been observed and mapped all across NACE, with the most points and mapped polygons in the central area, including Suitland Parkway.
Prince William Forest Park Range: Successional Herbaceous Wetland Map Class (COMP_HEWE), of which this association is a component, is mapped throughout the park.
Global Range: This seasonally flooded herbaceous marsh occurs throughout the northeastern U.S. from Maine to West Virginia.
Nations: CA,US
States/Provinces: CT:SNR, DC?:SNA, DE:SNR, MA:SNR, MD:SNR, ME:SNR, NH:SNR, NJ:SNR, NY:SNR, PA:SNR, QC?:SNA, RI:SNR, VA:SNA, VT:SNR, WV:S3
TNC Ecoregions: 49:C, 57:?, 58:C, 59:C, 60:?, 61:C, 62:C, 64:C
USFS Ecoregions (2007): 221Ab:CCC, 221Bc:CCP, 221Fa:CCC, 232Ac:CP, 232Ad:CP?, M221Ba:CCC, M221Bc:CCC
Federal Lands: NPS (C&O Canal, Cape Cod, Gateway, Manassas, National Capital-East, Prince William, Saratoga, Thomas Stone); USFS (Monongahela); USFWS (Assabet River?, Canaan Valley, Chincoteague, Erie, Great Meadows?, Rachel Carson?, Supawna Meadows)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: None
Manassas National Battlefield Park Plots: None.
National Capital Parks-East Plots: None.

Prince William Forest Park Plots: None.
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
Manassas National Battlefield Park Description Author(s): J. Teague
National Capital Parks-East Description Author(s): M. Pyne
Prince William Forest Park Description Author(s): J. Teague
Global Description Author(s): R.E. Zaremba and L.A. Sneddon
References: Breden et al. 2001, Byers et al. 2007, CDPNQ unpubl. data, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2008a, Edinger et al. 2014a, Edinger et al. 2014b, Fike 1999, Gawler 2002, Gawler and Cutko 2010, Harrison 2004, Harrison 2011, Lea et al. 2012, NRCS 2001b, NRCS 2004a, Sneddon et al. 2010, Sperduto and Nichols 2004, Swain and Kearsley 2014, Thompson and Sorenson 2005, WVNHP unpubl. data, Walbridge 1982, Zimmerman 2011o, Zimmerman et al. 2012

A3670 *Cephalanthus occidentalis - Decodon verticillatus* Shrub Swamp Alliance

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* (common buttonbush) or *Decodon verticillatus* (swamp-loosestrife) 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* (willow) spp. or *Cornus* (dogwood) spp., as well as *Ilex verticillata* (common winterberry), *Rosa palustris* (swamp rose), *Vaccinium corymbosum* (highbush blueberry), and *Viburnum dentatum* (southern arrow-wood). Floating aquatics, such as *Lemna* (duckweed) spp., can be common in deepwater habitats, whereas a variety of forbs and graminoids are associates under less flooded conditions. These include *Bidens tripartita* (threelobe beggarticks), *Boehmeria cylindrica* (small-spike false nettle), *Glyceria* (mannagrass) spp., *Leersia oryzoides* (rice cutgrass), *Polygonum* (knotweed) spp., *Scutellaria lateriflora* (blue skullcap), *Sium suave* (hemlock waterparsnip), and a wide variety of *Carex* (sedge) 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 Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Appalachian-Northeast Wet Meadow & Shrub Swamp (G903)
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* (common buttonbush) is dominant and often monotypic. Occasional associates depend on the environmental setting and most often occur in drier areas. They include *Vaccinium corymbosum* (highbush blueberry), *Rhododendron viscosum* (swamp azalea), *Acer rubrum* (red maple), *Cornus* (dogwood) spp. closer to upland borders, or *Acer saccharinum* (silver maple), *Fraxinus pennsylvanica* (green ash), and *Viburnum dentatum* (southern arrow-wood) where adjacent to floodplains, or *Decodon verticillatus* (swamp-loosestrife), *Chamaedaphne calyculata* (leatherleaf), and *Spiraea alba var. latifolia* (white meadowsweet) in more stagnant basins. Herbaceous species tend to be sparse but can include *Glyceria canadensis* (rattlesnake mannagrass), *Dulichium arundinaceum* (threeway sedge), *Carex stricta* (upright sedge), *Scirpus cyperinus* (woolgrass), *Thelypteris palustris* (eastern marsh fern), *Leersia oryzoides* (rice cutgrass), *Acorus calamus* (calamus), *Alisma plantago-aquatica* (European water plantain), *Polygonum* (knotweed) spp., *Sparganium* (bur-reed) spp., and floating or submerged aquatic species such as *Lemna minor* (common duckweed), *Potamogeton natans* (floating pondweed), and *Nuphar variegata* (variegated yellow pond-lily). Bryophytes, if present, cling to shrub bases and

include *Warnstorfia fluitans* (warnstorfia moss), *Drepanocladus aduncus* (drepanocladus moss), or *Sphagnum fallax* (sphagnum). In disturbed areas, these wetland may be invaded by *Lythrum salicaria* (purple loosestrife).

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This association is mapped as the Successional Woody Wetland Map Class (COMP_WOWE), described as successional shrublands and woodlands of disturbed floodplains, seepage wetlands, and artificial impoundments (including impoundments due to beaver activity).
National Capital Parks-East Environment: This association is mapped as the Successional Woody Wetland Map Class (COMP_WOWE), described as successional shrublands and woodlands of disturbed floodplains, seepage wetlands, and artificial impoundments (including impoundments due to beaver activity).
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

Chesapeake & Ohio Canal National Historical Park Vegetation: *Cephalanthus occidentalis* (common buttonbush) (common buttonbush) is dominant and often monotypic.
National Capital Parks-East Vegetation: *Cephalanthus occidentalis* (common buttonbush) (common buttonbush) is dominant and often monotypic.
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* (common buttonbush) is dominant and often monotypic. Scattered *Acer rubrum* (red maple) 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* (highbush blueberry), *Rhododendron viscosum* (swamp azalea), *Acer rubrum* (red maple), *Salix* (willow) spp., *Cornus amomum* (silky dogwood) or *Cornus sericea* (red-osier dogwood) closer to upland borders, or *Acer saccharinum* (silver maple), *Fraxinus pennsylvanica* (green ash), or *Viburnum dentatum* (southern arrow-wood) where adjacent to floodplains, or *Decodon verticillatus* (swamp-loosestrife), *Chamaedaphne calyculata* (leatherleaf), and *Spiraea alba var. latifolia* (white meadowsweet) in more stagnant basins. Herbaceous species tend to be sparse but can include *Glyceria canadensis* (rattlesnake mannagrass), *Dulichium arundinaceum* (threeway sedge), *Carex stricta* (upright sedge), *Scirpus cyperinus* (woolgrass), *Osmunda regalis* (royal fern), *Thelypteris palustris* (eastern marsh fern), *Bidens* (beggarticks) spp., *Sium suave* (hemlock waterparsnip), *Scutellaria lateriflora* (blue skullcap), *Alisma plantago-aquatica* (European water plantain), *Polygonum* (knotweed) spp., *Sparganium* (bur-reed) spp., and floating or submerged aquatic species such as *Lemna minor* (common duckweed), *Potamogeton natans* (floating pondweed), and *Nuphar variegata* (variegated yellow pond-lily). Bryophytes, if present, cling to shrub bases and include *Warnstorfia fluitans* (warnstorfia moss), *Drepanocladus aduncus* (drepanocladus moss), or *Sphagnum fallax* (sphagnum).

Most Abundant Species

Global

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Cephalanthus occidentalis* (common buttonbush)
Herb (field)	Graminoid	*Dulichium arundinaceum* (threeway sedge)

Characteristic Species

Chesapeake & Ohio Canal National Historical Park: *Cephalanthus occidentalis* (common buttonbush)
National Capital Parks-East: *Cephalanthus occidentalis* (common buttonbush)
Global: *Cephalanthus occidentalis* (common buttonbush), *Dulichium arundinaceum* (threeway sedge), *Osmunda regalis* (royal fern), *Sparganium americanum* (American bur-reed), *Vaccinium corymbosum* (highbush blueberry)

Other Noteworthy Species

Global: Invasive/Exotic Plants: *Lythrum salicaria* (purple loosestrife, 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* - *(Eubotrys racemosa) / Carex joorii* Shrub Swamp (CEGL004075)
- *Cephalanthus occidentalis / Carex* spp. Midwest Shrub Swamp (CEGL002190)
- *Cephalanthus occidentalis* Central Interior Shrub Swamp (CEGL006482)
- *Cephalanthus occidentalis* Southeast Coastal Plain Shrub Swamp (CEPP006641)

Global Related Concepts:

- *Cephalanthus occidentalis / Glyceria canadensis* community (Metzler and Barrett 2006) =
- Buttonbush semipermanently flooded shrub swamp (CAP pers. comm. 1998) **?**

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Chesapeake & Ohio Canal National Historical Park Classification Comments: In the NPS National Capital Region, this association is mapped as part of the Successional Woody Wetland Map Class (COMP_WOWE) which at this park includes existing successional associations Northeastern Buttonbush Shrub Swamp (CEGL006069), Ruderal Box-elder Floodplain Forest (CEGL005033), and Ruderal Black Walnut Forest (CEGL007879), as well as unclassified successional shrublands and woodlands occurring in wetlands. The Successional Woody Wetland Map Class (COMP_WOWE) is typically dominated by *Salix nigra* (black willow), *Populus deltoides* (eastern cottonwood), *Alnus serrulata* (hazel alder), and/or *Cephalanthus occidentalis* (common buttonbush). Standing snags of dead or dying trees are often present.

National Capital Parks-East Classification Comments: This association is mapped as part of the Successional Woody Wetland Map Class (COMP_WOWE) which at this park may include Northeastern Buttonbush Shrub Swamp (CEGL006069) and small patches of Ruderal Box-elder Floodplain Forest (CEGL005033), as well as unclassified successional shrublands and woodlands occurring in wetlands.

Global Classification Comments: This type is analogous to ~*Cephalanthus occidentalis / Carex* spp. Midwest Shrub Swamp (CEGL002190)$$, which 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

Chesapeake & Ohio Canal National Historical Park Range: This association is mapped as Successional Woody Wetland Map Class (COMP_WOWE), described as successional shrublands and woodlands of disturbed floodplains, seepage wetlands, and artificial impoundments (including impoundments due to beaver activity). As mapped on the Chesapeake & Ohio Canal National Historic Park, Successional Woody Wetland Map Class (COMP_WOWE) occurs at various locations, most commonly in the Ridge and Valley.

National Capital Parks-East Range: This association is mapped as Successional Woody Wetland Map Class (COMP_WOWE), described as successional shrublands and woodlands of disturbed floodplains, seepage wetlands, and artificial impoundments (including impoundments due to beaver activity). Successional Woody Wetland Map Class (COMP_WOWE) is mapped throughout National Capital Parks East in disturbed wetlands.

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:SNR, DC:SNR, DE:S2, MA:SNR, MD:SNR, ME:SNR, NH:SNR, NJ:S3, NY:SNR, ON:SNR, PA:SNR, QC?:SNA, RI:SNR, VA:SU, VT:SNR

TNC Ecoregions: 49:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C

USFS Ecoregions (2007): 211Dc:CC?, 211Fa:CCP, 211Fb:CCC, 211Fc:CCC, 211Fd:CCC, 211Ga:CCC, 211Gb:CCC, 211Ia:CCC, 211Ib:CCC, 221Aa:CC?, 221Ab:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCP, 221Bd:CCP, 221Da:CCC, 221Ea:CCP, 221Fa:CCC, 231:C, 232Ad:CCC, 232C:CC, 232Hd:CCP, 234:C, M211A:CP, M211Bb:CCC,

M211Bd:CCC, M211Cb:CCC, M211Cc:CCP, M211De:CCC, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, 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, Roosevelt-Vanderbilt, Saratoga, Weir Farm); USFWS (Assabet River?, Chesapeake Marshlands, Great Meadows, Great Swamp, Monomoy, Nomans Land Island, Oxbow, Patuxent)

ELEMENT SOURCES
Chesapeake & Ohio Canal National Historical Park Plots: none
National Capital Parks-East Plots: None.
Chesapeake & Ohio Canal National Historical Park Description Author(s): C.W. Nordman
National Capital Parks-East Description Author(s): M. Pyne
Global Description Author(s): S.L. Neid, E. Southgate, L.A. Sneddon, S.C. Gawler, E. Largay
References: Breden et al. 2001, CAP pers. comm. 1998, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2014a, Edinger et al. 2014b, Eichelberger and Zimmerman 2011b, Elliman 2003, Enser and Lundgren 2006, Fike 1999, Fleming et al. 2017, Gawler 2002, Gawler and Cutko 2010, Gawler et al. 2017, Harrison 2004, Harrison 2011, Harrison, J. pers. comm., Hopping 2000, Karanaukas 2001, Largay and Sneddon 2017, Metzler and Barrett 2006, Metzler et al. 2009, NRCS 2004a, Nichols et al. 2001, Perles et al. 2007, Sechler et al. 2014, Sneddon et al. 2010, Sperduto and Nichols 2004, Swain and Kearsley 2014, Thompson and Sorenson 2005, Zimmerman et al. 2012

M880. Eastern North American Wet Shoreline Vegetation

This widely ranging macrogroup comprises a large number of variable vegetation types that occur on the shores of rivers and lakes in the eastern U.S. and adjacent Canada. The patchy vegetation is typically composed of sparsely vegetated mud, sand, gravel or bedrock shores. Characteristic species vary over the range. Typical shrubs may include *Alnus serrulata* (hazel alder), *Cephalanthus occidentalis* (common buttonbush), *Cornus* (dogwood) spp., *Hypericum densiflorum* (bushy St. Johnswort), *Physocarpus opulifolius* (common ninebark), *Salix* (willow) spp., and stunted individuals of floodplain trees such as *Acer saccharinum* (silver maple), *Betula nigra* (river birch), and *Platanus occidentalis* (American sycamore). The herbaceous flora is highly variable but often includes *Bacopa monnieri* (herb of grace), *Boehmeria cylindrica* (small-spike false nettle), a number of *Cyperus* (flatsedge) spp., *Dulichium arundinaceum* (threeway sedge), *Eragrostis hypnoides* (teal lovegrass), *Justicia americana* (American water-willow), *Ludwigia palustris* (marsh seedbox), *Lindernia dubia* (yellowseed false pimpernel), *Polygonum* (knotweed) spp., *Saururus cernuus* (lizard's-tail), *Schoenoplectus pungens* (common threesquare), *Scirpus cyperinus* (woolgrass), and *Zizaniopsis miliacea* (giant cutgrass). In the Great Lakes portion of the range, scattered woody trees and shrubs are found throughout, including *Abies balsamea* (balsam fir), *Alnus incana* (gray alder), *Juniperus communis* (common juniper), *Picea glauca* (white spruce), and *Populus tremuloides* (quaking aspen). Herbs include *Argentina anserina* (silverweed cinquefoil), *Calamagrostis canadensis* (bluejoint), *Carex buxbaumii* (Buxbaum's sedge), *Carex castanea* (chestnut sedge), *Danthonia spicata* (poverty oatgrass), *Deschampsia cespitosa* (tufted hairgrass), and *Trichophorum cespitosum* (tufted bulrush).

G755. EASTERN NORTH AMERICAN SCRUB & HERB FLOODPLAIN WETLAND

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* (hazel alder), *Carex torta* (twisted sedge), *Elymus* (wildrye) spp., *Eupatorium* (thoroughwort) spp., *Panicum virgatum* (switchgrass), *Salix caroliniana* (coastal plain willow), *Salix interior* (sandbar willow) (more Midwest), *Solidago gigantea* (giant goldenrod), and others.

A3647 *Carex torta* Riverbed Alliance

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* (twisted sedge) and low *Salix* (willow) 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 (parasol whitetop), *Dichanthelium clandestinum* (deertongue), *Solidago rugosa ssp. aspera* (wrinkleleaf goldenrod), *Juncus effusus var. solutus* (lamp rush), *Scirpus expansus* (woodland bulrush), *Scirpus cyperinus* (woolgrass), *Equisetum arvense* (field horsetail), *Onoclea sensibilis* (sensitive fern), *Vernonia noveboracensis* (New York ironweed), *Lycopus virginicus* (Virginia water horehound), *Scutellaria lateriflora* (blue skullcap), and *Salix sericea* (silky willow). 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* (cardinalflower), *Symphyotrichum dumosum* (rice button aster), *Lycopus virginicus* (Virginia water horehound), *Osmunda regalis* (royal fern), and *Hypericum mutilum* (dwarf St. Johnswort). Physiognomy varies from strictly herbaceous to shrubby to wooded herbaceous. Scattered shrubs and small, battered specimens of *Platanus occidentalis* (American sycamore), *Betula nigra* (river birch), *Cornus amomum* (silky dogwood), *Alnus serrulata* (hazel alder), and *Carpinus caroliniana* (American hornbeam) are present in some stands. Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum* (Nepalese browntop), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), and other weedy exotics.

[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 Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Scrub & Herb Floodplain Wetland (G755)
Alliance	*Carex torta* Riverbed Alliance (A3647)

Element Concept

Global Summary: This association accommodates herbaceous alluvial wetlands in which *Carex torta* (twisted sedge) 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* (twisted sedge) often forms dense, extensive colonies. Associated species vary with geography but can include *Polygonum sagittatum* (arrowleaf tearthumb), *Dichanthelium clandestinum* (deertongue), *Solidago rugosa ssp. aspera* (wrinkleleaf goldenrod), *Juncus effusus* (common rush), *Equisetum arvense* (field horsetail), *Onoclea sensibilis* (sensitive fern), *Vernonia noveboracensis* (New York ironweed), *Lycopus virginicus* (Virginia water horehound), *Lobelia cardinalis* (cardinalflower), *Symphyotrichum dumosum* (rice button aster), *Lycopus virginicus* (Virginia water horehound), *Osmunda regalis* (royal fern), *Hypericum mutilum* (dwarf St. Johnswort), *Eutrochium fistulosum* (trumpetweed), *Solidago patula* (roundleaf goldenrod), *Boehmeria cylindrica* (small-spike false nettle), *Amphicarpaea bracteata* (American hogpeanut), *Acalypha rhomboidea* (common threeseed mercury), *Impatiens capensis* (orange jewelweed), *Leersia oryzoides* (rice cutgrass), and *Symphyotrichum lateriflorum* (calico aster). Physiognomy of this type varies from strictly herbaceous to wooded herbaceous to shrubby. Scattered shrubs and small, battered specimens of *Platanus occidentalis* (American sycamore), *Betula nigra* (river birch), *Cornus amomum* (silky dogwood), *Alnus serrulata* (hazel alder), and *Carpinus caroliniana* (American hornbeam) are present in some stands. An overhanging canopy may include *Platanus occidentalis* (American sycamore), *Betula alleghaniensis var. alleghaniensis* (yellow birch), or *Acer rubrum* (red maple). Overhanging shrubs often include *Rhododendron maximum* (great laurel). Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum* (Nepalese browntop), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), and other weedy exotics.

Environmental Description

Catoctin Mountain Park Environment: This association occurs as small patches on sand and gravel bars along major creeks where some flood scour occurs.

Chesapeake & Ohio Canal National Historical Park Environment: This twisted sedge herbaceous vegetation was sampled at six plot locations in the park. The sites are flat intermittently flooded stream terraces, alluvial plains, shorelines and ravines. Soils range from poorly to well-drained loam, loamy sand, silty clay and sand. The unvegetated surface is dominated by small rocks (30-91% cover) along with large rocks (1-60%), leaf litter (1-2%),

wood (0-1%), bare soil/sand (1-30%), and standing water (0-5%). Evidence of disturbance includes periodic flooding and scouring and the presence of exotic species.

Prince William Forest Park Environment: Rocky Bar and Shore (Twisted Sedge Type) occupies coarse-textured depositional bars in the stream channels of Quantico Creek and South Fork Quantico Creek, in high-gradient reaches that are frequently flooded and/or inundated for extended periods of the year. These habitats occur most commonly in the "gorge" sections of these valleys, where the streams cut through strata of resistant bedrock, and relatively steep slopes subtend the streams. Soils consist of recent alluvium that is rocky, cobbly, or gravelly, lacks any profile development, and is frequently heterogeneous at small spatial scales. Habitats are partly exposed for much of the growing season, becoming more extensive in mid to late summer as water levels drop. Vegetation composition is generally controlled by hydrologic stresses, ice-scouring, and the impacts of high-velocity floodwaters and flood debris.

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

Catoctin Mountain Park Vegetation: Although occupying open areas, some shade is cast by overhanging trees. The dominant species is *Carex torta* (twisted sedge). Other frequent associates include *Dichanthelium clandestinum* (deertongue), *Glyceria striata* (fowl mannagrass), *Hydrocotyle americana* (American marshpennywort), *Leersia oryzoides* (rice cutgrass), *Polygonum sagittatum* (arrowleaf tearthumb), *Amphicarpaea bracteata* (American hogpeanut), *Boehmeria cylindrica* (small-spike false nettle), and *Pilea pumila* (Canadian clearweed). A number of other wetland herbaceous species also occur at individual stands; a partial list includes *Symplocarpus foetidus* (skunk-cabbage), *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana* (broadleaf enchanter's nightshade), *Thelypteris palustris* (eastern marsh fern), *Tiarella cordifolia* (heartleaf foamflower), *Equisetum hyemale* (scouringrush horsetail), *Onoclea sensibilis* (sensitive fern), *Cyperus strigosus* (strawcolored flatsedge), *Scutellaria lateriflora* (blue skullcap), and others.

Chesapeake & Ohio Canal National Historical Park Vegetation: This community is defined by the moderate (60% cover) herbaceous layer dominated by *Carex torta* (twisted sedge). In addition, there may be a sparse (20%) emergent tree layer (20-35 m tall) of *Platanus occidentalis* (American sycamore). Additional herbs include *Boehmeria cylindrica* (small-spike false nettle), *Dichanthelium dichotomum* (cypress panicgrass), and *Osmunda regalis var. spectabilis* (royal fern). A total of 10 exotic species were reported from sampled stands. This community also supports Maryland state-imperiled *Cinna latifolia* (drooping woodreed) and three state-vulnerable species.

Prince William Forest Park Vegetation: This association is dominated by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. However, its physiognomy varies from strictly herbaceous to shrubby. Coppice sprouts of *Platanus occidentalis* (American sycamore) and/or *Betula nigra* (river birch) are the most common woody plants, but rarely cover more than 50% of a given area. At Prince William Forest Park, *Carex torta* (twisted sedge) is usually one of several patch-dominant herbs that form highly variable stands. Where *Carex torta* (twisted sedge) dominates, it typically forms dense, extensive colonies. Characteristic associates that can achieve patch-dominance in some areas include *Polygonum sagittatum* (arrowleaf tearthumb), *Dichanthelium clandestinum* (deertongue), *Boehmeria cylindrica* (small-spike false nettle), *Amphicarpaea bracteata* (American hogpeanut), *Equisetum arvense* (field horsetail), *Dichanthelium dichotomum* (cypress panicgrass), *Symphyotrichum lateriflorum* (calico aster), *Lycopus virginicus* (Virginia water horehound), and *Cyperus odoratus* (fragrant flatsedge). Many other annual and perennial herbs occur at lower cover and constancy. Stands in the park are often heavily invaded by the exotic grass *Microstegium vimineum* (Nepalese browntop).

Global Vegetation: Vegetation is characterized by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* (twisted sedge) is usually the dominant species and typically forms dense, extensive colonies. Associated species vary with geography. *Polygonum sagittatum* (arrowleaf tearthumb), *Solidago rugosa* (wrinkleleaf goldenrod), and *Dichanthelium clandestinum* (deertongue) are typical; others include *Acalypha rhomboidea* (common threeseed mercury), *Amphicarpaea bracteata* (American hogpeanut), *Boehmeria cylindrica* (small-spike false nettle), *Equisetum arvense* (field horsetail), *Eutrochium fistulosum* (trumpetweed), *Euthamia graminifolia var. graminifolia* (flat-top goldentop), *Juncus effusus* (common rush),

Hypericum mutilum (dwarf St. Johnswort), *Hypericum perforatum* (common St. Johnswort), *Impatiens capensis* (orange jewelweed), *Leersia oryzoides* (rice cutgrass), *Lobelia cardinalis* (cardinalflower), *Lycopus virginicus* (Virginia water horehound), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Prunella vulgaris* (common selfheal), *Solidago patula* (roundleaf goldenrod), *Symphyotrichum dumosum* (rice button aster), *Symphyotrichum lateriflorum* (calico aster), *Symphyotrichum prenanthoides* (crookedstem aster), *Thalictrum* (meadowrue) spp., *Trautvetteria caroliniensis var. caroliniensis* (Carolina bugbane), *Verbesina alternifolia* (wingstem), and *Vernonia noveboracensis* (New York ironweed). 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* (American sycamore), *Betula nigra* (river birch), *Cornus amomum* (silky dogwood), *Alnus serrulata* (hazel alder), and *Carpinus caroliniana* (American hornbeam) are present in some stands. An overhanging canopy with an average cover of 20% may include *Platanus occidentalis* (American sycamore), *Betula alleghaniensis var. alleghaniensis* (yellow birch), or *Acer rubrum* (red maple). Sparse overhanging shrubs often include *Rhododendron maximum* (great laurel). Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum* (Nepalese browntop), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), and other weedy exotics. Mean species richness of vascular plants in six West Virginia plots was 36 taxa per 400 m2, 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

Global Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex torta* (twisted sedge)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Boehmeria cylindrica* (small-spike false nettle), *Carex torta* (twisted sedge), *Dichanthelium clandestinum* (deertongue), *Glyceria striata* (fowl mannagrass), *Hydrocotyle americana* (American marshpennywort), *Leersia oryzoides* (rice cutgrass), *Pilea pumila* (Canadian clearweed), *Polygonum sagittatum* (arrowleaf tearthumb)

Chesapeake & Ohio Canal National Historical Park: *Carex torta* (twisted sedge)

Prince William Forest Park: *Betula nigra* (river birch), *Boehmeria cylindrica* (small-spike false nettle), *Carex torta* (twisted sedge), *Dichanthelium clandestinum* (deertongue), *Platanus occidentalis* (American sycamore), *Polygonum sagittatum* (arrowleaf tearthumb), *Symphyotrichum lateriflorum* (calico aster)

Global: *Carex torta* (twisted sedge), *Polygonum sagittatum* (arrowleaf tearthumb), *Solidago rugosa* (wrinkleleaf goldenrod)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Cinna latifolia* (drooping woodreed, G5, MD-imperiled), *Doellingeria infirma* (cornel-leaf whitetop, G5, MD-vulnerable), *Salix caroliniana* (coastal plain willow, G5, MD-vulnerable), *Zizia aurea* (golden zizia, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Allium vineale* (wild garlic, Medium/Insignificant), *Calystegia sepium* (hedge false bindweed), *Commelina communis* (Asiatic dayflower), *Echinochloa crus-galli* (barnyardgrass, Medium/Insignificant), *Glechoma hederacea* (ground ivy, Low), *Mentha spicata* (spearmint), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum persicaria* (spotted ladysthumb), *Rosa multiflora* (multiflora rose, Medium/Low), *Tussilago farfara* (coltsfoot, Insignificant)

Prince William Forest Park: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium)

Global: Invasive/Exotic Plants: *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb); **Other Plants**: *Dichanthelium clandestinum* (deertongue, 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)

Global Related Concepts:
- *Carex torta* Association (Fleming and Moorhead 1996) **?**
- *Carex torta* Herbaceous Vegetation (Fleming and Taverna 2006) =
- *Carex torta* Herbaceous Vegetation (Fleming and Coulling 2001) =
- *Carex torta* Herbaceous Vegetation (Bowman 2000) =
- *Carex torta* Riverscour Prairie (Byers et al. 2007) =
- *Carex torta* riparian herbaceous vegetation (Vanderhorst 2001b) =
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) >
- Sedge - spotted joe pye weed riverine herbaceous vegetation (Perles et al. 2004) =
- Torturous sedge gravel rivershore (CAP pers. comm. 1998) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Catoctin Mountain Park Classification Comments: Rocky Bar and Shore (Twisted Sedge Type) is mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP), which includes no other defined associations at this park.
Chesapeake & Ohio Canal National Historical Park Classification Comments: In NCR, this association is mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP), which includes seven associations at this park: Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Ridge and Valley Gravel Riverscour Prairie (CEGL006477), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Water-willow Rocky Bar and Shore (CEGL004286), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).
Prince William Forest Park Classification Comments: Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103) is the only classified association mapped as part of the Herbaceous Depositional Bar Map Class (COMP_HDEP) in this park. It can be distinguished from other disturbed herbaceous vegetation within this map class by its association with rocky bars in high-gradient stream reaches (versus sandy/silty bars in lower-gradient reaches), and by the dominance of perennial (versus annual) herbs.

ELEMENT DISTRIBUTION

Catoctin Mountain Park Range: This vegetation is confined to larger watercourses in the park.
Chesapeake & Ohio Canal National Historical Park Range: This community was sampled from plots at Fifteenmile Creek (Canal mile 141), at Spring Lick Hollow and elsewhere.
Prince William Forest Park Range: Rocky Bar and Shore (Twisted Sedge Type) is scattered in small linear patches along the lengths of Quantico Creek and South Fork Quantico Creek in Prince William Forest Park.
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:SNR, DE:S1, GA:SNR, KY:SNR, MD:SNR, NC:SNR, PA:S4, SC:SNR, TN:SNR, VA:S3, WV:S3
TNC Ecoregions: 44:C, 50:C, 51:C, 52:C, 58:C, 59:C, 60:C, 61:C
USFS Ecoregions (2007): 211Fa:CCP, 211Fb:CCC, 211Fc:CCC, 211Fd:CCC, 211Ga:CCC, 211Gb:CCC, 221Ba:CCC, 221Da:CCC, 221Db:CCC, 221Ea:CCP, 221En:CC?, 221Fa:CCC, 221Ha:CC?, 221Hb:CCP, 221Hc:CCC, 221He:CC?, 223Eg:CCC, 231Cd:CCC, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC,

M221Ba:CCC, M221Bb:CCC, M221Bd:CCC, M221Be: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

Catoctin Mountain Park Plots: CATO.37, CATO.51, CATO.52.
Chesapeake & Ohio Canal National Historical Park Plots: (6 plots): CHOH.626, CHOH.627, CHOH.630, CHOH.631, GRN_RDG.003 (CHOH.532), GRN_RDG.004 (CHOH.533).
Prince William Forest Park Plots: PRWI.52, PRWI.53.
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Prince William Forest Park Description Author(s): G. Fleming
Global Description Author(s): G. Fleming, P. Coulling, S.C. Gawler
References: Allard 1990, Bowman 2000, Byers et al. 2007, CAP pers. comm. 1998, Coxe 2009, Eyre 1980, Fleming and Coulling 2001, Fleming and Coulling 2001*, Fleming and Moorhead 1996, Fleming and Taverna 2006, Fleming et al. 2017, Harrison 2004, Hupp 1982, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, PNHP 2004, Palmer-Ball et al. 1988, Peet et al. unpubl. data, Perles et al. 2004, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d., Vanderhorst 2001b, Vanderhorst et al. 2007, WVNHP unpubl. data, Zimmerman 2011p, Zimmerman and Podniesinski 2008, Zimmerman et al. 2012

A2078 *Eupatorium serotinum - Verbesina alternifolia* Depositional Bar Alliance

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* (spiny amaranth), *Artemisia annua* (sweet sagewort), *Datura stramonium* (jimsonweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Polygonum lapathifolium* (curlytop knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum punctatum* (dotted smartweed), *Teucrium canadense* (Canada germander), *Verbesina alternifolia* (wingstem), and *Verbena urticifolia* (white vervain), which are relatively constant and generally contribute most of the cover. Additional, less constant or abundant species include *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Conoclinium coelestinum* (blue mistflower), *Perilla frutescens* (beefsteakplant), *Dysphania ambrosioides* (Mexican tea), *Mollugo verticillata* (green carpetweed), *Solanum ptycanthum* (West Indian nightshade), *Verbena hastata* (swamp verbena), *Urtica dioica ssp. dioica* (stinging nettle), *Solanum carolinense* (Carolina horsenettle), and *Hibiscus laevis* (halberdleaf rosemallow). Herbaceous vines may also be numerous, with *Calystegia sepium* (hedge false bindweed), *Cynanchum laeve* (honeyvine), and *Cuscuta gronovii* (scaldweed) most frequent. Scattered individuals of shrubby to full-sized flood-tolerant trees (e.g., *Platanus occidentalis* (American sycamore), *Acer saccharinum* (silver maple)), as well as saplings of *Betula nigra* (river birch) 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 Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Scrub & Herb Floodplain Wetland (G755)
Alliance	*Eupatorium serotinum* - *Verbesina alternifolia* Depositional Bar Alliance (A2078)

Element Concept

Global Summary: This association is known only from the Potomac and Shenandoah rivers in the Piedmont and mountain provinces of Maryland, Virginia, and West Virginia. Well-documented occurrences are concentrated in high-gradient reaches, particularly near the fall-line (Potomac Gorge) and Bull Falls 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* (sweet sagewort), *Amaranthus spinosus* (spiny amaranth), *Datura stramonium* (jimsonweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Polygonum lapathifolium* (curlytop knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum punctatum* (dotted smartweed), and *Verbena urticifolia* (white vervain) are relatively constant and generally contribute most of the cover. Additional, less constant or abundant species include *Dysphania ambrosioides* (Mexican tea), *Conoclinium coelestinum* (blue mistflower), *Hibiscus laevis* (halberdleaf rosemallow), *Mollugo verticillata* (green carpetweed), *Perilla frutescens* (beefsteakplant), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Solanum carolinense* (Carolina horsenettle), *Solanum ptycanthum* (West Indian nightshade), *Teucrium canadense* (Canada germander), *Urtica dioica ssp. dioica* (stinging nettle), *Verbena hastata* (swamp verbena), and *Verbesina alternifolia* (wingstem). Herbaceous vines may also be numerous, with *Calystegia sepium* (hedge false bindweed), *Cynanchum laeve* (honeyvine), and *Cuscuta gronovii* (scaldweed) most frequent. Scattered individuals of shrubby to full-sized flood-tolerant trees (e.g., *Platanus occidentalis* (American sycamore), *Acer saccharinum* (silver maple)) may be present.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This herbaceous vegetation was sampled at nine plot locations in the park. The sites are flat, seasonally or temporarily flooded alluvial plains and shorelines with rapidly to moderately well-drained sand or loamy sand soil. The unvegetated surface is dominated by large rocks (0-60% cover), small rocks (0-60%), or bare sand (40-60%). Evidence of disturbance includes regular flooding and scouring and the presence of exotic species.

George Washington Memorial Parkway Environment: Piedmont-Central Appalachian Scour Bar Wet Meadow occupies sandy bars and banks on and immediately adjacent to the river channel shelf. The type occurs in scattered patches along nearly the entire Virginia side of the Potomac Gorge, except in Mather Gorge. The habitats are inundated during most high-water events, and their loose, sandy substrates are especially vulnerable to the erosion or even complete removal by flooding. On the other hand, new sandy bars form readily from flood-deposited material. As a result, the habitat of this community is quite spatially and temporally dynamic. Soil samples extracted from plots are neutral to mildly alkaline, highly calcareous, and fully base-saturated.

Harpers Ferry National Historical Park Environment: Piedmont-Central Appalachian Scour Bar Wet Meadow occupies sandy bars and banks on and immediately adjacent to the Potomac River channel shelf. The type occurs in scattered patches along the Potomac and Shenandoah rivers in the park. The habitats are inundated during most high-water events and their loose, sandy substrates are especially vulnerable to erosion or even complete removal by flooding. On the other hand, new sandy bars form readily from flood-deposited material. As a result, the habitat of this community is quite spatially and temporally dynamic. Soil samples are neutral to mildly alkaline, highly calcareous, and fully base-saturated.

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

Chesapeake & Ohio Canal National Historical Park Vegetation: Dominant species in the very dense (80+% cover) herbaceous layer include natives *Eupatorium serotinum* (lateflowering thoroughwort), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum lapathifolium* (curlytop knotweed), and *Polygonum pensylvanicum* (Pennsylvania smartweed) and exotics *Datura stramonium* (jimsonweed), *Artemisia annua* (sweet sagewort), *Setaria faberi* (Japanese bristlegrass), and *Sorghum halepense* (Johnsongrass). More than 18 exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Rumex altissimus* (pale dock).

George Washington Memorial Parkway Vegetation: Although generally open, most of the Virginia-side sites of Piedmont-Central Appalachian Scour Bar Wet Meadow in the Potomac Gorge are in small, often linear patches bordered by the river on one side and floodplain forest on the other. As a result, they are usually partly overhung by trees (21% mean cover), principally *Acer saccharinum* (silver maple) and/or *Platanus occidentalis* (American sycamore), and the one 400-square-m sample has large-diameter *Acer saccharinum* (silver maple) rooted within the boundaries. The vegetation, however, is almost entirely herbaceous and dominated by a dense (78% mean cover) mixture of tall, annual and weedy perennial herbs. *Eupatorium serotinum* (lateflowering thoroughwort) is usually most abundant (25-50% mean cover), but *Boehmeria cylindrica* (small-spike false nettle), *Solanum carolinense* (Carolina horsenettle), *Polygonum punctatum* (dotted smartweed), *Verbena urticifolia* (white vervain), *Conoclinium coelestinum* (blue mistflower), *Verbesina alternifolia* (wingstem), *Cynanchum laeve* (honeyvine), *Teucrium canadense* (Canada germander), *Rumex altissimus* (pale dock), and the exotics *Artemisia annua* (sweet sagewort), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Perilla frutescens* (beefsteakplant), *Dysphania ambrosioides* (Mexican tea), *Amaranthus spinosus* (spiny amaranth), *Datura stramonium* (jimsonweed), and *Glechoma hederacea* (ground ivy) are constant species that may achieve high cover in a given stand. Some less constant but characteristic native species include *Verbena hastata* (swamp verbena), *Polygonum lapathifolium* (curlytop knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Hibiscus laevis* (halberdleaf rosemallow), *Impatiens capensis* (orange jewelweed), *Solidago gigantea* (giant goldenrod), and *Eupatorium perfoliatum var. perfoliatum* (common boneset). Many additional species occur at low cover and constancy. Total species richness ranges from 45 to 93 taxa/plot.

Harpers Ferry National Historical Park Vegetation: Although generally open, most sites of Piedmont-Central Appalachian Scour Bar Wet Meadow in the park are in small, often linear patches bordered by the river on one side and floodplain forest on the other. As a result, they are usually partly overhung by trees, principally *Acer saccharinum* (silver maple), *Platanus occidentalis* (American sycamore), and *Fraxinus pennsylvanica* (green ash). In addition, *Toxicodendron radicans* (eastern poison-ivy) is also common in stands. The vegetation, however, is primarily herbaceous and dominated by a dense mixture of tall, annual and weedy perennial herbs. The following herbs are common species that may achieve high cover in a stand: *Conoclinium coelestinum* (blue mistflower), *Eupatorium serotinum* (lateflowering thoroughwort), *Hibiscus laevis* (halberdleaf rosemallow), *Polygonum lapathifolium* (curlytop knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum punctatum* (dotted smartweed), *Solanum ptycanthum* (West Indian nightshade), *Teucrium canadense* (Canada germander), *Verbena hastata* (swamp verbena), *Verbena urticifolia* (white vervain), and the exotics *Artemisia annua* (sweet sagewort), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Perilla frutescens* (beefsteakplant), *Rumex crispus* (curly dock), *Dysphania ambrosioides* (Mexican tea), *Amaranthus spinosus* (spiny amaranth), *Datura stramonium* (jimsonweed), and *Glechoma hederacea* (ground ivy). Some less constant but characteristic native species include *Eragrostis capillaris* (lace grass), *Chamaesyce nutans* (eyebane), *Heteranthera dubia* (grassleaf mudplantain), *Hypericum perforatum* (common St. Johnswort), *Polymnia canadensis* (whiteflower leafcup), *Thalictrum revolutum* (waxyleaf meadowrue), *Elymus* (wildrye) spp., *Ranunculus recurvatus* (blisterwort), *Scirpus atrovirens* (green bulrush), *Solidago gigantea* (giant goldenrod), and *Eupatorium perfoliatum var. perfoliatum* (common boneset). Many additional species occur at low cover and constancy. Total species richness ranges from 47 to 75 taxa/plot.

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* (spiny amaranth), *Artemisia annua* (sweet sagewort), *Datura stramonium* (jimsonweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Polygonum lapathifolium* (curlytop knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum punctatum* (dotted smartweed), *Teucrium canadense* (Canada germander), *Verbesina alternifolia* (wingstem), and *Verbena urticifolia* (white vervain), which are relatively constant and generally contribute most of the cover. Additional, less constant or abundant species include *Dysphania ambrosioides* (Mexican tea), *Conoclinium coelestinum* (blue mistflower), *Hibiscus laevis* (halberdleaf rosemallow), *Mollugo*

verticillata (green carpetweed), *Perilla frutescens* (beefsteakplant), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Solanum carolinense* (Carolina horsenettle), *Solanum ptycanthum* (West Indian nightshade), *Teucrium canadense* (Canada germander), *Urtica dioica ssp. dioica* (stinging nettle), *Verbena hastata* (swamp verbena), and *Verbesina alternifolia* (wingstem). Herbaceous vines may also be numerous, with *Calystegia sepium* (hedge false bindweed), *Cynanchum laeve* (honeyvine), and *Cuscuta gronovii* (scaldweed) most frequent. Scattered individuals of shrubby to full-sized flood-tolerant trees (e.g., *Platanus occidentalis* (American sycamore), *Acer saccharinum* (silver maple)) 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

Global Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Amaranthus spinosus* (spiny amaranth), *Artemisia annua* (sweet sagewort), *Datura stramonium* (jimsonweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Polygonum lapathifolium* (curlytop knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum punctatum* (dotted smartweed), *Verbena urticifolia* (white vervain)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Eupatorium serotinum* (lateflowering thoroughwort), *Polygonum lapathifolium* (curlytop knotweed)

George Washington Memorial Parkway: *Boehmeria cylindrica* (small-spike false nettle), *Eupatorium serotinum* (lateflowering thoroughwort), *Polygonum punctatum* (dotted smartweed), *Solanum carolinense* (Carolina horsenettle)

Harpers Ferry National Historical Park: *Artemisia annua* (sweet sagewort), *Conoclinium coelestinum* (blue mistflower), *Polygonum lapathifolium* (curlytop knotweed), *Solanum ptycanthum* (West Indian nightshade)

Global: *Amaranthus spinosus* (spiny amaranth), *Artemisia annua* (sweet sagewort), *Datura stramonium* (jimsonweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Polygonum lapathifolium* (curlytop knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum punctatum* (dotted smartweed)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Rumex altissimus* (pale dock, G5, MD-critically imperiled); **Invasive/Exotic Plants**: *Abutilon theophrasti* (velvetleaf, Medium/Low), *Alliaria petiolata* (garlic mustard, High/Medium), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Brassica nigra* (black mustard, High/Low), *Chenopodium album* (lambsquarters), *Datura stramonium* (jimsonweed, High/Low), *Digitaria ischaemum* (smooth crabgrass), *Fallopia japonica* var. *japonica* (Japanese knotweed, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Plantago lanceolata* (narrowleaf plantain, High/Low), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Rumex crispus* (curly dock, Low/Insignificant), *Setaria faberi* (Japanese bristlegrass), *Setaria pumila* (yellow foxtail, Low/Insignificant), *Solanum dulcamara* var. *dulcamara* (climbing nightshade), *Sorghum halepense* (Johnsongrass, High/Medium), *Verbascum thapsus* (common mullein, Medium); **Other Plants**: *Dysphania ambrosioides* (Mexican tea, GNR)

George Washington Memorial Parkway: Vulnerable Plants: *Acalypha deamii* (Deam's threeseed mercury, G4?, VA state-vulnerable), *Lipocarpha micrantha* (smallflower halfchaff sedge, G5, VA state-critically imperiled);

Invasive/Exotic Plants: *Amaranthus spinosus* (spiny amaranth), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Datura stramonium* (jimsonweed, High/Low), *Glechoma hederacea* (ground ivy, Low), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb); **Other Plants**: *Dysphania ambrosioides* (Mexican tea, GNR)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Datura stramonium* (jimsonweed, High/Low), *Glechoma hederacea* (ground ivy, Low), *Perilla frutescens* (beefsteakplant, Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rumex crispus* (curly dock, Low/Insignificant); **Other Plants**: *Dysphania ambrosioides* (Mexican tea, GNR)
Global: Invasive/Exotic Plants: *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Datura stramonium* (jimsonweed, High/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR. 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.

Global Related Concepts:
- *Conoclinum coelestinum - Acalypha gracilens - Polygonum lapathifolium* Herbaceous Rivershore [Shenandoah Bedrock Scour Bar Herbaceous Vegetation] (Vanderhorst 2017b) <
- *Datura stramonium - Eupatorium serotinum - Polygonum (punctatum, lapathifolium, pensylvanicum)* Herbaceous Vegetation (Lea 2003) =
- *Eupatorium serotinum - Cynanchum laeve - Polygonum (pensylvanicum, punctatum, lapathifolium)* Herbaceous Vegetation (Fleming and Patterson 2003) =
- *Eupatorium serotinum - Polygonum (lapathifolium, punctatum, pensylvanicum)* Herbaceous Vegetation (Fleming and Taverna 2006) =
- *Eupatorium serotinum - Polygonum (lapathifolium, punctatum, pensylvanicum)* Herbaceous Vegetation (Fleming 2007) =
- *Polygonum (punctatum, lapathifolium, pensylvanicum) - Verbena urticifolia / Ampelamus albidus* Herbaceous Vegetation (Lea 2000) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Piedmont-Central Appalachian Scour Bar Wet Meadow is sometimes referred to as Piedmont / Central Appalachian Scour Bar Herbaceous Vegetation. This is one of seven associations mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) at this park. They are Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Ridge and Valley Gravel Riverscour Prairie (CEGL006477), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Water-willow Rocky Bar and Shore (CEGL004286), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).
George Washington Memorial Parkway Classification Comments: Piedmont-Central Appalachian Scour Bar Wet Meadow is sometimes referred to as Piedmont / Central Appalachian Scour Bar Herbaceous Vegetation. This is one of three associations mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) at this park. They are Water-Willow Rocky Bar and Shore (CEGL004286), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), and Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483).

Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481) is distinguished by its tall, weedy herbaceous vegetation, usually dominated by *Eupatorium serotinum* (lateflowering thoroughwort) and by occupying sandy depositional bars and upper parts of riverbanks. It differs from Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483) by the dominance of tall annual and perennial herbs (versus low, predominantly annual herbs), and from Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476) and Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896) (both part of a different map class, the River-Scour Woodland Map Class) by the lack of integral woody vegetation.

George Washington Memorial Parkway Other Comments: Stands of this riverbank vegetation type, Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), often have a within-season, zonal-successional relationship with Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), i.e., the higher bank habitats occupied by Piedmont-Central Appalachian Scour Bar Wet Meadow start out with an early (June-July) flush of low annuals characteristic of the rivershore bar community, including *Eragrostis hypnoides* (teal lovegrass), *Eragrostis frankii* (sandbar lovegrass), *Lindernia dubia var. dubia* (yellowseed false pimpernel), *Paspalum fluitans* (horsetail paspalum), etc. Later in the summer, when this type is reaching maximal growth, the evanescing remains of these low annuals can usually be found underneath the tall herbs. At the same time, low annual herbaceous vegetation of the Appalachian-Atlantic Riverbar Drawdown Shore will be at peak development on the lowest rivershore bars that became exposed later. Exotics are very problematic in this vegetation type, with 55 taxa recorded in seven plots.

Harpers Ferry National Historical Park Classification Comments: Piedmont-Central Appalachian Scour Bar Wet Meadow is sometimes referred to as Piedmont / Central Appalachian Scour Bar Herbaceous Vegetation. This is one of five associations mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) at this park. They are Water-willow Rocky Bar and Shore (CEGL004286), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).

Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481) is distinguished by its tall, weedy herbaceous vegetation occupying unstable sandy depositional bars and upper parts of riverbanks. It differs from Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483) by the dominance of tall annual and perennial herbs (versus low, predominantly annual herbs), and from Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476) and Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896) (both part of a different map class, the River-Scour Woodland Map Class) by the lack of integral woody vegetation.

It is most similar in physiognomy to Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480). Both types are dominated by tall herbs, and there can be some overlap in species between the two, but Piedmont-Central Appalachian Scour Bar Wet Meadow is primarily composed of tall annuals and weedy perennials on unstable bars and banks. Piedmont-Central Appalachian Riverbar Tall Wet Meadow, on the other hand, is dominated by tall perennial species as it is a more stable type that does not experience disturbance as frequently.

Harpers Ferry National Historical Park Other Comments: Stands of this riverbank vegetation type, Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), often have a within-season, zonal-successional relationship with Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), i.e., the higher bank habitats occupied by Piedmont-Central Appalachian Scour Bar Wet Meadow start out with an early (June-July) flush of low annuals characteristic of the rivershore bar community, including *Eragrostis hypnoides* (teal lovegrass), *Eragrostis frankii* (sandbar lovegrass), *Lindernia dubia var. dubia* (yellowseed false pimpernel), etc. Later in the summer, when this type is reaching maximal growth, the evanescing remains of these low annuals can usually be found underneath the tall herbs. At the same time, low annual herbaceous vegetation of the Appalachian-Atlantic Riverbar Drawdown Shore will be at peak development on the lowest rivershore bars that became exposed later. Exotics are very problematic in this vegetation type.

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

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled in plots at Fairplay and elsewhere. Herbaceous Depositional Bar Map Class (COMP_HDEP) includes various predominantly herbaceous (and often ephemeral) communities subject to frequent high-energy floods, occurring on scoured shorelines or on sand, gravel, and cobble bars within the channels of rivers and streams. It is mapped at many locations, the length of the Chesapeake & Ohio Canal.

George Washington Memorial Parkway Range: Piedmont-Central Appalachian Scour Bar Wet Meadow occupies sandy bars and banks on and immediately adjacent to the river channel shelf. The type occurs in scattered patches in all parks of the Potomac Gorge section of George Washington Memorial Parkway.

Harpers Ferry National Historical Park Range: Piedmont-Central Appalachian Scour Bar Wet Meadow occupies sandy bars and banks on and immediately adjacent to the river channel shelf. The type occurs in scattered patches along both sides of the Potomac and Shenandoah rivers.
Global Range: This association is known only from the Potomac and Shenandoah rivers in the Piedmont and mountain provinces of Maryland, Virginia, and West Virginia. Well-documented occurrences are concentrated in high-gradient reaches, particularly near the fall-line (Potomac Gorge) and Bull Falls at Harpers Ferry.
Nations: US
States/Provinces: DC:SNR, MD:SNR, VA:S2S3, WV:S1
TNC Ecoregions: 52:C, 59:C, 61:C
USFS Ecoregions (2007): M221Da:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal, George Washington Parkway, Harpers Ferry)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (9 plots): CHOH.525, CHOH.644, CHOH.645, POTO_012.03, POTO_019.06, POTO_021.01, POTO_021.02, RIVB_016, RIVB_022.
George Washington Memorial Parkway Plots: GFNP_020, GFNP_047, GWMP_011, TURK_052.
Harpers Ferry National Historical Park Plots: HAFE.27, HAFE.28, HAFE.33, HAFE.34, HAFE.41.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Harpers Ferry National Historical Park Description Author(s): G. Fleming and K. Taverna
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 Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2000, Lea 2000*, Lea 2003, Lea 2004, Vanderhorst 2017b, WVNHP unpubl. data, 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 Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Scrub & Herb Floodplain Wetland (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* (Indian woodoats), *Dichanthelium clandestinum* (deertongue), *Verbesina alternifolia* (wingstem), *Elymus* (wildrye) spp. (*Elymus riparius* (riverbank wildrye), *Elymus canadensis* (Canada wildrye), *Elymus villosus* (hairy wildrye), *Elymus virginicus* (Virginia wildrye)), *Conoclinium coelestinum* (blue mistflower), *Eutrochium fistulosum* (trumpetweed), several species of *Eupatorium* (thoroughwort) (*Eupatorium perfoliatum* (common boneset), *Eupatorium serotinum* (lateflowering thoroughwort)), *Rudbeckia laciniata* (cutleaf coneflower), *Solidago gigantea* (giant goldenrod), *Calystegia sepium* (hedge false bindweed), and *Verbena urticifolia* (white vervain). Along the Potomac in the Great Valley of Virginia downstream to the fall line, *Teucrium canadense* (Canada germander) and *Scrophularia marilandica* (carpenter's square) are also abundant; less abundant species include *Ageratina altissima* (white snakeroot), *Helianthus decapetalus* (thinleaf sunflower), *Oenothera biennis* (common evening-primrose),

Phytolacca americana (American pokeweed), and *Monarda fistulosa* (wild bergamot). Along the New and Bluestone rivers in West Virginia, additional characteristic species include *Amphicarpaea bracteata* (American hogpeanut), *Apios americana* (groundnut), *Helenium autumnale* (common sneezeweed), *Helianthus strumosus* (paleleaf woodland sunflower), *Heliopsis helianthoides* (smooth oxeye), *Packera aurea* (golden ragwort), *Phlox paniculata* (fall phlox), *Polygonum scandens* (climbing false buckwheat), *Polygonum virginianum* (jumpseed), *Senna hebecarpa* (American senna), *Solanum carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), *Symphyotrichum lanceolatum* (white panicle aster), *Symphyotrichum lateriflorum* (calico aster), *Tradescantia ohiensis* (bluejacket), *Tripsacum dactyloides* (eastern gamagrass), *Verbesina occidentalis* (yellow crownbeard), and *Vernonia noveboracensis* (New York ironweed). 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* (eastern poison-ivy), *Vitis riparia* (riverbank grape), and *Vitis vulpina* (frost grape). Scattered shrubby or occasionally full-sized trees of flood-tolerant species may occur, with *Acer saccharinum* (silver maple), *Platanus occidentalis* (American sycamore), *Fraxinus pennsylvanica* (green ash), *Betula nigra* (river birch), and *Acer negundo* (box-elder) the most frequent. *Lindera benzoin* (northern spicebush) may be present as a shrub. This type often has a number of invasive exotic weeds, including *Fallopia japonica var. japonica* (Japanese knotweed), *Polygonum perfoliatum* (Asiatic tearthumb), *Schedonorus arundinaceus* (tall fescue), *Phalaris arundinacea* (reed canarygrass), *Humulus japonicus* (Japanese hop), *Glechoma hederacea* (ground ivy), *Microstegium vimineum* (Nepalese browntop), and *Stellaria media* (common chickweed).

ENVIRONMENTAL DESCRIPTION

Antietam National Battlefield Environment: Vegetation is found on riverbanks, riverine cobble bars, and floodplains.

Chesapeake & Ohio Canal National Historical Park Environment: This herbaceous vegetation was sampled at eight plot locations in the park. The sites range from flat to gently undulating or hilly to very steep, temporarily to intermittently flooded alluvial plains with southern aspects. Soils are rapidly to moderately well-drained silt loam, sandy loam, loamy sand and sand. The unvegetated surface is dominated by either leaf litter (4-95% cover) or bare sand or soil (3-95%) along with some large rocks (0-1%), small rocks (0-38%), and wood (1-2%). Evidence of disturbance includes periodic flooding, bank erosion, and the abundance of exotic species.

Harpers Ferry National Historical Park Environment: Piedmont-Central Appalachian Riverbar Tall Wet Meadow occupies well-drained riverbanks or high depositional bars along the Potomac and Shenandoah rivers. It typically occurs as narrow, linear patches along the outer edge of floodplain forest. Sites are exposed for nearly all of the growing season and experience low rates of sediment turnover during floods. Surface substrate is primarily sand and silt but can have cover of small rocks and cobbles. Soil samples have very high Ca and 100% total base saturation.

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

Antietam National Battlefield Vegetation: Herbaceous vegetation dominated by tall perennial species such as *Verbesina alternifolia* (wingstem), *Teucrium canadense* (Canada germander), *Solidago gigantea* (giant goldenrod), and *Eupatorium* (thoroughwort) spp.

Chesapeake & Ohio Canal National Historical Park Vegetation: This community is defined by the very dense (80+% cover) herbaceous layer with dominants that may include *Chasmanthium latifolium* (Indian woodoats), *Elymus riparius* (riverbank wildrye), *Eupatorium serotinum* (lateflowering thoroughwort), *Menispermum canadense*

(common moonseed), *Rudbeckia laciniata* (cutleaf coneflower), *Teucrium canadense* (Canada germander), *Toxicodendron radicans* (eastern poison-ivy), and *Verbesina alternifolia* (wingstem). Less abundant species include *Ageratina altissima* (white snakeroot), *Elymus villosus* (hairy wildrye), *Elymus virginicus* (Virginia wildrye), *Helianthus decapetalus* (thinleaf sunflower), *Oenothera biennis* (common evening-primrose), *Phytolacca americana* (American pokeweed), *Monarda fistulosa* (wild bergamot), *Rudbeckia laciniata* (cutleaf coneflower), *Calystegia sepium* (hedge false bindweed), and *Solidago gigantea* (giant goldenrod). In addition, there may also be a very sparse to dense (<5-80+%) canopy layer (20-35 m tall), sparse (10-40%) tall-shrub layer and/or very sparse (<5-10%) short-shrub layer. Dominant trees include *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), and *Platanus occidentalis* (American sycamore), and dominant shrubs may include *Acer negundo* (box-elder), *Asimina triloba* (pawpaw), *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), and *Lindera benzoin* (northern spicebush). A total of 46 exotic species were reported from sampled stands, including dominants *Glechoma hederacea* (ground ivy) and *Microstegium vimineum* (Nepalese browntop). This community also supports Maryland state-critically imperiled *Carex hystericina* (bottlebrush sedge), state-imperiled *Carex emoryi* (Emory's sedge), and three state-vulnerable species.

Harpers Ferry National Historical Park Vegetation: Although generally open, most sites of Piedmont-Central Appalachian Riverbar Tall Wet Meadow are in small, often linear patches bordered by the river on one side and floodplain forest on the other. As a result, they are usually partly overhung by trees, principally *Platanus occidentalis* (American sycamore), *Fraxinus pennsylvanica* (green ash), and *Acer negundo* (box-elder). The vegetation, however, is primarily herbaceous and is dominated by tall, native perennials. The perennials are typically a mix of species, and dominants can vary at any given site. Characteristic species include *Verbesina alternifolia* (wingstem), *Apios americana* (groundnut), *Eutrochium fistulosum* (trumpetweed), *Solidago gigantea* (giant goldenrod), *Verbena urticifolia* (white vervain), *Asclepias syriaca* (common milkweed), *Dichanthelium clandestinum* (deertongue), *Elymus canadensis* (Canada wildrye), *Elymus riparius* (riverbank wildrye), *Calystegia sepium* (hedge false bindweed), *Eupatorium perfoliatum* (common boneset), *Lobelia siphilitica var. siphilitica* (great blue lobelia), *Silene latifolia ssp. alba* (bladder campion), *Helianthus decapetalus* (thinleaf sunflower), *Hypericum punctatum* (spotted St. Johnswort), *Scrophularia marilandica* (carpenter's square), *Smallanthus uvedalius* (hairy leafcup), *Solidago canadensis* (Canada goldenrod), *Teucrium canadense* (Canada germander), and *Tripsacum dactyloides* (eastern gamagrass). Exotic species are present but generally cover <5% of a plot.

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* (silver maple), *Platanus occidentalis* (American sycamore), *Betula nigra* (river birch), *Liriodendron tulipifera* (tuliptree), *Fraxinus pennsylvanica* (green ash), and *Acer negundo* (box-elder) 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* (wingstem), *Teucrium canadense* (Canada germander), *Elymus riparius* (riverbank wildrye), *Verbena urticifolia* (white vervain), *Conoclinium coelestinum* (blue mistflower), several species of *Eupatorium* (thoroughwort) (*Eutrochium fistulosum* (trumpetweed), *Eupatorium perfoliatum* (common boneset), *Eupatorium serotinum* (lateflowering thoroughwort)), *Dichanthelium clandestinum* (deertongue), *Scrophularia marilandica* (carpenter's square), and *Chasmanthium latifolium* (Indian woodoats). Less abundant species include *Ageratina altissima* (white snakeroot), *Elymus villosus* (hairy wildrye), *Elymus virginicus* (Virginia wildrye), *Helianthus decapetalus* (thinleaf sunflower), *Oenothera biennis* (common evening-primrose), *Phytolacca americana* (American pokeweed), *Monarda fistulosa* (wild bergamot), *Rudbeckia laciniata* (cutleaf coneflower), *Calystegia sepium* (hedge false bindweed), and *Solidago gigantea* (giant goldenrod). 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* (eastern poison-ivy), and *Vitis riparia* (riverbank grape). Along the New and Bluestone rivers in West Virginia, herbs with high constancy and/or cover include *Amphicarpaea bracteata* (American hogpeanut), *Apios americana* (groundnut), *Boehmeria cylindrica* (small-spike false nettle), *Chasmanthium latifolium* (Indian woodoats), *Conoclinium coelestinum* (blue mistflower), *Dichanthelium clandestinum* (deertongue), *Elymus canadensis* (Canada wildrye), *Elymus riparius* (riverbank wildrye), *Elymus virginicus* (Virginia wildrye), *Eutrochium fistulosum* (trumpetweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Helenium autumnale* (common sneezeweed), *Helianthus strumosus* (paleleaf woodland sunflower), *Heliopsis helianthoides* (smooth oxeye), *Leersia virginica* (whitegrass), *Packera aurea* (golden ragwort), *Phlox paniculata* (fall phlox), *Polygonum scandens* (climbing false buckwheat), *Polygonum virginianum* (jumpseed), *Rudbeckia laciniata* (cutleaf coneflower), *Senna hebecarpa* (American senna), *Solanum carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), *Solidago gigantea* (giant goldenrod), *Symphyotrichum lanceolatum* (white panicle aster), *Symphyotrichum lateriflorum* (calico aster), *Tradescantia ohiensis* (bluejacket), *Tripsacum dactyloides* (eastern gamagrass), *Verbena urticifolia* (white vervain), *Verbesina alternifolia* (wingstem),

Verbesina occidentalis (yellow crownbeard), and *Vernonia noveboracensis* (New York ironweed). Vascular plant richness is generally high: in West Virginia plots, values range from 41-80 species per 400 m2, averaging 44.6 (Vanderhorst et al. 2008). This type often has a number of invasive exotic weeds, including *Fallopia japonica var. japonica* (Japanese knotweed), *Polygonum perfoliatum* (Asiatic tearthumb), *Schedonorus arundinaceus* (tall fescue), *Phalaris arundinacea* (reed canarygrass), *Humulus japonicus* (Japanese hop), *Glechoma hederacea* (ground ivy), *Microstegium vimineum* (Nepalese browntop), *Urtica dioica* (stinging nettle), and *Stellaria media* (common chickweed). 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* (cutleaf coneflower) and *Solidago gigantea* (giant goldenrod). These differences may reflect the influence of more calcareous substrates and/or stream order on the communities. *Hasteola suaveolens* (false Indian plantain), *Sida hermaphrodita* (Virginia fanpetals), *Iresine rhizomatosa* (Juda's bush), *Rumex altissimus* (pale dock), and *Ruellia strepens* (limestone wild petunia) are Maryland rare species known from this type. Some examples at Mammoth Cave National Park, Kentucky also contain *Xanthium strumarium* (rough cocklebur), *Vernonia gigantea ssp. gigantea* (giant ironweed), *Echinochloa muricata* (rough barnyardgrass), *Dipsacus fullonum* (Fuller's teasel), and *Setaria parviflora* (marsh bristlegrass), 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

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Verbesina alternifolia* (wingstem)
Herb (field)	Graminoid	*Chasmanthium latifolium* (Indian woodoats), *Dichanthelium clandestinum* (deertongue)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Eupatorium* spp., *Solidago gigantea* (giant goldenrod), *Teucrium canadense* (Canada germander), *Verbesina alternifolia* (wingstem)

Chesapeake & Ohio Canal National Historical Park: *Elymus riparius* (riverbank wildrye), *Teucrium canadense* (Canada germander), *Verbesina alternifolia* (wingstem)

Harpers Ferry National Historical Park: *Apios americana* (groundnut), *Eutrochium fistulosum* (trumpetweed), *Solidago gigantea* (giant goldenrod), *Verbesina alternifolia* (wingstem)

Global: *Chasmanthium latifolium* (Indian woodoats), *Dichanthelium clandestinum* (deertongue), *Elymus canadensis* (Canada wildrye), *Elymus riparius* (riverbank wildrye), *Elymus virginicus* (Virginia wildrye), *Eupatorium serotinum* (lateflowering thoroughwort), *Eutrochium fistulosum* (trumpetweed), *Helianthus strumosus* (paleleaf woodland sunflower), *Heliopsis helianthoides* (smooth oxeye), *Leersia virginica* (whitegrass), *Packera aurea* (golden ragwort), *Polygonum virginianum* (jumpseed), *Rudbeckia laciniata* (cutleaf coneflower), *Scrophularia marilandica* (carpenter's square), *Solanum carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), *Solidago gigantea* (giant goldenrod), *Verbena urticifolia* (white vervain), *Verbesina alternifolia* (wingstem), *Vernonia noveboracensis* (New York ironweed)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Carex emoryi* (Emory's sedge, G5, MD-imperiled), *Carex hystericina* (bottlebrush sedge, G5, MD-critically imperiled), *Geum laciniatum* (rough avens, G5, MD-vulnerable), *Juglans cinerea* (butternut, G3, MD-vulnerable), *Monarda clinopodia* (white bergamot, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Brassica nigra* (black mustard, High/Low), *Calystegia sepium* (hedge false bindweed), *Commelina communis* (Asiatic dayflower), *Dactylis glomerata* (orchardgrass, Medium/Insignificant), *Datura stramonium* (jimsonweed, High/Low), *Dianthus armeria* (Deptford pink, Low/Insignificant), *Digitaria ischaemum* (smooth crabgrass), *Duchesnea indica* (Indian strawberry, Low/Insignificant), *Fallopia japonica* var. *japonica*

(Japanese knotweed, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Hesperis matronalis* (dames rocket, Medium/Low), *Humulus japonicus* (Japanese hop, Medium/Low), *Hypericum perforatum* (common St. Johnswort, High/Medium), *Lespedeza cuneata* (sericea lespedeza, Medium), *Linaria vulgaris* (butter and eggs, High/Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Melilotus officinalis* (yellow sweetclover, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Morus alba* (white mulberry, High/Medium), *Paulownia tomentosa* (princesstree, Medium/Low), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Rorippa sylvestris* (creeping yellowcress, Medium/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Rumex crispus* (curly dock, Low/Insignificant), *Rumex obtusifolius* (bitter dock), *Saponaria officinalis* (bouncingbet, Low/Insignificant), *Securigera varia* (purple crownvetch, High), *Setaria faberi* (Japanese bristlegrass), *Setaria pumila* (yellow foxtail, Low/Insignificant), *Silene latifolia* ssp. *alba* (bladder campion), *Silene noctiflora* (nightflowering silene), *Sorghum halepense* (Johnsongrass, High/Medium), *Taraxacum officinale* (common dandelion), *Trifolium arvense* (rabbitfoot clover, Low), *Trifolium pratense* (red clover, Low/Insignificant), *Urtica dioica* ssp. *dioica* (stinging nettle), *Verbascum thapsus* (common mullein, Medium); **Other Plants**: *Artemisia vulgaris* var. *vulgaris* (GUTU), *Dysphania ambrosioides* (Mexican tea, GNR)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Humulus japonicus* (Japanese hop, Medium/Low), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Global: Vulnerable Plants: *Carex emoryi* (Emory's sedge, G5, WV state-rare), *Hasteola suaveolens* (false Indian plantain, G4, MD state-rare), *Iresine rhizomatosa* (Juda's bush, G5, MD state-rare), *Ruellia strepens* (limestone wild petunia, G4G5, WV & MD state-rare plant), *Rumex altissimus* (pale dock, G5, MD state-rare), *Sida hermaphrodita* (Virginia fanpetals, G3, WV & MD state-rare plant), *Spiraea virginiana* (Virginia meadowsweet, G2);
Invasive/Exotic Plants: *Fallopia japonica* var. *japonica* (Japanese knotweed, High/Medium), *Glechoma hederacea* (ground ivy, Low), *Humulus japonicus* (Japanese hop, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Phalaris arundinacea* (reed canarygrass, High), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Schedonorus arundinaceus* (tall fescue, High/Medium), *Stellaria media* (common chickweed, Low), *Urtica dioica* (stinging nettle)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR. 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)

Global Related Concepts:
- *Rudbeckia laciniata - Solidago gigantea - Teucrium canadense* Wooded Herbaceous Vegetation (Lea 2000) =
- *Verbesina alternifolia - Teucrium canadense - Verbena urticifolia - (Rudbeckia laciniata - Solidago gigantea)* Wooded Herbaceous Vegetation (Lea 2003) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Antietam National Battlefield Classification Comments: Piedmont-Central Appalachian Riverbar Tall Wet Meadow is sometimes referred to as Piedmont / Central Appalachian Riverbank Tall Herbaceous Vegetation. In this park, it is the only described association included in the Herbaceous Depositional Bar Map Class (COMP_HDEP). Even combined with other undefined bar or shoreline communities with which it may co-occur in fine-scale patch-mosaics, there were no patches large enough to meet the 0.5-ha minimum map unit established for the NCR project, and so COMP_HDEP was not mapped at Antietam National Battlefield.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Piedmont-Central Appalachian Riverbar Tall Wet Meadow is sometimes referred to as Piedmont / Central Appalachian Riverbank Tall Herbaceous Vegetation. It is one of seven associations mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) at this park. They are Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103), Water-willow Rocky Bar and Shore (CEGL004286), Ridge and Valley Gravel Riverscour Prairie (CEGL006477), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow

(CEGL006481), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).

Harpers Ferry National Historical Park Classification Comments: Piedmont-Central Appalachian Riverbar Tall Wet Meadow is sometimes referred to as Piedmont / Central Appalachian Riverbank Tall Herbaceous Vegetation. It is one of five associations mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) at this park. They are Water-willow Rocky Bar and Shore (CEGL004286), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).

Piedmont-Central Appalachian Riverbar Tall Wet Meadow is distinguished by its tall, native herbaceous vegetation, occupying high depositional bars and upper parts of riverbanks. It differs from Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476) and Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896) (both part of the River-scour Woodland Map Class) by the lack of integral woody vegetation, and from Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483) by the dominance of tall perennial herbs (versus low, predominantly annual herbs).

It is most similar in physiognomy to Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481). Both types are dominated by tall herbs, and there can be some overlap in species between the two, but Piedmont-Central Appalachian Riverbar Tall Wet Meadow is primarily composed of tall native perennials on stable bars and banks that do not experience frequent disturbance. Piedmont-Central Appalachian Scour Bar Wet Meadow, on the other hand, is dominated by tall weedy perennial species and annuals. It is an unstable type that experiences extensive sediment turnover during even relatively small floods, and most non-weedy perennial species are quickly buried or scoured away.

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 Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217), 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

Antietam National Battlefield Range: This vegetation occurs along Antietam Creek in patches that were too small to map in the ANTI vegetation map.

Chesapeake & Ohio Canal National Historical Park Range: Piedmont-Central Appalachian Riverbar Tall Wet Meadow was sampled in plots near Bevan Bend Barrens, Brunswick, Weverton, Dam #3 and elsewhere. Herbaceous Depositional Bar Map Class (COMP_HDEP), of which this is part, includes various predominantly herbaceous (and often ephemeral) communities subject to frequent high-energy floods, occurring on scoured shorelines or on sand, gravel, and cobble bars within the channels of rivers and streams. It is mapped at many locations, the length of the Chesapeake & Ohio Canal.

Harpers Ferry National Historical Park Range: Piedmont-Central Appalachian Riverbar Tall Wet Meadow occupies high sandy bars and banks on and immediately adjacent to the river channel shelf. The type occurs in scattered patches along the Shenandoah and Potomac rivers in the park.

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:SNR, KY:SNR, MD:SNR, PA:SNR, WV:S2

TNC Ecoregions: 44:C, 49:C, 50:C, 52:C, 59:C, 60:C, 61:C
USFS Ecoregions (2007): 211Fa:CCP, 211Fb:CCC, 211Fc:CCC, 211Fd:CCC, 211Ga:CCC, 211Gb:CCC, 221Am:CCC, 221Da:CCC, 221Db:CCC, 221Ea:CCP, 221Fa:CCC, 223D:CC, M221Ac:CCC, M221Ad:CCC, M221Be: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

Antietam National Battlefield Plots: None.
Chesapeake & Ohio Canal National Historical Park Plots: (8 plots): CHOH.090, CHOH.096, CHOH.097, CHOH.520, CHOH.639, CHOH.641, CHOH.642, CHOH.650.
Harpers Ferry National Historical Park Plots: HAFE.42, HAFE.46.
Antietam National Battlefield Description Author(s): S. Perles
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo and C.W. Nordman
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
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, Zimmerman 2011q, Zimmerman and Podniesinski 2008, Zimmerman et al. 2012

A1657 *Justicia americana* Riverbed Alliance

This alliance covers rocky river shoals dominated by *Justicia americana* (American water-willow) with *Leersia* (cutgrass) spp., *Saururus cernuus* (lizard's-tail), 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* (goldenclub) as a codominant. In parts of the Ridge and Valley and Piedmont, *Hymenocallis coronaria* (shoals spiderlily) 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 Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Scrub & Herb Floodplain Wetland (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* (American water-willow) is the characteristic dominant. *Saururus cernuus* (lizard's-tail) is often present and may be codominant. Other herbaceous species that may be present include *Bidens* (beggarticks) spp., *Cyperus* (flatsedge) spp., *Diodia teres* (poorjoe), *Elodea* (waterweed) sp., *Eleocharis* (spikerush) spp., *Equisetum arvense* (field horsetail), *Gratiola brevifolia* (sticky hedgehyssop), *Leersia oryzoides* (rice cutgrass), *Leersia virginica* (whitegrass), *Lemna minor* (common duckweed), *Orontium aquaticum* (goldenclub), *Physostegia virginiana* (obedient plant), *Podostemum ceratophyllum* (hornleaf riverweed), *Scirpus* (bulrush) spp., *Schoenoplectus pungens* (common threesquare), *Schoenoplectus tabernaemontani* (softstem bulrush), and *Xyris difformis var. difformis* (bog yelloweyed grass). Exotics include *Lythrum salicaria* (purple loosestrife), *Lysimachia vulgaris* (garden yellow loosestrife) and *Polygonum cespitosum var. longisetum* (oriental ladysthumb); 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* (silver maple), *Betula nigra* (river birch), *Carpinus caroliniana* (American hornbeam), *Fraxinus*

pennsylvanica (green ash), and *Platanus occidentalis* (American sycamore). Scattered shrub seedlings of *Salix nigra* (black willow), *Salix caroliniana* (coastal plain willow), *Betula nigra* (river birch), *Cephalanthus occidentalis* (common buttonbush), *Acer saccharinum* (silver maple), or *Platanus occidentalis* (American sycamore) may also be present. This association provides habitat in some portions of its range for globally rare dragonflies and herbs.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This herbaceous wetland was sampled at 14 plot locations in the park. The sites are flat to gently undulating, seasonally, intermittently or semipermanently flooded stream terraces, riverbeds, bars, and alluvial plains. Soils are somewhat to very poorly drained sand. The unvegetated surface is variously dominated by exposed bedrock (0-85% cover), large rocks (0-87%), small rocks (0-95%), bare sand (0-95%) or standing water (0-70%) with some leaf litter (0-5%) and wood (0-2%). Evidence of disturbance includes periodic flooding and the presence of exotic species.

George Washington Memorial Parkway Environment: Water-willow Rocky Bar and Shore is a frequent rivershore community in the George Washington Memorial Parkway, occurring in scattered patches up to about 0.2 ha (0.5 acre) in size along nearly the entire Virginia side of the Potomac Gorge. It develops only on low, gravel, cobble, or boulder bars (mean rock cover = 60%) that are inundated from 50 to 100% of the year (Lea 2000). Soils consist of heterogeneous accumulations of base-rich sand, silt, and mud packed between cobbles or embedded in a matrix of coarse gravel.

Harpers Ferry National Historical Park Environment: Water-willow Rocky Bar and Shore is a rivershore and depositional bar community, occurring in scattered patches in the stream channels of the Shenandoah and Potomac rivers. It develops only on low, gravel, cobble or boulder bars (mean rock cover about 60%) that are often inundated for much of the growing season. Soils consist of heterogeneous accumulations of base-rich sand, silt and mud packed between cobbles or embedded in a matrix of coarse gravel.

Manassas National Battlefield Park Environment: Water-willow Rocky Bar and Shore is a rivershore and depositional bar community, occurring in scattered patches in the stream channel of Bull Run. It develops only on low gravel, cobble, or boulder bars (mean rock cover = 60%) that are often inundated for much of the growing season. Soils consist of heterogeneous accumulations of base-rich sand, silt, and mud packed between cobbles or embedded in a matrix of coarse gravel.

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

Chesapeake & Ohio Canal National Historical Park Vegetation: The moderate to very dense (40-80+% cover) herbaceous layer is overwhelmingly dominated by *Justicia americana* (American water-willow). Additional common herbs found in small amounts include *Cyperus strigosus* (strawcolored flatsedge), *Eleocharis tenuis* (slender spikerush), *Leersia oryzoides* (rice cutgrass), *Ludwigia palustris* (marsh seedbox), and *Acer saccharinum* (silver maple) seedlings. A total of 12 exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Paspalum fluitans* (horsetail paspalum) and *Ptilimnium nodosum* (piedmont mock bishopweed), state-imperiled *Carex emoryi* (Emory's sedge), and vulnerable *Hibiscus laevis* (halberdleaf rosemallow).

George Washington Memorial Parkway Vegetation: Examples of Water-willow Rocky Bar and Shore in the Potomac Gorge consist of nearly monospecific stands of *Justicia americana* (American water-willow) covering about 50% of a given area. On average, eight other species occur in a stand. *Boehmeria cylindrica* (small-spike false nettle), severely stunted *Hibiscus laevis* (halberdleaf rosemallow), *Phyla lanceolata* (lanceleaf fogfruit), *Apocynum cannabinum* (Indianhemp), *Lindernia dubia var. dubia* (yellowseed false pimpernel), *Schoenoplectus pungens var. pungens* (common threesquare), *Xanthium strumarium* (rough cocklebur), *Echinochloa muricata* (rough barnyardgrass), and seedlings of *Platanus occidentalis* (American sycamore) are most frequent. Total species richness ranges from 3 to 17 taxa, lowest among community types in the Potomac Gorge. Floristically, this is the most heterogeneous community in the Potomac Gorge. It is also the most easily recognized because of its habitat and the overwhelming dominance of a single species.

Harpers Ferry National Historical Park Vegetation: Examples of Water-willow Rocky Bar and Shore consist of nearly monospecific stands of *Justicia americana* (American water-willow) covering about 50 to 95% of a given area. Additional associated species vary and occur with very low cover (<2%). Herbaceous species that were recorded in more than one plot include *Hibiscus laevis* (halberdleaf rosemallow), *Saururus cernuus* (lizard's-tail), *Heteranthera dubia* (grassleaf mudplantain), *Lycopus virginicus* (Virginia water horehound), and *Leersia virginica* (whitegrass). Woody species present as small saplings or low shrubs include *Platanus occidentalis* (American sycamore), *Acer saccharinum* (silver maple), and *Betula nigra* (river birch).
Manassas National Battlefield Park Vegetation: Examples of Water-willow Rocky Bar and Shore in the park consist of nearly monospecific stands of *Justicia americana* (American water-willow) covering about 50-95% of a given area. *Leersia virginica* (whitegrass) is a common associate in stands not totally dominated by *Justicia americana* (American water-willow). Additional species typically occur with very low cover (<2%), and the most frequent include *Polygonum punctatum* (dotted smartweed), *Saururus cernuus* (lizard's-tail), *Boehmeria cylindrica* (small-spike false nettle), *Pontederia cordata* (pickerelweed), and the exotic species *Rorippa sylvestris* (creeping yellowcress), *Murdannia keisak* (wartremoving herb), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), and *Arthraxon hispidus* (small carpgrass).
Global Vegetation: *Justicia americana* (American water-willow) is the dominant (and sometimes the only) species, forming lawnlike stands in shallow reaches of rivers. Cover by *Justicia americana* (American water-willow) ranges from 40 to 85%. *Saururus cernuus* (lizard's-tail) is often present and may be codominant. Other herbaceous species may be present but rarely achieve more than 2% cover; they include *Bidens* (beggarticks) spp., *Cyperus* (flatsedge) spp., *Diodia teres* (poorjoe), *Elodea* (waterweed) sp., *Eleocharis* (spikerush) spp., *Equisetum arvense* (field horsetail), *Gratiola brevifolia* (sticky hedgehyssop), *Leersia oryzoides* (rice cutgrass), *Leersia virginica* (whitegrass), *Lemna minor* (common duckweed), *Orontium aquaticum* (goldenclub), *Physostegia virginiana* (obedient plant), *Podostemum ceratophyllum* (hornleaf riverweed), *Scirpus* (bulrush) spp., *Schoenoplectus pungens* (common threesquare), *Schoenoplectus tabernaemontani* (softstem bulrush), and *Xyris difformis var. difformis* (bog yelloweyed grass). Exotics include *Lythrum salicaria* (purple loosestrife), *Lysimachia vulgaris* (garden yellow loosestrife), and *Polygonum cespitosum var. longisetum* (oriental ladysthumb); they have not been observed in abundance in this community, possibly due to intolerance of high-energy flooding. In some areas, *Justicia* (water-willow) usually grows in nearly pure patches, so that few other species are associated with it. *Cuscuta gronovii* (scaldweed), *Mimulus ringens* (Allegheny monkeyflower), *Polygonum* (knotweed) spp., *Rumex* (dock) spp., and *Salix interior* (sandbar willow) 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* (silver maple), *Betula nigra* (river birch), *Carpinus caroliniana* (American hornbeam), *Fraxinus pennsylvanica* (green ash), and *Platanus occidentalis* (American sycamore). Scattered shrub seedlings of *Salix nigra* (black willow), *Salix caroliniana* (coastal plain willow), *Betula nigra* (river birch), *Cephalanthus occidentalis* (common buttonbush), *Acer saccharinum* (silver maple), or *Platanus occidentalis* (American sycamore) may also be present. In the Cumberland Plateau of Alabama, *Justicia americana* (American water-willow) is present in dense patches with some interspersion of other species, including *Pilea pumila* (Canadian clearweed), *Boehmeria cylindrica* (small-spike false nettle), *Eclipta prostrata* (false daisy), *Juncus coriaceus* (leathery rush), *Mikania scandens* (climbing hempvine), *Ludwigia palustris* (marsh seedbox), *Leersia* (cutgrass) sp., and *Bidens* (beggarticks) sp. Schmalzer and DeSelm (1982) discuss *Orontium aquaticum* (goldenclub) growing along streambanks or in shallow riffles "along or with" *Justicia americana* (American water-willow) 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* (water-willow) 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* (American water-willow) that allow it to persist in river channels.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Justicia americana* (American water-willow)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Justicia americana* (American water-willow)
George Washington Memorial Parkway: *Justicia americana* (American water-willow)

Harpers Ferry National Historical Park: *Hibiscus laevis* (halberdleaf rosemallow), *Justicia americana* (American water-willow)
Manassas National Battlefield Park: *Justicia americana* (American water-willow), *Leersia virginica* (whitegrass)
Global: *Eleocharis* spp., *Justicia americana* (American water-willow), *Leersia oryzoides* (rice cutgrass), *Leersia virginica* (whitegrass), *Orontium aquaticum* (goldenclub), *Polygonum amphibium* (water knotweed), *Saururus cernuus* (lizard's-tail), *Schoenoplectus pungens* (common threesquare)

Other Noteworthy Species

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Carex emoryi* (Emory's sedge, G5, MD-imperiled), *Hibiscus laevis* (halberdleaf rosemallow, G5, MD-vulnerable), *Paspalum fluitans* (horsetail paspalum, G5, MD-critically imperiled), *Ptilimnium nodosum* (piedmont mock bishopweed, G2, globally imperiled, MD-critically imperiled); **Invasive/Exotic Plants**: *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Arthraxon hispidus* (small carpgrass, Medium/Low), *Commelina communis* (Asiatic dayflower), *Echinochloa crus-galli* (barnyardgrass, Medium/Insignificant), *Hypericum perforatum* (common St. Johnswort, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Polygonum persicaria* (spotted ladysthumb), *Rorippa indica* (variableleaf yellowcress), *Setaria pumila* (yellow foxtail, Low/Insignificant), *Taraxacum officinale* (common dandelion)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Murdannia keisak* (wartremoving herb, Medium/Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rorippa sylvestris* (creeping yellowcress, Medium/Low)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Arthraxon hispidus* (small carpgrass, Medium/Low), *Murdannia keisak* (wartremoving herb, Medium/Low), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Rorippa sylvestris* (creeping yellowcress, Medium/Low)
Global: Vulnerable Plants: *Marshallia trinervia* (broadleaf Barbara's buttons, G3), *Ptilimnium nodosum* (piedmont mock bishopweed, G2), *Sagittaria secundifolia* (Little River arrowhead, G1); **Invasive/Exotic Plants**: *Lysimachia vulgaris* (garden yellow loosestrife), *Lythrum salicaria* (purple loosestrife, High), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb); **Other Plants**: *Boehmeria cylindrica* (small-spike false nettle, G5)

Conservation Status Rank

Global Rank & Reasons: G4G5 (02-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)

Global Related Concepts:
- *Justicia americana - Andropogon gerardii* herbaceous channel bed (Walton and Anderson 1997) =
- *Justicia americana* Herbaceous Vegetation (Faber-Langendoen 2001) =
- *Justicia americana* riparian herbaceous vegetation (Vanderhorst 2001b) =
- Aquatic Types (Schmalzer and DeSelm 1982) >
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) >
- Lizard's tail emergent bed (Perles et al. 2004) **?**
- Water willow emergent bed (Perles et al. 2004) **?**

Classification

Status: Standard
Classification Confidence: 1 - Strong
Chesapeake & Ohio Canal National Historical Park Classification Comments: Water-willow Rocky Bar and Shore (CEGL004286) is one of seven associations mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) at this park. They are Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103), Water-willow Rocky Bar and Shore (CEGL004286), Ridge and Valley Gravel Riverscour Prairie (CEGL006477), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).

George Washington Memorial Parkway Classification Comments: This community is clearly distinguished by its occurrence on bouldery / cobbly bars that are inundated most of the year and its nearly monospecific dominance by *Justicia americana* (American water-willow). However, on large, rocky bar complexes, this vegetation may co-occur in very small-scale patch-mosaics with other shoreline communities. Water-willow Rocky Bar and Shore (CEGL004286) is one of three associations mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) at this park. They are Water-willow Rocky Bar and Shore (CEGL004286), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), and Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483).
George Washington Memorial Parkway Other Comments: The comparative extent of this vegetation on the two sides of the river in the Potomac Gorge is not known.
Harpers Ferry National Historical Park Classification Comments: Water-willow Rocky Bar and Shore (CEGL004286) is clearly distinguished by its occurrence on bouldery / cobbly bars that are inundated most of the year and the nearly monospecific dominance by *Justicia americana* (American water-willow). However, on larger, rocky bar complexes, this vegetation may co-occur in very small-scale patch-mosaics with other shoreline communities. This association is one of five associations mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) at this park. They are Water-willow Rocky Bar and Shore (CEGL004286), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).
Harpers Ferry National Historical Park Other Comments: This is the most easily recognized community in the park because of its habitat and the overwhelming dominance of a single species.
Manassas National Battlefield Park Classification Comments: Water-willow Rocky Bar and Shore (CEGL004286) is clearly distinguished by its occurrence on bouldery / cobbley bars that are inundated most of the year and the nearly monospecific dominance by *Justicia americana* (American water-willow). However, on larger, rocky bar complexes, this vegetation may co-occur in very small-scale patch-mosaics with other shoreline communities. Water-willow Rocky Bar and Shore (CEGL004286) is mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) because it may co-occur in very small-scale patch-mosaics with other undefined shoreline communities.
Manassas National Battlefield Park Other Comments: This is the most easily recognized community in the park because of its habitat and the overwhelming dominance of a single species.
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* (water-willow) (Anderson 1982). However, Anderson (1996) no longer recognizes this type.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: Water-willow Rocky Bar and Shore was sampled in plots near Blockhouse Point, High Island, Rocky Islands Channel, Outdoor Club Uplands, Orleans Scourbar and Floodplain, Spring Gap Bottomland, Brunswick and Weverton. At this park, Herbaceous Depositional Bar Map Class (COMP_HDEP) (of which this community is part) includes various predominantly herbaceous (and often ephemeral) communities subject to frequent high-energy floods, occurring on scoured shorelines or on sand, gravel, and cobble bars within the channels of rivers and streams. It is mapped at many locations, the length of the Chesapeake & Ohio Canal.
George Washington Memorial Parkway Range: Water-willow Rocky Bar and Shore is a frequent rivershore community in the western portion of George Washington Memorial Parkway, occurring in scattered patches up to about 0.2 ha (0.5 acre) in size along nearly the entire Virginia side of the Potomac Gorge.
Harpers Ferry National Historical Park Range: Water-willow Rocky Bar and Shore occurs in scattered patches in the stream channels of the Shenandoah and Potomac rivers. It typically occurs as small isolated patches or in patch-mosaics with other shoreline communities.
Manassas National Battlefield Park Range: Water-willow Rocky Bar and Shore occurs as small patches in the stream channel of Bull Run.
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:SNR, AR:SNR, GA:SNR, KY:SNR, MD:SNR, NC:SNR, NJ:SNR, NY:SNR, OH:SNR, OK:SNR, PA:SNR, SC?:SNA, TN:SNR, VA:S4, WV:S3

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 (2007): 211Fa:CCP, 211Fb:CCC, 211Fc:CCC, 211Fd:CCC, 211Ga:CCC, 211Gb:CCC, 221Am:CCC, 221Ba:CCC, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Ea:CCP, 221Ec:CCC, 221Ed:CCP, 221Ef:CCP, 221Ej:CCP, 221En:CC?, 221Fa:CCC, 221Ha:CCC, 221Hb:CCP, 221Hc:CCC, 221He:CC?, 222Ha:CCP, 223Dg:CCC, 223Eb:CCC, 223Eg:CCC, 231Af:CC?, 231B:CC, 231Cc:CCC, 231Cd:CCC, 231D:CC, 231Id:CPP, M221Aa:CCP, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Ca:CCC, M221Cb:CCC, M221Cd:CCC, M221Da:CCC, M221Dc:CCC, M223A: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

Chesapeake & Ohio Canal National Historical Park Plots: (14 plots): CHOH.092, CHOH.094, CHOH.215, CHOH.220, CHOH.230, CHOH.506, CHOH.510, CHOH.528, CHOH.628, CHOH.629, CHOH.635, CHOH.638, CHOH.643, CHOH.646.
George Washington Memorial Parkway Plots: GFNP_019, GWMP_009, TURK_031, TURK_032.
Harpers Ferry National Historical Park Plots: HAFE.44, HAFE.45, HAFE.109, HAFE.117, HAFE.120.
Manassas National Battlefield Park Plots: MANA.42, MANA.43.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
Global Description Author(s): A.S. Weakley, D. Faber-Langendoen and S.C. Gawler
References: Allard 1990, Anderson 1982, Anderson 1996, Edinger et al. 2014a, Evans et al. 2009, Faber-Langendoen 2001, Fike 1999, Fleming 2007, Fleming and Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Hoagland 2000, Hop et al. 2012a, 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 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Schotz et al. 2008, Southeastern Ecology Working Group n.d.*, TNC and WPC 2004, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2010, WVNHP unpubl. data, Walton and Anderson 1997, Zimmerman 2011r, Zimmerman et al. 2012

A4152 Mid-Atlantic Piedmont & Mountain Riverscour Annual Vegetation Alliance

[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 Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Scrub & Herb Floodplain Wetland (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* (teal lovegrass), *Ludwigia palustris* (marsh seedbox), *Lindernia dubia var. dubia* (yellowseed false pimpernel), and *Cyperus squarrosus* (bearded flatsedge) are constant and often abundant. Other characteristic annuals (and biennials) are *Acalypha rhomboidea* (common threeseed mercury), *Ammannia coccinea* (valley redstem), *Artemisia annua* (sweet sagewort), *Bidens frondosa* (devil's beggarticks), *Chamaesyce humistrata* (spreading sandmat), *Chamaesyce maculata* (spotted sandmat), *Dysphania ambrosioides* (Mexican tea), *Cyperus bipartitus* (slender flatsedge), *Cyperus odoratus* (fragrant flatsedge), *Diodia virginiana* (Virginia buttonweed), *Echinochloa crus-galli* (barnyardgrass), *Eclipta prostrata* (false daisy), *Elsholtzia ciliata* (crested latesummer mint), *Eragrostis frankii* (sandbar lovegrass), *Fimbristylis autumnalis* (slender fimbry), *Hypericum mutilum* (dwarf St. Johnswort), *Lindernia dubia var. anagallidea* (yellowseed false pimpernel), *Lindernia dubia var. dubia* (yellowseed false pimpernel), *Lipocarpha micrantha* (smallflower halfchaff sedge), *Mollugo verticillata* (green carpetweed), *Panicum dichotomiflorum var. dichotomiflorum* (fall panicgrass), *Panicum gattingeri* (Gattinger's panicgrass), *Paspalum fluitans* (horsetail paspalum), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Rorippa palustris ssp. fernaldiana* (Fernald's yellowcress), *Rotala ramosior* (lowland rotala), *Solanum ptycanthum* (West Indian nightshade), and *Xanthium strumarium* (rough cocklebur). Frequent perennials include *Boehmeria cylindrica* (small-spike false nettle), *Cyperus strigosus* (strawcolored flatsedge), *Leersia virginica* (whitegrass), *Justicia americana* (American water-willow), *Lycopus americanus* (American water horehound), *Mimulus alatus* (sharpwing monkeyflower), *Penthorum sedoides* (ditch stonecrop), *Phyla lanceolata* (lanceleaf fogfruit), *Rorippa sylvestris* (creeping yellowcress), and *Samolus valerandi ssp. parviflorus* (seaside brookweed). Stranded mats of *Heteranthera dubia* (grassleaf mudplantain) are also frequent. Seedlings of taller annuals and perennials such as *Hibiscus laevis* (halberdleaf rosemallow), *Eupatorium* (thoroughwort) spp., and *Polygonum* (knotweed) spp. are also frequent but rarely reach full stature. Overhanging trees of *Platanus occidentalis* (American sycamore) and *Acer saccharinum* (silver maple) may be present, as well as saplings of *Betula nigra* (river birch).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This herbaceous wetland was sampled at 10 plot locations in the park. The sites are flat to sloping, seasonally or semi-permanently flooded shorelines and alluvial plains. Soils are somewhat poorly to moderately well-drained clay loam, loamy sand and sand. The unvegetated surface is dominated by either small rocks (0-95% cover) or bare sand/soil (0-99%), with some large rocks (0-15%), leaf litter (0-2%) and wood (0-1%). Evidence of disturbance includes regular flooding and the presence of exotic species.

George Washington Memorial Parkway Environment: Appalachian-Atlantic Riverbar Drawdown Shore occurs in widely scattered patches along the length of the Potomac Gorge in Virginia. It is most frequent, and forms the largest patches, above Great Falls (primarily in Riverbend Park above Great Falls Park). Discrete patches of this community are usually not much larger than 100 square m; exceptional, linear patches up to about 400 square m occur in favorable years. The habitat develops primarily on intermittently exposed shoreline flats or the toes of riverbanks that are inundated for about 60% of the year (Lea 2000). In a typical year, they are exposed from early to mid-summer to early autumn, with maximal vegetation development in August and September. However, stands of this vegetation type can develop early in the summer on the higher riverbank zones, then progressively occupy lower and lower bank zones as these habitats become exposed. Soils vary from reddish-brown or reddish-gray sand or sandy loam to mucky silt loam. Most sites have some scattered gravel at the surface. Soil samples collected at plots are consistently neutral to mildly alkaline, highly calcareous, and fully base-saturated.

Harpers Ferry National Historical Park Environment: Appalachian-Atlantic Riverbar Drawdown Shore occurs in widely scattered patches along the Potomac and Shenandoah rivers in the park. Discrete patches of this community are usually not much larger than 100 square meters. The habitat develops primarily on intermittently exposed shoreline flats or the toes of riverbanks that are inundated for about 60% of the year (Lea 2000). In a typical year, they are exposed from early to mid summer to early autumn, with maximal vegetation development in August and September. However, stands of this vegetation type can develop early in the summer on the higher riverbank zones, then progressively occupy lower and lower bank zones as these habitats become exposed. Soils vary from reddish-brown or reddish-gray sand or sandy loam to mucky silt loam. Most sites have some scattered gravel at the surface. Soil samples are consistently neutral to mildly alkaline, highly calcareous, and fully base-saturated.

Monocacy National Battlefield Environment: This riparian vegetation occurs immediately above the waterline along the lowest parts of riverbanks or rivershore depositional bars. This association is well-developed in mid- to

late summer, when river water levels are lowest. Due to the frequent floods and ice-scour that these areas experience, the location and extent of this vegetation type may change from year to year. It is characterized by short-statured annual herbs growing on semipermanently flooded, flat, muddy alluvial plains. The soil is typically a subhygric, somewhat poorly drained mucky clayey silt over coarse sand and gravel.

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

Chesapeake & Ohio Canal National Historical Park Vegetation: The sparse to very dense (20-80+% cover) herbaceous layer may be dominated by *Cyperus strigosus* (strawcolored flatsedge), *Eleocharis tenuis* (slender spikerush), *Eragrostis hypnoides* (teal lovegrass), *Lindernia dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox), *Panicum dichotomiflorum* (fall panicgrass), *Paspalum fluitans* (horsetail paspalum) (Maryland state-critically imperiled), and/or *Polygonum punctatum* (dotted smartweed). One stand has a very dense (80+%) canopy layer (20-35 m tall) of *Acer saccharinum* (silver maple), *Celtis occidentalis* (common hackberry), and *Ulmus americana* (American elm). A total of 24 exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Rhynchospora globularis* (globe beaksedge), *Rumex altissimus* (pale dock), and *Salix exigua* (narrowleaf willow) and state-imperiled *Carex emoryi* (Emory's sedge).

George Washington Memorial Parkway Vegetation: The vegetation of Appalachian-Atlantic Riverbar Drawdown Shore is low in height (<0.5 m), with patchy to dense cover (43% mean cover) of herbaceous plants. Shoreline habitats with denser cover of this vegetation can have a distinctly lawnlike appearance. *Eragrostis hypnoides* (teal lovegrass), *Lindernia dubia var. dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox), *Eupatorium serotinum* (lateflowering thoroughwort), *Cyperus squarrosus* (bearded flatsedge), *Cyperus odoratus* (fragrant flatsedge), and *Artemisia annua* (sweet sagewort) are the most constant (100%) species, with the first two usually the most abundant (each 10-25% mean cover). *Ludwigia palustris* (marsh seedbox) and *Eupatorium serotinum* (lateflowering thoroughwort) are the only perennials in this group; first-year seedlings of the latter may be numerous but perform as low annuals, their growth remaining severely stunted throughout the period of habitat exposure and community development. Other less constant and less abundant but characteristic low annuals or biennials are *Eclipta prostrata* (false daisy), *Rorippa palustris ssp. fernaldiana* (Fernald's yellowcress), *Acalypha rhomboidea* (common threeseed mercury), *Ranunculus sceleratus var. sceleratus* (cursed buttercup), *Ammannia coccinea* (valley redstem), *Eleocharis obtusa* (blunt spikerush), *Hypericum mutilum* (dwarf St. Johnswort), *Lipocarpha micrantha* (smallflower halfchaff sedge), *Paspalum fluitans* (horsetail paspalum), *Rotala ramosior* (lowland rotala), *Bidens cernua* (nodding beggarticks), *Chamaesyce humistrata* (spreading sandmat), *Lindernia dubia var. anagallidea* (yellowseed false pimpernel), *Cyperus bipartitus* (slender flatsedge), and *Eragrostis frankii* (sandbar lovegrass). Characteristic perennials that are typically low and/or stunted include *Boehmeria cylindrica* (small-spike false nettle), *Mimulus alatus* (sharpwing monkeyflower), *Penthorum sedoides* (ditch stonecrop), *Samolus valerandi ssp. parviflorus* (seaside brookweed), *Lycopus americanus* (American water horehound), *Hibiscus laevis* (halberdleaf rosemallow), *Verbena urticifolia* (white vervain), and *Phyla lanceolata* (lanceleaf fogfruit). Ephemeral tree seedlings, especially of *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Populus deltoides ssp. deltoides* (eastern cottonwood), *Fraxinus pennsylvanica* (green ash), and *Salix nigra* (black willow), are also frequent. Total species richness ranges from 36 to 61 taxa per 100 square meters.

Harpers Ferry National Historical Park Vegetation: The vegetation of Appalachian-Atlantic Riverbar Drawdown Shore is low (<0.5 m) with patchy to dense cover of herbaceous plants. Shoreline habitats with denser cover of this vegetation can have a distinctly lawnlike appearance. *Ludwigia palustris* (marsh seedbox), *Rotala ramosior* (lowland rotala), *Verbena hastata* (swamp verbena), *Cyperus squarrosus* (bearded flatsedge), and *Cyperus*

strigosus (strawcolored flatsedge) are the most abundant species, with the first two often covering 10-25% of a plot. *Ludwigia palustris* (marsh seedbox) and *Verbena hastata* (swamp verbena) are the only perennials in this group. Other less constant and less abundant but characteristic low annuals or biennials of the study area are *Eragrostis hypnoides* (teal lovegrass), *Lindernia dubia var. dubia* (yellowseed false pimpernel), *Eupatorium serotinum* (lateflowering thoroughwort), *Eclipta prostrata* (false daisy), *Rorippa sylvestris* (creeping yellowcress), *Acalypha rhomboidea* (common threeseed mercury), *Asclepias incarnata* (swamp milkweed), *Solidago canadensis* (Canada goldenrod), *Ipomoea lacunosa* (whitestar), *Helenium autumnale* (common sneezeweed), *Cuscuta gronovii var. gronovii* (scaldweed), *Bidens cernua* (nodding beggarticks), *Chamaesyce maculata* (spotted sandmat), *Chamaesyce humistrata* (spreading sandmat), *Lindernia dubia var. anagallidea* (yellowseed false pimpernel), *Cyperus odoratus* (fragrant flatsedge), and *Eragrostis frankii* (sandbar lovegrass). Characteristic perennials that are typically low and/or stunted include *Boehmeria cylindrica* (small-spike false nettle), *Mimulus alatus* (sharpwing monkeyflower), *Penthorum sedoides* (ditch stonecrop), *Lycopus americanus* (American water horehound), *Hibiscus laevis* (halberdleaf rosemallow), *Verbena urticifolia* (white vervain), and *Phyla lanceolata* (lanceleaf fogfruit). Ephemeral tree seedlings, especially of *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Platanus occidentalis* (American sycamore), *Fraxinus pennsylvanica* (green ash), and *Salix nigra* (black willow), are also frequent.

Monocacy National Battlefield Vegetation: Short-statured annual herbs such as *Lindernia dubia var. dubia* (yellowseed false pimpernel) and *Ludwigia palustris* (marsh seedbox) typically cover 25-50% of the area. Various species of *Polygonum* (knotweed) spp., such as *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Polygonum hydropiperoides* (swamp smartweed), and *Polygonum pensylvanicum* (Pennsylvania smartweed), can be common. Other typical species include *Eclipta prostrata* (false daisy), *Eragrostis hypnoides* (teal lovegrass), *Cyperus squarrosus* (bearded flatsedge), *Echinochloa* (cockspur grass) spp., *Eleocharis* (spikerush) spp., and *Leersia virginica* (whitegrass). Due to the frequent disturbances that this vegetation type experiences, the species composition can be variable. Seedlings of several tree species, such as *Acer saccharinum* (silver maple), *Salix nigra* (black willow), *Betula nigra* (river birch), and *Populus tremuloides* (quaking aspen), can also be present.

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* (teal lovegrass), *Ludwigia palustris* (marsh seedbox), *Lindernia dubia var. dubia* (yellowseed false pimpernel), and *Cyperus squarrosus* (bearded flatsedge) are constant and often abundant. Other characteristic annuals (and biennials) are *Acalypha rhomboidea* (common threeseed mercury), *Ammannia coccinea* (valley redstem), *Artemisia annua* (sweet sagewort), *Bidens frondosa* (devil's beggarticks), *Chamaesyce humistrata* (spreading sandmat), *Chamaesyce maculata* (spotted sandmat), *Dysphania ambrosioides* (Mexican tea), *Cyperus bipartitus* (slender flatsedge), *Cyperus odoratus* (fragrant flatsedge), *Diodia virginiana* (Virginia buttonweed), *Echinochloa crus-galli* (barnyardgrass), *Eclipta prostrata* (false daisy), *Elsholtzia ciliata* (crested latesummer mint), *Eragrostis frankii* (sandbar lovegrass), *Fimbristylis autumnalis* (slender fimbry), *Hypericum mutilum* (dwarf St. Johnswort), *Lindernia dubia var. anagallidea* (yellowseed false pimpernel), *Lindernia dubia var. dubia* (yellowseed false pimpernel), *Lipocarpha micrantha* (smallflower halfchaff sedge), *Mollugo verticillata* (green carpetweed), *Panicum dichotomiflorum var. dichotomiflorum* (fall panicgrass), *Panicum gattingeri* (Gattinger's panicgrass), *Paspalum fluitans* (horsetail paspalum), *Polygonum cespitosum var. longisetum* (oriental ladysthumb), *Rorippa palustris ssp. fernaldiana* (Fernald's yellowcress), *Rotala ramosior* (lowland rotala), *Solanum ptycanthum* (West Indian nightshade), and *Xanthium strumarium* (rough cocklebur). Frequent perennials include *Boehmeria cylindrica* (small-spike false nettle), *Cyperus strigosus* (strawcolored flatsedge), *Leersia virginica* (whitegrass), *Justicia americana* (American water-willow), *Lycopus americanus* (American water horehound), *Mimulus alatus* (sharpwing monkeyflower), *Penthorum sedoides* (ditch stonecrop), *Phyla lanceolata* (lanceleaf fogfruit), *Rorippa sylvestris* (creeping yellowcress), and *Samolus valerandi ssp. parviflorus* (seaside brookweed). Stranded mats of *Heteranthera dubia* (grassleaf mudplantain) are also frequent. Seedlings of taller annuals and perennials such as *Hibiscus laevis* (halberdleaf rosemallow), *Eupatorium* (thoroughwort) spp., and *Polygonum* (knotweed) 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* (slender spikerush). Species that are more characteristic of the James River and Roanoke River occurrences in central and southern Virginia include *Cyperus flavicomus* (whiteedge flatsedge), *Cyperus erythrorhizos* (redroot flatsedge), *Ludwigia decurrens* (wingleaf primrose-willow), *Paspalum dissectum* (mudbank crowngrass), *Rorippa sessiliflora* (stalkless yellowcress), and *Sagittaria calycina var. calycina* (hooded arrowhead). Overhanging trees of *Platanus occidentalis* (American sycamore) and *Acer saccharinum* (silver maple) may be present, as well as saplings of *Betula nigra* (river birch).

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

Global Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Lindernia dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox), *Rotala ramosior* (lowland rotala)
Herb (field)	Graminoid	*Eragrostis hypnoides* (teal lovegrass)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Cyperus squarrosus* (bearded flatsedge), *Eragrostis hypnoides* (teal lovegrass), *Lindernia dubia* var. *dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox)
George Washington Memorial Parkway: *Cyperus squarrosus* (bearded flatsedge), *Eragrostis hypnoides* (teal lovegrass), *Lindernia dubia* var. *dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox)
Harpers Ferry National Historical Park: *Cyperus squarrosus* (bearded flatsedge), *Cyperus strigosus* (strawcolored flatsedge), *Ludwigia palustris* (marsh seedbox), *Rotala ramosior* (lowland rotala)
Monocacy National Battlefield: *Eragrostis hypnoides* (teal lovegrass), *Lindernia dubia* var. *dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox)
Global: *Acalypha rhomboidea* (common threeseed mercury), *Artemisia annua* (sweet sagewort), *Chamaesyce humistrata* (spreading sandmat), *Cyperus* spp., *Diodia virginiana* (Virginia buttonweed), *Dysphania ambrosioides* (Mexican tea), *Echinochloa crus-galli* (barnyardgrass), *Eclipta prostrata* (false daisy), *Eragrostis frankii* (sandbar lovegrass), *Eragrostis hypnoides* (teal lovegrass), *Fimbristylis autumnalis* (slender fimbry), *Hypericum mutilum* (dwarf St. Johnswort), *Leersia virginica* (whitegrass), *Lindernia dubia* (yellowseed false pimpernel), *Lipocarpha micrantha* (smallflower halfchaff sedge), *Ludwigia palustris* (marsh seedbox), *Mimulus alatus* (sharpwing monkeyflower), *Oxalis stricta* (common yellow oxalis), *Panicum dichotomiflorum* (fall panicgrass), *Panicum gattingeri* (Gattinger's panicgrass), *Rotala ramosior* (lowland rotala), *Solanum ptycanthum* (West Indian nightshade), *Verbascum thapsus* (common mullein), *Verbena urticifolia* (white vervain)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Carex emoryi* (Emory's sedge, G5, MD-imperiled), *Paspalum fluitans* (horsetail paspalum, G5, MD-critically imperiled), *Rhynchospora globularis* (globe beaksedge, G5?, MD-critically imperiled), *Rumex altissimus* (pale dock, G5, MD-critically imperiled), *Salix exigua* (G5, MD-critically imperiled); **Invasive/Exotic Plants**: *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Arthraxon hispidus* (small carpgrass, Medium/Low), *Brassica nigra* (black mustard, High/Low), *Cirsium vulgare* (bull thistle, Medium/Low), *Cleome hassleriana* (pink queen), *Datura stramonium* (jimsonweed, High/Low), *Digitaria ischaemum* (smooth crabgrass), *Echinochloa crus-galli* (barnyardgrass, Medium/Insignificant), *Eragrostis cilianensis* (stinkgrass, Medium/Insignificant), *Fallopia japonica* var. *japonica* (Japanese knotweed, High/Medium), *Galinsoga quadriradiata* (shaggy-soldier), *Lythrum salicaria* (purple loosestrife, High), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Polygonum hydropiper* (marshpepper knotweed), *Polygonum persicaria* (spotted ladysthumb), *Rorippa sylvestris* (creeping yellowcress, Medium/Low), *Rumex crispus* (curly dock, Low/Insignificant), *Rumex obtusifolius* (bitter dock), *Setaria faberi* (Japanese bristlegrass), *Setaria pumila* (yellow foxtail, Low/Insignificant), *Taraxacum officinale* (common dandelion); **Other Plants**: *Amaranthus retroflexus* (redroot amaranth, G5), *Dysphania ambrosioides* (Mexican tea, GNR)
George Washington Memorial Parkway: Vulnerable Plants: *Lipocarpha micrantha* (smallflower halfchaff sedge, G5, VA state-critically imperiled); **Invasive/Exotic Plants**: *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb); **Other Plants**: *Dysphania ambrosioides* (Mexican tea, GNR)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb); **Other Plants**: *Dysphania ambrosioides* (Mexican tea, GNR)
Monocacy National Battlefield: Invasive/Exotic Plants: *Albizia julibrissin* (silktree, High/Low), *Echinochloa crus-galli* (barnyardgrass, Medium/Insignificant), *Rorippa sylvestris* (creeping yellowcress, Medium/Low); **Other Plants**: *Cyperus squarrosus* (bearded flatsedge, G5)

Global: Vulnerable Plants: *Lipocarpha micrantha* (smallflower halfchaff sedge, G5, state-rare), *Paspalum dissectum* (mudbank crowngrass, G4?, state-rare), *Rorippa sessiliflora* (stalkless yellowcress, G5, VA & WV state-rare), *Sagittaria calycina* var. *calycina* (hooded arrowhead, G5T5?, VA & WV state-rare); **Invasive/Exotic Plants**: *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Dysphania ambrosioides* (Mexican tea), *Echinochloa crus-galli* (barnyardgrass, Medium/Insignificant), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Verbascum thapsus* (common mullein, 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.

Global Related Concepts:

- *Eragrostis hypnoides - Lindernia dubia - Ludwigia palustris* Herbaceous Vegetation (Lea 2000) =
- *Eragrostis hypnoides - Ludwigia palustris - Cyperus squarrosus* Herbaceous Vegetation (Lea 2003) <
- *Eragrostis hypnoides - Ludwigia palustris - Lindernia dubia - Cyperus squarrosus* Herbaceous Vegetation (Fleming and Taverna 2006) =
- *Panicum rigidulum - Eleocharis tenuis - Phyla lanceolata* Herbaceous Vegetation (Lea 2003) <

CLASSIFICATION

Status: Standard

Classification Confidence: 2 - Moderate

Chesapeake & Ohio Canal National Historical Park Classification Comments: This association, Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), is one of seven associations mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) at this park. The others are Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103), Water-willow Rocky Bar and Shore (CEGL004286), Ridge and Valley Gravel Riverscour Prairie (CEGL006477), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).

George Washington Memorial Parkway Classification Comments: Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483) is the only riparian vegetation type in the Potomac Gorge dominated peak-season by low, predominantly annual herbaceous vegetation. Its typical habitat on the lowest portions of riverbanks and very low depositional bars is also distinct and typically exposed only from mid-summer to early fall. This type is easily distinguished from the other two herbaceous depositional bar and shore communities in the gorge, with which it is mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP). Water-Willow Rocky Bar and Shore (CEGL004286) occupies lower, bouldery / cobbly bars that are inundated for most of the year and is characterized by nearly monospecific dominance of the perennial *Justicia americana* (American water-willow). Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481) occupies higher sandy banks and depositional bars and is characterized by dense stands of tall (1-2 m) annuals and weedy perennials at peak season.

In some situations, Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483) can have a within-season, zonal-successional relationship with Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), i.e., the higher riverbanks can start out with an early (June-July) flush of low annuals characteristic of the early-season growth of the Piedmont-Central Appalachian Scour Bar Wet Meadow. Later in the summer, Piedmont-Central Appalachian Scour Bar Wet Meadow reaches maximal growth with dense colonies of tall annual and perennial herbs that overtop and replace them, while the low annual herbaceous vegetation of the Appalachian-Atlantic Riverbar Drawdown Shore is still reaching peak development on the lowest rivershore bars that became exposed later.

Harpers Ferry National Historical Park Classification Comments: Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483) is one of five associations mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) at this park. The others are Water-willow Rocky Bar and Shore (CEGL004286), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).

Appalachian-Atlantic Riverbar Drawdown Shore is the only riparian vegetation type in the study area dominated by low, predominantly annual herbaceous vegetation. Its typical habitat on the lowest portions of riverbanks and very low depositional bars is also distinct and typically exposed only from mid-summer to early fall. By contrast, Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481) occupies higher sandy banks and depositional bars and is characterized by dense stands of tall (1-2 m) annuals and weedy perennials. In some situations, these two communities can have a within-season, zonal-successional relationship, i.e., the higher riverbanks can start out with an early (June-July) flush of low annuals characteristic of the early season growth of the Piedmont-Central Appalachian Scour Bar Wet Meadow. Later in the summer, Piedmont-Central Appalachian Scour Bar Wet Meadow reaches maximal growth with dense colonies of tall annual and perennial herbs that overtop and replace them, while the low annual herbaceous vegetation of the Appalachian-Atlantic Riverbar Drawdown Shore is still reaching peak development on the lowest rivershore bars that became exposed later.
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

Chesapeake & Ohio Canal National Historical Park Range: Appalachian-Atlantic Riverbar Drawdown Shore was sampled in plots near Sycamore Landing Area, Outdoor Club Uplands, Little Orleans South, Bevan Bend Barrens, Two Locks (Dam #5), Nolands Ferry Floodplain, the mouth of Catoctin Creek, and Weverton. The plots are in the Ridge and Valley, Hagerstown Valley, Blue Ridge and Inner Piedmont.
George Washington Memorial Parkway Range: Appalachian-Atlantic Riverbar Drawdown Shore occurs in widely scattered patches along the length of the Potomac Gorge in Virginia. It occurs very sparingly in all parks of the George Washington Memorial Parkway.
Harpers Ferry National Historical Park Range: Appalachian-Atlantic Riverbar Drawdown Shore occurs in widely scattered patches along the length of the Potomac River in the park. Discrete patches of this community are usually not much larger than 100 square meters.
Monocacy National Battlefield Range: Appalachian-Atlantic Riverbar Drawdown Shore occurs occasionally along the shoreline and depositional bars of the Monocacy River.
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:SNR, MD:SNR, VA:S2S3, WV:S1
TNC Ecoregions: 50:C, 52:C, 59:C, 61:C
USFS Ecoregions (2007): M221Cb:CCC
Federal Lands: NPS (Appalachian Trail [Central Appalachians], C&O Canal, George Washington Parkway, Harpers Ferry, Monocacy, New River Gorge)

Element Sources

Chesapeake & Ohio Canal National Historical Park Plots: (10 plots): CHOH.089, CHOH.095, CHOH.214, CHOH.505, CHOH.513, CHOH.517, CHOH.535, CHOH.536, CHOH.538, CHOH.634.
George Washington Memorial Parkway Plots: GFNP_050, GWMP_010.
Harpers Ferry National Historical Park Plots: HAFE.119.
Monocacy National Battlefield Plots: (1 plot): MONO.9.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Harpers Ferry National Historical Park Description Author(s): G. Fleming and K. Taverna
Monocacy National Battlefield Description Author(s): S. Perles and M. Russo
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 Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2000, Lea 2000*, Lea 2003, Lea 2004, Vanderhorst et al. 2007, WVNHP unpubl. data

A0948 *Salix nigra* Sand-Gravel Floodplain Scrub Alliance

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* (black willow) is characteristic, but floristic composition and structure is widely variable. Other species of *Salix* (willow) may co-occur, as well as *Alnus serrulata* (hazel alder), *Cornus sericea* (red-osier dogwood), and a variety of herbaceous species that tolerate flood disturbance. Alluvial tree saplings often occur as well, including *Acer saccharinum* (silver maple), *Populus deltoides* (eastern cottonwood), and others. This alliance occurs throughout the eastern United States and possibly adjacent Canada.

[CEGL006484] *Carpinus caroliniana - Ilex decidua* Wet Shrubland

Translated Name: **American Hornbeam - Possum-haw Wet Shrubland**
Common Name: **Piedmont Riverscour Shrubland**

USNVC Classification

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Scrub & Herb Floodplain Wetland (G755)
Alliance	*Salix nigra* Sand-Gravel Floodplain Scrub Alliance (A0948)

Element Concept

Global Summary: This association has been documented only in the eastern Piedmont region of Maryland and Virginia, where it is restricted to high-gradient stretches of the Potomac and Rappahannock rivers. It occupies protected areas (eroding draws, ravines, downstream sides of large outcrops) on the flanks of rocky bluffs and bedrock terraces that are periodically scoured by powerful floods, and occasionally occurs on sand- and boulder-covered flats on the active channel shelf. The vegetation is characterized by partially open to dense thickets of shrubs and shrubby trees generally less than 6 m tall. The species richness of the woody layers is high. *Carpinus caroliniana* (American hornbeam) and *Ilex decidua* (possum-haw) are both present and usually codominant. *Fraxinus pennsylvanica* (green ash), *Fraxinus americana* (white ash), *Robinia pseudoacacia* (black locust), *Diospyros virginiana* (common persimmon), *Viburnum prunifolium* (blackhaw), *Hypericum prolificum* (shrubby St. Johnswort), *Quercus rubra* (northern red oak), and *Nyssa sylvatica* (blackgum) are also frequent. Less constant shrubs and small trees that occasionally achieve moderate cover include *Ilex verticillata* (common winterberry), *Ostrya virginiana* (hophornbeam), *Physocarpus opulifolius* (common ninebark), and *Viburnum dentatum* (southern arrow-wood). Vines are common, with *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison-ivy), and/or *Parthenocissus quinquefolia* (Virginia creeper) often present. The herbaceous layer is species-rich and variable, with a more diverse assemblage of species present at low cover where soils are shallow over rocks, and dominance by a more limited number of species, particularly *Chasmanthium latifolium* (Indian woodoats), *Dichanthelium clandestinum* (deertongue), *Elymus virginicus* (Virginia wildrye), and *Cerastium arvense* (field chickweed), where soils are deep. *Lonicera japonica* (Japanese honeysuckle), as well as the exotic herbs *Saponaria officinalis* (bouncingbet) and *Lespedeza cuneata* (sericea lespedeza), can be invasive.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: Based on limited data from three sampled stands, this hornbeam shrubland occurs on a gently undulating toeslope with well-drained sand soil. The unvegetated surface is made up of exposed bedrock (23-45% cover), large rocks (0-65%), small rocks (0-1%), leaf litter (0-1%), wood (0-2%), and mosses and lichens (1-2%). Evidence of disturbance includes trails and an abundance of exotic species.

George Washington Memorial Parkway Environment: Piedmont Riverscour Shrubland is confined to a linear, 10-m wide zone of steep (24-degree) bedrock outcrops and bouldery colluvium (surface cover = 90%) that is immediately upslope from the edge of the Potomac River's channel shelf. Based on subjective evaluation of vegetation structure and damage, this zone lies within the bounds of relatively frequent flooding, with the lower part of the zone more obviously impacted by floods than the higher portion. Upslope, site conditions transition rapidly to an area of fully wooded boulderfields and cliffs that show no evidence of flood damage. The site is ENE-facing and quite sheltered. Interstitial soils appear to be flood-deposited, sandy alluvium and appear to be seasonally droughty. Chemical analysis of a single sample produced values for pH, calcium, magnesium, and total base saturation indicating high fertility.

Global Environment: The community occupies protected areas (eroding draws, ravines, downstream sides of large outcrops) in the bedrock-controlled channel of Potomac River in Mather Gorge (reach about 5 km immediately below Great Falls on the Maryland side), where shallow to deep coarse sands are deposited during large floods. Traces of this vegetation were observed along a somewhat lower gradient (but also bedrock-controlled) reach just downstream from Violette's Lock, about 11 km upstream from Great Falls. Some occurrences are located in infrequently flooded, rocky drainage channels that are moist enough and protected enough to allow woody vegetation to persist, but that experience tree-damaging flood debris regularly enough to produce thicket-like growths of shrubs and trees. A single stand documented on the Virginia side of Mather Gorge occupies a linear ecotonal area at the foot of a massive bluff, on periodically scoured outcrops between the river and the forested slope above. Stands along the Rappahannock River in Fauquier and Culpeper counties, Virginia, occur on a bouldery slope with some diabase outcrops at the foot of a bluff bordering the river, as well as on sand- and boulder-covered flats on the active channel shelf. Flooding regime is temporarily flooded, with a probable mean return interval of from 1 to 15 years. Sites can be seasonally somewhat dry.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: There may be a sparse (20% cover) tree canopy, 10-20 m tall, that can include *Fraxinus americana* (white ash), *Platanus occidentalis* (American sycamore), *Quercus rubra* (northern red oak), and *Quercus stellata* (post oak). However, this community is defined by the very sparse to moderate (10-60%) tall-shrub layer (6-10 m) and moderate to dense (60-80+%) short-shrub layer (1-6 m) dominated by *Carpinus caroliniana* (American hornbeam) and *Ilex decidua* (possum-haw) (Maryland state-imperiled); additional shrubs may include *Carya glabra* (pignut hickory), *Fraxinus pennsylvanica* (green ash), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Nyssa sylvatica* (blackgum), *Quercus rubra* (northern red oak), and *Viburnum prunifolium* (blackhaw). The herbaceous layer (20-60%) may include *Andropogon gerardii* (big bluestem), *Carex jamesii* (James' sedge), *Chasmanthium latifolium* (Indian woodoats), *Panicum virgatum var. virgatum* (switchgrass), *Uvularia sessilifolia* (sessileleaf bellwort), and Vaccinium pallidum. More than two dozen exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Melica mutica* (twoflower melicgrass) and three state-vulnerable species.

George Washington Memorial Parkway Vegetation: Only one stand of Piedmont Riverscour Shrubland, covering approximately 0.3 ha (0.7 acre), is known in the Potomac Gorge section of George Washington Memorial Parkway. However, additional, very small patches of this community likely occur in Mather Gorge. The vegetation is a fairly dense shrubland (<6 m tall) with scattered trees (6 to 20 m tall) and a sparse herbaceous flora. *Carpinus caroliniana* (American hornbeam) is the dominant species, accounting for approximately 50% of the woody cover and 30% of total density of stems >2.5 cm dbh. Less abundant tall shrubs and trees include *Ilex decidua* (possum-haw), *Hamamelis virginiana* (American witch-hazel), *Ostrya virginiana* (hophornbeam), *Nyssa sylvatica* (blackgum), *Quercus rubra* (northern red oak), *Quercus montana* (chestnut oak), *Fraxinus americana* (white ash), *Diospyros virginiana* (common persimmon), and *Ulmus americana* (American elm). Mixed, low shrubs form dense thickets among the rocks, with *Ilex verticillata* (common winterberry), *Rhododendron periclymenoides* (pink azalea), *Rhododendron arborescens* (smooth azalea), *Physocarpus opulifolius var. opulifolius* (common ninebark), *Toxicodendron radicans* (eastern poison-ivy), and *Viburnum rafinesquianum* all contributing significant cover. True herbaceous plants are sparse and include representatives of riverside outcrops and prairies, as well as common flood-adapted species of riverside depositional bars. *Andropogon gerardii* (big bluestem) is the most abundant (2-5% cover) herb; other prairie and lithophytic species are *Lespedeza violacea* (violet lespedeza), *Panicum virgatum var. virgatum* (switchgrass), *Veronicastrum virginicum* (Culver's root), *Arabis laevigata var. laevigata* (smooth rockcress), *Polypodium virginianum* (rock polypody), *Solidago rupestris* (rock goldenrod), *Solidago simplex var. racemosa* (Rand's goldenrod), and *Hylotelephium telephioides* (Allegheny stonecrop). Common weedy riverside species include *Apocynum cannabinum* (Indianhemp), *Chamaesyce humistrata* (spreading sandmat), *Cynanchum laeve* (honeyvine), and *Eupatorium serotinum* (lateflowering thoroughwort).

Global Vegetation: The type is characterized by partially open to dense thickets of shrubs and shrubby trees generally less than 6 m tall. The species richness of the woody layers is high. *Carpinus caroliniana* (American hornbeam) and *Ilex decidua* (possum-haw) are both present and usually codominant. *Fraxinus pennsylvanica* (green ash), *Fraxinus americana* (white ash), *Robinia pseudoacacia* (black locust), *Diospyros virginiana* (common persimmon), *Viburnum prunifolium* (blackhaw), *Hypericum prolificum* (shrubby St. Johnswort), *Quercus rubra* (northern red oak), and *Nyssa sylvatica* (blackgum) are also frequent. Less constant shrubs and small trees that occasionally achieve moderate cover include *Ilex verticillata* (common winterberry), *Ostrya virginiana* (hophornbeam), *Physocarpus opulifolius* (common ninebark), and *Viburnum dentatum* (southern arrow-wood). Vines are common, with *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison-ivy), and/or

Parthenocissus quinquefolia (Virginia creeper) often present. The herbaceous layer is species-rich and variable, with a more diverse assemblage of species present at low cover where soils are shallow over rocks, and dominance by a more limited number of species, particularly *Chasmanthium latifolium* (Indian woodoats), *Dichanthelium clandestinum* (deertongue), *Elymus virginicus* (Virginia wildrye), and *Cerastium arvense* (field chickweed), where soils are deep. *Lonicera japonica* (Japanese honeysuckle), as well as the exotic herbs *Saponaria officinalis* (bouncingbet) and *Lespedeza cuneata* (sericea lespedeza), can be invasive.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Carpinus caroliniana* (American hornbeam), *Ilex decidua* (possum-haw)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Carpinus caroliniana* (American hornbeam), *Ilex decidua* (possum-haw)
George Washington Memorial Parkway: *Carpinus caroliniana* (American hornbeam), *Ilex decidua* (possum-haw), *Physocarpus opulifolius* var. *opulifolius* (common ninebark), *Toxicodendron radicans* (eastern poison-ivy)
Global: *Carpinus caroliniana* (American hornbeam), *Ilex decidua* (possum-haw)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Clematis viorna* (vasevine, G5, MD-vulnerable), *Ilex decidua* (possum-haw, G5, MD-imperiled), *Melica mutica* (twoflower melicgrass, G5, MD-critically imperiled), *Silphium trifoliatum* (whorled rosinweed, G4?, MD-vulnerable), *Zizia aurea* (golden zizia, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Calystegia sepium* (hedge false bindweed), *Cerastium fontanum* ssp. *vulgare* (big chickweed), *Commelina communis* (Asiatic dayflower), *Festuca rubra* (red fescue, Unknown), *Hemerocallis fulva* (orange daylily, Medium/Low), *Humulus japonicus* (Japanese hop, Medium/Low), *Lespedeza cuneata* (sericea lespedeza, Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Morus alba* (white mulberry, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Poa compressa* (Canada bluegrass, High/Low), *Rosa multiflora* (multiflora rose, Medium/Low), *Silene noctiflora* (nightflowering silene), *Taraxacum officinale* (common dandelion), *Trifolium pratense* (red clover, Low/Insignificant), *Verbascum blattaria* (moth mullein); **Other Plants**: *Artemisia vulgaris* var. *vulgaris* (GUTU), *Dysphania ambrosioides* (Mexican tea, GNR)
George Washington Memorial Parkway: Vulnerable Plants: *Rhododendron arborescens* (smooth azalea, G4G5, VA state-imperiled), *Solidago rupestris* (rock goldenrod, G4?, VA state-critically imperiled), *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?, VA state-critically imperiled); **Invasive/Exotic Plants**: *Celastrus orbiculatus* (oriental bittersweet, High/Medium)
Global: Vulnerable Plants: *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?); **Invasive/Exotic Plants**: *Lespedeza cuneata* (sericea lespedeza, Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Saponaria officinalis* (bouncingbet, Low/Insignificant)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1? (30-May-2007). This association is known only from scoured, rocky riversides in fall-line and eastern Piedmont gorges of the Potomac River (Maryland and Virginia) and Rappahannock River (Virginia). It occurs in small patches under localized environmental conditions at both sites, which are on Federal and state lands, respectively. Additional occurrences are possible in other Piedmont river systems, but would likely not increase the acreage of the type significantly.

RELATED CONCEPTS

Global Related Concepts:
- *Carpinus caroliniana - Ilex decidua - Fraxinus pennsylvanica* Shrubland (Lea 2000) =
- *Carpinus caroliniana - Ilex decidua* Shrubland (Fleming and Taverna 2006) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Piedmont Riverscour Shrubland is the only vegetation type in the Potomac Gorge that is dominated by shrubs. The steep, rocky, flood-scoured habitat and dominance of the vegetation by *Carpinus caroliniana* (American hornbeam) and deciduous *Ilex* (holly) spp. are both distinctive and diagnostic. While relatively large, the single known Virginia-side stand is wedged into a long, narrow zone between the rivershore and an upland forest, and is somewhat ecotonal and indistinct in places. Smaller, more numerous patches of this vegetation on the Maryland side of the river are more discrete in their association with eroding draws on the flank of Bear Island. In addition, *Ilex decidua* (possum-haw) is comparatively less abundant, and *Ilex verticillata* (common winterberry) more important in the Virginia-side stand. This association is mapped as Riverside Rock Outcrop and Prairie Map Class (COMP_RROP), which includes four associations at this park, Central Appalachian-Allegheny Calcareous Riverscour Prairie (CEGL006283), Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478), Piedmont Riverscour Shrubland (CEGL006484), and Potomac Gorge Riverside Outcrop Barrens (CEGL006491).
George Washington Memorial Parkway Classification Comments: Piedmont Riverscour Shrubland is the only vegetation type in the Potomac Gorge that is dominated by shrubs. The steep, rocky, flood-scoured habitat and dominance of the vegetation by *Carpinus caroliniana* (American hornbeam) and deciduous *Ilex* (holly) spp. are both distinctive and diagnostic. While relatively large, the single known Virginia-side stand is wedged into a long, narrow zone between the rivershore and an upland forest, and is somewhat ecotonal and indistinct in places. Smaller, more numerous patches of this vegetation on the Maryland side of the river are more discrete in their association with eroding draws on the flank of Bear Island. In addition, *Ilex decidua* (possum-haw) is comparatively less abundant, and *Ilex verticillata* (common winterberry) more important in the Virginia-side stand. This association is mapped as Riverside Rock Outcrop and Prairie Map Class (COMP_RROP), which includes four associations at this park, Central Appalachian-Allegheny Calcareous Riverscour Prairie (CEGL006283), Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478), Piedmont Riverscour Shrubland (CEGL006484), and Potomac Gorge Riverside Outcrop Barrens (CEGL006491).
Global Classification Comments: Classification of this type is based partly on analysis of data from seven plot samples collected along the Potomac (5 plots) and Rappahannock (2 plots) rivers. Composition of this group of plots is quite heterogeneous but strongly united by similar habitats, comparable physiognomy, and a suite of 26 species (mostly woody) with >70% constancy. Although associated with very specialized habitats and potentially very rare, the fact that this vegetation has been documented from two different mid-Atlantic river systems argues for recognition as an USNVC association.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: Several patches of this vegetation occur on the flanks of Bear Island, Maryland, in Mather Gorge (C&O Canal National Historical Park). It was sampled in plots on Bear Island and Rocky Island, Great Falls area (Canal mile 13-14). Only a single patch of Piedmont Riverscour Shrubland has been found in George Washington Memorial Parkway, stretching discontinuously for approximately 300 m along the rocky, lower slope of Mather Gorge upstream of the mouth of Difficult Run (Great Falls Park).
George Washington Memorial Parkway Range: Only a single patch of Piedmont Riverscour Shrubland has been found in George Washington Memorial Parkway, stretching discontinuously for approximately 300 m along the rocky, lower slope of Mather Gorge upstream of the mouth of Difficult Run (Great Falls Park). Several patches of this vegetation occur on the flanks of Bear Island, Maryland, in Mather Gorge (C&O Canal National Historical Park).
Global Range: This association has been documented only in the eastern Piedmont region of Maryland and Virginia, where it is restricted to high-gradient stretches of the Potomac and Rappahannock rivers.
Nations: US
States/Provinces: MD:S1, VA:S1
TNC Ecoregions: 52:C, 61:C
Federal Lands: NPS (C&O Canal, George Washington Parkway)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (4 plots): CHOH.204, CHOH.207, CHOH.208, POTO_033.12.
George Washington Memorial Parkway Plots: GFNP_053.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo

George Washington Memorial Parkway Description Author(s): G.P. Fleming
Global Description Author(s): C. Lea and G.P. Fleming
References: Eastern Ecology Working Group n.d., Fleming 2007, Fleming and Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2000, Lea 2000*, Lea 2004

M881. Eastern North American Riverscour Vegetation

This widely ranging macrogroup comprises a large number of highly variable vegetation types that occur on the shores of rivers in the eastern U.S. and adjacent Canada. Characteristic species vary over the range. Shrubs may include *Alnus serrulata* (hazel alder), *Hypericum prolificum* (shrubby St. Johnswort), *Prunus pumila* (sandcherry), *Salix caroliniana* (coastal plain willow), or *Salix interior* (sandbar willow). Characteristic herbaceous species, depending on geography, may include *Andropogon gerardii* (big bluestem), *Baptisia australis* (blue wild indigo), *Calamagrostis canadensis* (bluejoint), *Campanula rotundifolia* (bluebell bellflower), *Carex torta* (twisted sedge), *Deschampsia cespitosa* (tufted hairgrass), *Doellingeria umbellata* (parasol whitetop), *Elymus* (wildrye) spp., *Eupatorium* (thoroughwort) spp., *Packera paupercula* (balsam groundsel), *Panicum virgatum* (switchgrass), *Schizachyrium scoparium* (little bluestem), *Solidago gigantea* (giant goldenrod), *Solidago simplex* (Mt. Albert goldenrod), *Spartina pectinata* (prairie cordgrass), and *Triantha glutinosa* (sticky tofieldia). The patchy vegetation ranges from riverside prairies to highly flood-scoured, ice-scoured, and flood-battered patchy or very sparse vegetation along high-gradient rivers.

G753. Central Interior-Appalachian Riverscour Barrens & Prairie

This group consists of riverbank "prairies" and riverine shrublands often occurring as distinct zones, maintained by flash flooding events on larger rivers of the south-central portion of the United States, including the Central and Southern Appalachians, Interior Low Plateau, Ozark and Ouachita regions. Stands are scoured by floods that may reach well above normal summer water levels. Grasses typical of midwestern prairies are characteristic of this group, including *Andropogon gerardii* (big bluestem), *Panicum virgatum* (switchgrass), *Schizachyrium scoparium* (little bluestem), and/or *Sorghastrum nutans* (Indiangrass). Typical shrubs may include *Alnus serrulata* (hazel alder), *Cephalanthus occidentalis* (common buttonbush), *Hamamelis virginiana* (American witch-hazel), *Ilex vomitoria* (yaupon), and *Physocarpus opulifolius* (common ninebark). The substrate includes gravelly streambanks, cobbles, as well as exposed bedrock that ranges from acidic to calcareous. The vegetation is highly variable in composition and structure, with plants often restricted to boulder cracks and shallow soil pockets.

A2069 *Andropogon gerardii - Sorghastrum nutans* Appalachian Gravel Riverscour Alliance

This alliance includes scoured riverbank "prairies" of the Central Appalachian regions of the United States, including the Allegheny Plateau, Cumberland Plateau, and the adjacent Ridge and Valley. These may be called "riverside prairies," "linear prairies," "rivershore grasslands," "scoured riverine prairies," or other local names. These grasslands may be associated with dry cobble or gravel riverbanks, as well as flood-scoured, acidic or calcareous bedrock exposures associated with major rivers. This includes riverine gravel/cobble bar "prairies" along the upper Cumberland River in Kentucky and Tennessee, as well as scour areas along high-gradient sections of major rivers, such as in gorges in Virginia, Maryland, Ohio, Pennsylvania, West Virginia, and possibly farther west. In addition to *Panicum virgatum* (switchgrass), *Andropogon gerardii* (big bluestem), and/or *Sorghastrum nutans* (Indiangrass), examples may also contain *Schizachyrium scoparium* (little bluestem) and *Chasmanthium latifolium* (Indian woodoats), any of which could be locally dominant. Examples of this alliance have mixed shrub and herbaceous physiognomy and may include a few taller trees. Trees are characteristically less than 5 m tall (but scattered individuals may approach 10 m), and canopy cover characteristically ranges from 0 to 10% (but in intervals between flood events may locally approach 30%).

[CEGL006491] *(Hypericum prolificum, Eubotrys racemosa) / Schizachyrium scoparium - Solidago simplex var. racemosa - Ionactis linariifolius* Riverscour Sparse Vegetation

Translated Name: **(Shrubby St. John's-wort, Swamp Doghobble) / Little Bluestem - Sticky Goldenrod - Flaxleaf Whitetop Aster Riverscour Sparse Vegetation**
Common Name: **Potomac Gorge Riverside Outcrop Barrens**

USNVC Classification

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Riverscour Vegetation (M881)
Group	Central Interior-Appalachian Riverscour Barrens & Prairie (G753)
Alliance	*Andropogon gerardii* - *Sorghastrum nutans* Appalachian Gravel Riverscour Alliance (A2069)

Element Concept

Global Summary: This sparse outcrop vegetation of the Potomac Gorge in Virginia and Maryland occurs on metasedimentary and intrusive igneous rock exposures that are catastrophically flood-scoured. The habitat is variable, with small pools interspersed among shaded microhabitats and exposed xeric microhabitats. The vascular vegetation generally covers <5% of a given area and consists of scattered herbs and dwarfed shrubs. The most characteristic species are *Schizachyrium scoparium* (little bluestem), *Solidago simplex var. racemosa* (Rand's goldenrod), *Dichanthelium acuminatum var. acuminatum* (tapered rosette grass), *Ionactis linariifolius* (flaxleaf whitetop aster), and the shrubs *Eubotrys racemosa* (swamp doghobble) and *Hypericum prolificum* (shrubby St. Johnswort). Other minor, inconstant species include *Andropogon gerardii* (big bluestem), *Gaylussacia baccata* (black huckleberry), *Juncus dichotomus* (forked rush), *Phlox subulata* (moss phlox), *Veronicastrum virginicum* (Culver's root), *Hypericum gentianoides* (orangegrass), *Amelanchier nantucketensis* (Nantucket serviceberry), and *Sporobolus clandestinus* (rough dropseed). Small pools and potholes support inclusions of wetland species, including *Ludwigia alternifolia* (seedbox), *Scirpus cyperinus* (woolgrass), *Cephalanthus occidentalis* (common buttonbush), and *Ludwigia palustris* (marsh seedbox). Lichens, especially *Xanthoparmelia conspersa* (xanthoparmelia lichen), have very high cover on the rock surfaces. The bryophyte *Grimmia laevigata* (grimmia dry rock moss) is also important in areas with ephemeral seepage or surface water. This association is apparently endemic to the Potomac Gorge.

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: See Global Environment.

George Washington Memorial Parkway Environment: Potomac Gorge Riverside Outcrop Barrens is endemic to the most xeric and exposed cliffs and outcrops that flank the Potomac River from Great Falls to Madeira School, and occasionally further downstream. Stands occur between approximately 3 and 15 m (10-49 feet) relative elevation above mean river level, and thus have variable flood regimes. The average flood-return interval is probably similar to that reported by Lea (2000) for Maryland-side occurrences (range = 0.5 year to more than 15 years). Because of the exposed, typically convex topography, the severity of flood scouring may reach maximal intensity at these sites. Parent material at nine plot-sampling sites includes Mather Gorge Formation schist, metagraywacke, and migmatitic metagraywacke, and Bear Island granodiorite (Southworth and Denenny 2006). Mean bedrock cover is >95% and no mineral soil could be located or collected at any plot. Small deposits of organic matter and fine gravel occur in crevices and small depressions. Water-sculpted potholes that hold water for parts of the growing season are frequent at some sites.

Global Environment: This sparse outcrop vegetation occurs on metasedimentary and intrusive igneous rock exposures that are catastrophically flood-scoured. Most of the global range is on exposed cliffs, ledges, and crags of the massive bedrock terraces that flank Great Falls and Mather Gorge for several miles below the falls. A few patches occur on exposed shoreline outcrops downstream of Mather Gorge. The habitat is variable, with small pools interspersed among shaded microhabitats and exposed xeric microhabitats. No extractable mineral soil is present in this environment, and plants are rooted in crevices, gravel and organic deposits, and bryophyte mats. According to Lea (2000, 2004), the mean flood-return interval varies from less than one year to about 10 years, and the substrate is violently scoured by larger floods.

Vegetation Description

Chesapeake & Ohio Canal National Historical Park Vegetation: See Global Vegetation.

George Washington Memorial Parkway Vegetation: Shrub cover in samples of Potomac Gorge Riverside Outcrop Barrens ranges from 0 to 12% (mean = 5%), and herb cover ranges from 3 to 9% (mean = 7%). This coverage is high for sparse vegetation and is the result of plot placement biased to capture maximum vascular vegetation cover and diversity in a 100-square-m quadrat. *Schizachyrium scoparium* (little bluestem) and *Solidago simplex var. racemosa* (Rand's goldenrod) occur in every plot and are the most numerous and characteristic herbs. *Dichanthelium acuminatum var. acuminatum* (tapered rosette grass) and *Ionactis linariifolius* (flaxleaf whitetop aster) are also constant, while *Andropogon gerardii* (big bluestem), *Hypericum gentianoides* (orangegrass), *Phlox*

subulata (moss phlox), and *Aquilegia canadensis* (red columbine) are less frequent. *Juncus dichotomus* (forked rush), *Ludwigia palustris* (marsh seedbox), *Ludwigia alternifolia* (seedbox), *Scirpus cyperinus* (woolgrass), *Rhynchospora capitellata* (brownish beaksedge), and other wetland herbs occur irregularly in and around periodically flooded potholes and depressions. One or both of the shrubs *Eubotrys racemosa* (swamp doghobble) and *Hypericum prolificum* (shrubby St. Johnswort) also occur in every plot and are usually dwarfed. Other woody plants that occur less frequently include *Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Amelanchier stolonifera* (running serviceberry), *Amelanchier nantucketensis* (Nantucket serviceberry), scrambling vines of *Campsis radicans* (trumpet creeper) and *Rubus flagellaris* (northern dewberry), and scattered tree seedlings. Lichens are the predominant biota on the exposed rock surfaces of this community, with *Xanthoparmelia conspersa* (xanthoparmelia lichen), *Dimelaena oreina* (mountain lichen), *Candelariella* (eggyolk lichen) cf. *vitellina*, *Xanthoria* (orange wall lichen) sp., and numerous unidentified crustose species all abundant. Total species richness ranges from 12 to 36 taxa per 100 square meters.

Global Vegetation: The vascular vegetation generally covers <5% of a given area and consists of scattered herbs and dwarfed shrubs. The most characteristic species are *Schizachyrium scoparium* (little bluestem), *Solidago simplex var. racemosa* (Rand's goldenrod), *Dichanthelium acuminatum var. acuminatum* (tapered rosette grass), *Ionactis linariifolius* (flaxleaf whitetop aster), and the shrubs *Eubotrys racemosa* (swamp doghobble) and *Hypericum prolificum* (shrubby St. Johnswort). Other minor, inconstant species include *Andropogon gerardii* (big bluestem), *Gaylussacia baccata* (black huckleberry), *Juncus dichotomus* (forked rush), *Phlox subulata* (moss phlox), *Veronicastrum virginicum* (Culver's root), *Euphorbia corollata* (flowering spurge), *Hypericum gentianoides* (orangegrass), *Amelanchier nantucketensis* (Nantucket serviceberry), and *Sporobolus clandestinus* (rough dropseed). Small pools and potholes support inclusions of wetland species, including *Ludwigia alternifolia* (seedbox), *Scirpus cyperinus* (woolgrass), *Cephalanthus occidentalis* (common buttonbush), and *Ludwigia palustris* (marsh seedbox). Lichens, especially *Xanthoparmelia conspersa* (xanthoparmelia lichen), have very high cover on the rock surfaces. The bryophyte *Grimmia laevigata* (grimmia dry rock moss) is also important in areas with ephemeral seepage or surface water. Mean species richness of 17 plot-sampled stands was 23 taxa per 100 m2 (range 12 to 36 taxa).

Global Dynamics: The community is patchy, occurring in narrow, discontinuous strips bordering the river in a roughly 2 mile long river corridor.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Ionactis linariifolius* (flaxleaf whitetop aster), *Solidago simplex* var. *racemosa* (Rand's goldenrod)
Herb (field)	Graminoid	*Dichanthelium acuminatum* var. *acuminatum* (tapered rosette grass), *Schizachyrium scoparium* (little bluestem)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Dichanthelium acuminatum* var. *acuminatum* (tapered rosette grass), *Eubotrys racemosa* (swamp doghobble), *Ionactis linariifolius* (flaxleaf whitetop aster), *Schizachyrium scoparium* (little bluestem), *Solidago simplex* var. *racemosa* (Rand's goldenrod)

George Washington Memorial Parkway: *Dichanthelium acuminatum* var. *acuminatum* (tapered rosette grass), *Eubotrys racemosa* (swamp doghobble), *Ionactis linariifolius* (flaxleaf whitetop aster), *Schizachyrium scoparium* (little bluestem), *Solidago simplex* var. *racemosa* (Rand's goldenrod)

Global: *Andropogon gerardii* (big bluestem), *Dichanthelium acuminatum* var. *acuminatum* (tapered rosette grass), *Eubotrys racemosa* (swamp doghobble), *Hypericum prolificum* (shrubby St. Johnswort), *Ionactis linariifolius* (flaxleaf whitetop aster), *Phlox subulata* (moss phlox), *Schizachyrium scoparium* (little bluestem), *Solidago rupestris* (rock goldenrod), *Solidago simplex* var. *racemosa* (Rand's goldenrod)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?)

George Washington Memorial Parkway: Vulnerable Plants: *Amelanchier nantucketensis* (Nantucket serviceberry, G3Q, VA state-critically imperiled), *Baptisia australis* var. *australis* (blue wild indigo, G5T3T4, VA state-vulnerable), *Cerastium arvense* var. *velutinum* (field chickweed, G5T4?, VA state-imperiled), *Helianthus occidentalis* ssp. *occidentalis* (fewleaf sunflower, G5T5, VA state-critically imperiled), *Rhododendron arborescens*

(smooth azalea, G4G5, VA state-imperiled), *Solidago rupestris* (rock goldenrod, G4?, VA state-critically imperiled), *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?, VA state-critically imperiled)
Global: Vulnerable Plants: *Amelanchier nantucketensis* (Nantucket serviceberry, G3Q, MD & VA state-rare), *Baptisia australis* var. *australis* (blue wild indigo, G5T3T4), *Solidago rupestris* (rock goldenrod, G4?, MD & VA state-rare), *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?, MD & VA state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (31-May-2007). This vegetation type and its flood-scoured outcrop habitat have always been rare and localized. Using current ranking standards, there are fewer than five discrete occurrences of this community rangewide, covering <25 ha in aggregate. In addition, inventory of potential habitats has been fairly rigorous, at least in the mid-Atlantic states. Most of the global range is on heavily used public (National Park Service) lands but is only partly protected from visitor impacts such as trampling.

RELATED CONCEPTS

Global Similar Types:
- *Andropogon gerardii - Campanula rotundifolia - Solidago simplex* Riverscour Sparse Vegetation (CEGL006284)
- *Andropogon gerardii - Panicum virgatum - Baptisia australis* Riverscour Wet Meadow (CEGL006283)
- *Fraxinus americana / Andropogon gerardii - Sorghastrum nutans - Schizachyrium scoparium - Pycnanthemum tenuifolium* Riverscour Wet Meadow (CEGL006478)

Global Related Concepts:
- *(Hypericum prolificum, Leucothoe racemosa) / Schizachyrium scoparium - Solidago racemosa - Ionactis linariifolius* Herbaceous Vegetation (Fleming et al. 2007b) =
- *Leucothoe racemosa / Schizachyrium scoparium - Solidago racemosa - Ionactis linariifolius* Herbaceous Vegetation (Fleming and Patterson 2003) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: The extremely xeric habitat and sparse vascular vegetation of Potomac Gorge Riverside Outcrop Barrens are unique in the Potomac Gorge area. This community often co-occurs in small-scale mosaics and shares some species with Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478). The latter, however, differs in its habitats with some soil development, its prairie-like aspect, and its much higher cover and richness of herbaceous and scrub vegetation. This association is mapped as Riverside Rock Outcrop and Prairie Map Class (COMP_RROP), which includes four associations, Central Appalachian-Allegheny Calcareous Riverscour Prairie (CEGL006283), Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478), Piedmont Riverscour Shrubland (CEGL006484), and Potomac Gorge Riverside Outcrop Barrens (CEGL006491).
George Washington Memorial Parkway Classification Comments: The extremely xeric habitat and sparse vascular vegetation of Potomac Gorge Riverside Outcrop Barrens are unique in the George Washington Memorial Parkway. This community often co-occurs in small-scale mosaics and shares some species with Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478). The latter, however, differs in its habitats with some soil development, its prairie-like aspect, and its much higher cover and richness of herbaceous and scrub vegetation. This association is mapped as Riverside Rock Outcrop and Prairie Map Class (COMP_RROP), which includes four associations at this park, Central Appalachian-Allegheny Calcareous Riverscour Prairie (CEGL006283), Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478), Piedmont Riverscour Shrubland (CEGL006484), and Potomac Gorge Riverside Outcrop Barrens (CEGL006491).
George Washington Memorial Parkway Other Comments: Although locally common in Mather Gorge, this community is unquestionably one of the Potomac Gorge's most important and conservation-worthy vegetation types because of its rangewide rarity. This association is endemic to the Potomac Gorge in Virginia and Maryland.
Global Classification Comments: Classification of this type is supported by analysis of a 1250-plot regional dataset assembled for the NCR parks vegetation mapping project. This association is represented by 17 Maryland and Virginia plots from the Potomac Gorge.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This association occurs on exposed cliffs, ledges, and crags of the massive bedrock terraces that flank Great Falls and Mather Gorge for several miles below the falls. A few patches occur on exposed shoreline outcrops downstream of Mather Gorge. .

George Washington Memorial Parkway Range: Potomac Gorge Riverside Outcrop Barrens occupies the most xeric and exposed cliffs and outcrops that flank the Potomac River from Great Falls through Mather Gorge to Madeira School, and occasionally further downstream. In George Washington Memorial Parkway, it is confined to Great Falls Park. The distribution and extent of this community appear to be similar on both sides of the Potomac River.
Global Range: This community is endemic to a 15-km stretch of the Potomac River valley in Maryland and Virginia.
Nations: US
States/Provinces: MD:S1, VA:S1
TNC Ecoregions: 61:C
USFS Ecoregions (2007): 221Db:CCC
Federal Lands: NPS (C&O Canal, George Washington Parkway)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: POTO_PH1, POTO_PH2, POTO_RI1, POTO_RI2, POTO_RI3, POTO_RI4, POTO_RI5, POTO_RI6
George Washington Memorial Parkway Plots: GFNP_022, GFNP_023, GFNP_025, GFNP_031, GFNP_032.
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
George Washington Memorial Parkway Description Author(s): G.P. Fleming
Global Description Author(s): M. Anderson and G.P. Fleming
References: Eastern Ecology Working Group n.d.*, Fleming 2007, Fleming and Patterson 2003, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Grossman et al. 1994, Harrison 2004, Harrison 2011, Harrison and Stango 2003, Lea 2000, Southworth and Denenny 2006

[CEGL006283] *Andropogon gerardii - Panicum virgatum - Baptisia australis* Riverscour Wet Meadow

Translated Name: **Big Bluestem - Switchgrass - Blue Wild Indigo Riverscour Wet Meadow**
Common Name: **Central Appalachian-Allegheny Calcareous Riverscour Prairie**

USNVC CLASSIFICATION

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Riverscour Vegetation (M881)
Group	Central Interior-Appalachian Riverscour Barrens & Prairie (G753)
Alliance	*Andropogon gerardii - Sorghastrum nutans* Appalachian Gravel Riverscour Alliance (A2069)

ELEMENT CONCEPT

Global Summary: This community is found in the east-central United States along high-gradient sections of major rivers, such as in gorges and along the fall-line. It usually occupies rocky areas within the active channel shelf at an intermediate level above the low-water level and the bank-full level. Flood scouring and ice floods are powerful and ecologically important abrasive forces that shape the physiognomy and composition of this association. Soils are rapidly drained Psamments. Often, soil material is restricted to the narrow interstices of tightly packed boulders, or to small crevices in bedrock exposures. This community is characterized by a luxuriant growth of the robust grasses *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass), *Panicum virgatum* (switchgrass), and *Spartina pectinata* (prairie cordgrass) which resembles prairie vegetation. *Tripsacum dactyloides* (eastern gamagrass) may also occur. Many of the forbs are also typical of prairies. Characteristic species include *Baptisia australis* (blue wild indigo), *Allium cernuum* (nodding onion), *Aristida purpurascens* (arrowfeather threeawn), *Bidens frondosa* (devil's beggarticks), *Chasmanthium latifolium* (Indian woodoats), *Clematis viorna* (vasevine), *Eleocharis compressa* (flatstem spikerush), *Conoclinium coelestinum* (blue mistflower), *Coreopsis tripteris* (tall tickseed), *Eupatorium serotinum* (lateflowering thoroughwort), *Eutrochium fistulosum* (trumpetweed), *Lespedeza violacea* (violet lespedeza), *Packera aurea* (golden ragwort), *Physostegia virginiana* (obedient plant), *Pycnanthemum virginianum* (Virginia mountainmint), *Solidago rupestris* (rock goldenrod), *Teucrium canadense* (Canada germander), *Veronicastrum virginicum* (Culver's root), *Zizia trifoliata* (meadow alexanders), and *Zizia aurea* (golden zizia). Scattered and flood-battered shrubs and tree saplings often occur.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This big bluestem herbaceous vegetation was sampled at nine plots in the park. These sites are flat seasonally flooded stream terrace, and gently undulating, temporarily flooded alluvial plains that are part of the active channel shelf. The sampled soil was well-drained sand. The unvegetated surface is dominated by either large rocks (5-95%) or small rocks (5-87%), with some leaf litter (0-1%), wood (1-2%), bare sand (0-5%). Evidence of disturbance includes regular flooding and scouring and the abundance of exotic species.

George Washington Memorial Parkway Environment: Central Appalachian-Allegheny Calcareous Riverscour Prairie occurs along the Potomac River on rocky areas within the active channel shelf subject to frequent high-energy flooding, at an intermediate level above the low-water level and the bank-full level. These are stable outcrop / boulder habitats versus more ephemeral cobble bars. Soil material is often restricted to the narrow interstices of tightly packed boulders, or to small crevices in bedrock exposures. This big bluestem herbaceous vegetation was sampled at three plots in the park in an area that also overlaps with Chesapeake & Ohio Canal National Historical Park.

Harpers Ferry National Historical Park Environment: Central Appalachian-Allegheny Calcareous Riverscour Prairie develops on bedrock outcrops along the Shenandoah and Potomac rivers. This community occupies frequently flooded rocky areas on the active channel shelf. Potomac drainage stands are associated with stable outcrop / boulder habitats versus more ephemeral cobble bars. Soil material is often restricted to the narrow interstices of tightly packed boulders, or to small crevices in bedrock exposures.

Global Environment: Stands occur along high-gradient sections of major rivers, such as in gorges and along the fall-line. They occupy rocky areas within the active channel shelf subject to frequent high-energy flooding, at an intermediate level above the low-water level and the bank-full level. These positions are prone to dramatic restructuring by large floods and patches of this association may be ephemeral. Flooding and scouring are powerful and ecologically important abrasive forces that shape the physiognomy and composition of this association. Soils are rapidly drained Psamments, usually with neutral to high pH. These coarse-textured substrates are potentially well-drained, but fluvial topography and a high water table often result in a mixture of well-drained and poorly drained microsites. Occurrences on flat bedrock often develop scoured out potholes which hold flood and rain water, and vegetation is confined to cracks and sediment accumulations. Soil material is restricted to the narrow interstices of tightly packed boulders, or to small crevices in bedrock exposures. However, along the Greenbrier and New rivers in West Virginia, stands of this type occupy cobble bars rather than stabilized outcrops and boulder deposits.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: This community is defined by *Andropogon gerardii* (big bluestem) in the herb layer. However, stands can have a very dense (80+% cover) short-shrub layer (1-6 m tall) of mixed hardwood saplings including *Betula nigra* (river birch), *Fraxinus pennsylvanica* (green ash), *Quercus bicolor* (swamp white oak), and *Quercus macrocarpa* (bur oak) (Maryland state-critically imperiled), along with saplings of other tree species. The more common plants in the herbaceous layer (20-60%) include *Andropogon gerardii* (big bluestem), *Baptisia australis var. australis* (blue wild indigo), *Carex emoryi* (Emory's sedge), *Cerastium arvense var. velutinum* (field chickweed), *Chasmanthium latifolium* (Indian woodoats), *Cornus amomum* (silky dogwood), *Conoclinium coelestinum* (blue mistflower), *Eleocharis compressa* (flatstem spikerush), *Elymus riparius* (riverbank wildrye), *Eupatorium serotinum* (lateflowering thoroughwort), *Lespedeza procumbens* (trailing lespedeza), *Lysimachia ciliata* (fringed loosestrife), *Myosotis verna* (spring forget-me-not), *Panicum virgatum var. virgatum* (switchgrass), *Solidago gigantea* (giant goldenrod), *Spartina pectinata* (prairie cordgrass), *Symphyotrichum pilosum var. pringlei*, *Toxicodendron radicans* (eastern poison-ivy), and *Tripsacum dactyloides*. More than 30 exotic plant species were reported from sampled stands. This community also supports Maryland state-vulnerable *Zizia aurea* (golden zizia).

George Washington Memorial Parkway Vegetation: This community is defined by *Andropogon gerardii* (big bluestem) in the herb layer. However, stands can have a dense short-shrub layer (1-6 m tall) of mixed hardwood saplings including *Betula nigra* (river birch), *Fraxinus pennsylvanica* (green ash), *Diospyros virginiana* (common persimmon), *Quercus bicolor* (swamp white oak), and *Quercus macrocarpa* (bur oak), along with saplings of other tree species. The more common plants in the herbaceous layer (20-60%) include *Andropogon gerardii* (big bluestem), *Panicum virgatum var. virgatum* (switchgrass), *Baptisia australis var. australis* (blue wild indigo), *Chasmanthium latifolium* (Indian woodoats), *Eleocharis compressa* (flatstem spikerush), *Eupatorium serotinum* and a number of invasive exotic plants. This community was sampled at three locations within the park, but it is more widespread in adjacent areas along the Potomac River.

Harpers Ferry National Historical Park Vegetation: This herbaceous vegetation is characterized by the graminoids *Andropogon gerardii* (big bluestem) and *Panicum virgatum* (switchgrass) and the forb *Baptisia australis* (blue wild indigo). Other associated graminoids and forbs include *Chamaecrista fasciculata* (partridge pea), *Euphorbia corollata* (flowering spurge), *Paronychia virginica* (yellow nailwort), *Sorghastrum nutans* (Indiangrass), and *Sporobolus clandestinus* (rough dropseed). Despite its name, this type is usually not strictly herbaceous and may contain a variety of flood-stunted shrubs and small trees interspersed with herbaceous patches. Woody species include *Celtis tenuifolia* (dwarf hackberry), *Fraxinus pennsylvanica* (green ash), *Cornus amomum* (silky dogwood), *Ulmus americana* (American elm), and *Rhus glabra* (smooth sumac). The type has moderate species richness. This is an uncommon community in the park, occurring in very small patches.
Global Vegetation: This community is characterized by a luxuriant growth of the robust grasses *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass), *Panicum virgatum* (switchgrass), and *Spartina pectinata* (prairie cordgrass), which resembles prairie vegetation. *Tripsacum dactyloides* (eastern gamagrass) may also occur. Many of the forbs are also typical of prairies. Characteristic species include *Baptisia australis* (blue wild indigo), *Allium cernuum* (nodding onion), *Aristida purpurascens* (arrowfeather threeawn), *Bidens frondosa* (devil's beggarticks), *Chasmanthium latifolium* (Indian woodoats), *Clematis viorna* (vasevine), *Eleocharis compressa* (flatstem spikerush), *Conoclinium coelestinum* (blue mistflower), *Eupatorium serotinum* (lateflowering thoroughwort), *Lespedeza violacea* (violet lespedeza), *Packera aurea* (golden ragwort), *Physostegia virginiana* (obedient plant), *Pycnanthemum virginianum* (Virginia mountainmint), *Solidago rupestris* (rock goldenrod), *Teucrium canadense* (Canada germander), *Veronicastrum virginicum* (Culver's root), *Zizia trifoliata* (meadow alexanders), and *Zizia aurea* (golden zizia). Additional herbs with high cover and/or constancy in some areas include *Apocynum cannabinum* (Indianhemp), *Coreopsis tripteris* (tall tickseed), *Cyperus strigosus* (strawcolored flatsedge), *Eutrochium fistulosum* (trumpetweed), *Helianthus occidentalis ssp. occidentalis* (fewleaf sunflower), *Justicia americana* (American water-willow), *Lobelia cardinalis* (cardinalflower), *Ludwigia alternifolia* (seedbox), *Potentilla simplex* (common cinquefoil), *Pycnanthemum torrei* (Torrey's mountainmint), *Rhynchospora capitellata* (brownish beaksedge), *Rhynchospora recognita* (globe beaksedge), *Solidago juncea* (early goldenrod), *Symphyotrichum laeve* (smooth blue aster), and *Viola cucullata* (marsh blue violet). There may be low cover by trees, which are usually short and flood-battered, including *Betula nigra* (river birch), *Chionanthus virginicus* (white fringetree), *Diospyros virginiana* (common persimmon), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). Cover in the shrub layer is likewise low and includes short individuals of the tree and shrub species, including *Alnus serrulata* (hazel alder), *Cephalanthus occidentalis* (common buttonbush), *Cornus amomum* (silky dogwood), *Hypericum prolificum* (shrubby St. Johnswort), and *Salix caroliniana* (coastal plain willow). Low-growing vines include *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison-ivy), and *Vitis rupestris* (sand grape). In the Potomac River drainage, *Solidago simplex var. racemosa* (Rand's goldenrod), *Helianthus occidentalis* (fewleaf sunflower), *Cerastium arvense var. velutinum* (field chickweed), and *Ceanothus herbaceus* (Jersey tea) are noteworthy components (Lea 2000). In the James River drainage, *Orbexilum pedunculatum var. psoralioides* (Sampson's snakeroot), *Silphium trifoliatum* (whorled rosinweed), *Solidago speciosa* (showy goldenrod), and *Vicia americana* (American vetch) are associated. Vascular plant species richness of sampled plots (Virginia and West Virginia sample sets) averages 43-56 taxa per 100 m2.
Global Dynamics: Flash floods actively scour the floodplain, keeping the vegetation open. Available data suggest that the differences between this community and related types may be more related to flooding frequency/intensity and/or substrate chemistry than to topography (i.e., outcrop vs. cobble bar).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Herb (field)	Graminoid	*Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Andropogon gerardii* (big bluestem), *Baptisia australis* var. *australis* (blue wild indigo)
George Washington Memorial Parkway: *Andropogon gerardii* (big bluestem), *Baptisia australis* var. *australis* (blue wild indigo), *Panicum virgatum* var. *virgatum* (switchgrass)
Harpers Ferry National Historical Park: *Andropogon gerardii* (big bluestem), *Baptisia australis* (blue wild indigo), *Panicum virgatum* (switchgrass)

Global: *Andropogon gerardii* (big bluestem), *Apocynum cannabinum* (Indianhemp), *Baptisia australis* (blue wild indigo), *Betula nigra* (river birch), *Cornus amomum* (silky dogwood), *Desmodium glabellum* (Dillenius' ticktrefoil), *Lespedeza frutescens* (shrubby lespedeza), *Packera aurea* (golden ragwort), *Panicum virgatum* (switchgrass), *Physostegia virginiana* (obedient plant), *Sorghastrum nutans* (Indiangrass), *Spartina pectinata* (prairie cordgrass)

Other Noteworthy Species

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Baptisia australis* var. *australis* (blue wild indigo, G5T3T4), *Carex emoryi* (Emory's sedge, G5, MD-imperiled), *Quercus macrocarpa* (bur oak, G5, MD-critically imperiled), *Zizia aurea* (golden zizia, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Ampelopsis brevipedunculata* (Amur peppervine, Medium/Low), *Arabidopsis thaliana* (mouseear cress), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Arthraxon hispidus* (small carpgrass, Medium/Low), *Calystegia sepium* (hedge false bindweed), *Commelina communis* (Asiatic dayflower), *Daucus carota* (Queen Anne's lace, Low), *Dianthus armeria* (Deptford pink, Low/Insignificant), *Digitaria ischaemum* (smooth crabgrass), *Elaeagnus umbellata* var. *parvifolia* (autumn olive), *Glechoma hederacea* (ground ivy, Low), *Hemerocallis fulva* (orange daylily, Medium/Low), *Ipomoea hederacea* (ivyleaf morning-glory), *Lespedeza cuneata* (sericea lespedeza, Medium), *Leucojum aestivum*, *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Melilotus officinalis* (yellow sweetclover, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Phleum pratense* (timothy, Medium), *Plantago major* (common plantain), *Poa pratensis* (Kentucky bluegrass, Medium), *Polygonum cespitosum* var. *longisetum* (oriental ladysthumb), *Ranunculus bulbosus* (St. Anthony's turnip), *Ranunculus ficaria* (fig buttercup, Medium/Low), *Rorippa sylvestris* (creeping yellowcress, Medium/Low), *Rumex crispus* (curly dock, Low/Insignificant), *Stellaria media* (common chickweed, Low), *Trifolium pratense* (red clover, Low/Insignificant), *Vicia sativa* ssp. *nigra* (garden vetch)

George Washington Memorial Parkway: Vulnerable Plants: *Baptisia australis* var. *australis* (blue wild indigo, G5T3T4); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Arthraxon hispidus* (small carpgrass, Medium/Low), *Daucus carota* (Queen Anne's lace, Low), *Lysimachia nummularia* (creeping jenny, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Poa pratensis* (Kentucky bluegrass, Medium), *Rorippa sylvestris* (creeping yellowcress, Medium/Low), *Rumex crispus* (curly dock, Low/Insignificant)

Harpers Ferry National Historical Park: Vulnerable Plants: *Baptisia australis* var. *australis* (blue wild indigo, G5T3T4, vulnerable)

Global: Vulnerable Plants: *Baptisia australis* var. *australis* (blue wild indigo, G5T3T4), *Pycnanthemum torrei* (Torrey's mountainmint, G2), *Spartina pectinata* (prairie cordgrass, G5, VA state-rare), *Vicia americana* (American vetch, G5, VA state-rare), *Vitis rupestris* (sand grape, G3)

Conservation Status Rank

Global Rank & Reasons: G3 (20-May-2011). There are probably fewer than 100 occurrences of this community rangewide, depending on how an occurrence is defined. It is known from Maryland, the District of Columbia, and Virginia along the Potomac River, from the James River, Shenandoah River, and various tributaries in Virginia, and from scattered patches along about 50 miles along the Greenbrier River in West Virginia. It is also reported from the Delaware River in Pennsylvania and may also occur in Ohio. This community is threatened by invasion of exotic weeds, especially *Sorghum halepense* (Johnsongrass), *Centaurea stoebe ssp. micranthos* (spotted knapweed), and *Lythrum salicaria* (purple loosestrife).

Related Concepts

Global Similar Types:

- *(Betula nigra, Ilex verticillata) / Andropogon gerardii - Solidago simplex var. racemosa* Riverscour Wet Meadow (CEGL006623)
- *(Hypericum prolificum, Eubotrys racemosa) / Schizachyrium scoparium - Solidago simplex var. racemosa - Ionactis linariifolius* Riverscour Sparse Vegetation (CEGL006491)
- *(Salix caroliniana, Rhododendron arborescens) / Andropogon gerardii - Baptisia australis - (Solidago simplex ssp. randii)* Riverscour Wet Meadow (CEGL008471)
- (*Salix* spp.) / *Andropogon gerardii - Panicum virgatum - Salvia azurea* Cahaba Riverscour Wet Meadow (CEGL004149)

- *Fraxinus americana / Andropogon gerardii - Sorghastrum nutans - Schizachyrium scoparium - Pycnanthemum tenuifolium* Riverscour Wet Meadow (CEGL006478) on less frequently flooded, terraced or sloping outcrops above the channel shelf.
- *Panicum virgatum - Andropogon gerardii* Gravel Riverscour Wet Meadow (CEGL006477) on gravel and cobble depositional bars along lower-gradient rivershores.
- *Salix* spp. / *Andropogon gerardii - Sorghastrum nutans* Riverscour Wet Meadow (CEGL005175) is found in the Interior Low Plateau.
- Southern Appalachian Bedrock Riverscour Vegetation (CEGL004033)

Global Related Concepts:

- *Andropogon gerardii - Baptisia australis* riparian herbaceous vegetation (Vanderhorst 2001b) =
- *Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation (Faber-Langendoen 2001) =
- *Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation (Fleming and Taverna 2006) =
- *Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation [Big Bluestem - Blue Wild Indigo Riverscour Prairie] (Vanderhorst 2017b) =
- *Andropogon gerardii - Panicum virgatum - Rhus radicans - Baptisia australis* Association (Rawinski et al. 1996) =
- *Cornus amomum / Andropogon gerardii - Panicum virgatum - Baptisia australis* Shrub Herbaceous Vegetation (Fleming and Coulling 2001) =
- *Fraxinus pennsylvanica / Andropogon gerardii - Panicum virgatum - Baptisia australis* Wooded Herbaceous Vegetation (Lea 2000) =
- Riverwash Grasslands (*Baptisia australis - Lespedeza violacea - Chasmanthium latifolium* Herbaceous Vegetation) (Grossman et al. 1994) >
- Willow - Indian grass riverine shrubland (Perles et al. 2004) >

CLASSIFICATION

Status: Standard

Classification Confidence: 1 - Strong

Chesapeake & Ohio Canal National Historical Park Classification Comments: See Global Classification Comments. Central Appalachian-Allegheny Calcareous Riverscour Prairie is also referred to as Fall-Line Riverwash Bedrock Prairie. This association is mapped as Riverside Rock Outcrop and Prairie Map Class (COMP_RROP), which includes four associations at this park, Central Appalachian-Allegheny Calcareous Riverscour Prairie (CEGL006283), Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478), Piedmont Riverscour Shrubland (CEGL006484), and Potomac Gorge Riverside Outcrop Barrens (CEGL006491).

George Washington Memorial Parkway Classification Comments: See Global Classification Comments. Central Appalachian-Allegheny Calcareous Riverscour Prairie is also referred to as Fall-Line Riverwash Bedrock Prairie. This association is mapped as Riverside Rock Outcrop and Prairie Map Class (COMP_RROP), which includes four associations at this park, Central Appalachian-Allegheny Calcareous Riverscour Prairie (CEGL006283), Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478), Piedmont Riverscour Shrubland (CEGL006484), and Potomac Gorge Riverside Outcrop Barrens (CEGL006491).

Harpers Ferry National Historical Park Classification Comments: Central Appalachian-Allegheny Calcareous Riverscour Prairie is also referred to as Fall-Line Riverwash Bedrock Prairie. This is an easily distinguished type for the park as it is the only graminoid-dominated vegetation that occurs along the Shenandoah and Potomac river channels. All other rivershore communities are dominated by woody species or forbs. This association is mapped as Riverside Rock Outcrop and Prairie Map Class (COMP_RROP), which includes only this association, in addition to small patches of undescribed vegetation in the same environment at this park.

Global Classification Comments: The distinctions between this community type and ~*(Salix caroliniana*, *Rhododendron arborescens) / Andropogon gerardii - Baptisia australis - (Solidago simplex ssp. randii)* Riverscour Wet Meadow (CEGL008471)$$ seem quite artificial and further study should be undertaken to determine whether these merely represent geographic subtypes of a single association. The effect of merging this type with ~*Andropogon gerardii - Panicum virgatum - Baptisia australis* Riverscour Wet Meadow (CEGL006283)$$ would likely have no effect on the Global Conservation Status Rank, as CEGL008471 is currently ranked G2Q. Both of these types also appear to be similar to ~*Salix* (willow) spp. / *Andropogon gerardii - Sorghastrum nutans* Riverscour Wet Meadow (CEGL005175)$$, but that type is found in the Interior Low Plateau region. In the Central

Appalachian region, this community type is found predominantly on Western Allegheny Mountains (M221Be + M221Bd, Gauley M221Ca dammed).

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This association was sampled with plots at Dam 5 (Canal mile 106 - 107) in the High Island area (Canal mile 4-5). At Chesapeake & Ohio Canal, COMP_RROP is described as any combination of shrublands, prairies, and barrens occurring on riverside rock outcrops and eroded bedrock terraces in association with high-gradient stretches of major rivers. All communities in this map class are influenced and shaped by major flood scouring events, although flood return intervals vary widely. Communities typically occur in a mosaic of patches too small to map separately. In NCR, this map class is restricted primarily to the Potomac Gorge, with a few outliers at Harpers Ferry. Riverside Rock Outcrop and Prairie (COMP_RROP) is documented with many plots.
George Washington Memorial Parkway Range: This community was sampled three times within the park boundary on the MD side of the Potomac in the vicinity of Little Falls Branch. It is more common in adjacent areas of the Chesapeake & Ohio Canal National Historical Park. It is mapped as Riverside Rock Outcrop and Prairie (COMP_RROP).
Harpers Ferry National Historical Park Range: Central Appalachian-Allegheny Calcareous Riverscour Prairie occurs in small isolated patches on channel shelf bedrock outcrops in high-gradient stretches of the Potomac and Shenandoah rivers.
Global Range: This community is found in the east-central United States, from Pennsylvania, Maryland, West Virginia, and Virginia, and possibly Ohio.
Nations: US
States/Provinces: MD:S3, OH:SNR, PA:SNR, VA:S2, WV:S1
TNC Ecoregions: 49:C, 50:C, 59:C, 60:C, 61:C
USFS Ecoregions (2007): 211Fa:CCP, 211Fb:CCC, 221Am:CCC, 221Da:CCC, 221Db:CCC, 221De:CCC, 221Ea:CCP, 231Ib:CCC, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Bd:CCC, M221Be:CCC, M221Cb:CCC, M221Da:CCC, M221Db:CC?
Federal Lands: NPS (C&O Canal, George Washington Parkway, Harpers Ferry, New River Gorge); USFS (Jefferson)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (9 plots): CHOH.219, CHOH.647, POTO_005.04, POTO_005.08, POTO_005.09, POTO_005.11, POTO_006.02, POTO_006.05, POTO_006.06.
George Washington Memorial Parkway Plots: CHOH 219, POTO_006.02, POTO_006.05
Harpers Ferry National Historical Park Plots: None.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo and C.W. Nordman
George Washington Memorial Parkway Description Author(s): J. Teague
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Global Description Author(s): L.A. Sneddon, G. Fleming, P. Coulling and S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Faber-Langendoen 2001, Fike 1999, Fleming and Coulling 2001, Fleming and Taverna 2006, Fleming et al. 2017, Grossman et al. 1994, Harrison 2004, Harrison 2011, Lea 2000, Lea 2004, Perles et al. 2004, Rawinski 1988c, Rawinski et al. 1996, Vanderhorst 2000b, Vanderhorst 2001a, Vanderhorst 2001b, Vanderhorst 2017b, Vanderhorst and Streets 2006, Vanderhorst et al. 2007, WVNHP unpubl. data, Zimmerman 2011a, Zimmerman et al. 2012

[CEGL006478] *Fraxinus americana / Andropogon gerardii - Sorghastrum nutans - Schizachyrium scoparium - Pycnanthemum tenuifolium* Riverscour Wet Meadow

Translated Name: **White Ash / Big Bluestem - Indiangrass - Little Bluestem - Narrowleaf Mountainmint Riverscour Wet Meadow**
Common Name: **Piedmont-Central Appalachian Riverside Outcrop Prairie**

USNVC CLASSIFICATION

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Riverscour Vegetation (M881)
Group	Central Interior-Appalachian Riverscour Barrens & Prairie (G753)

Alliance *Andropogon gerardii - Sorghastrum nutans* Appalachian Gravel Riverscour Alliance (A2069)

ELEMENT CONCEPT

Global Summary: This association is known only from scattered sites along the Potomac River in Maryland and Virginia, and possibly the Shenandoah River in Virginia. The type occupies steeply sloping riverside outcrops and eroded bedrock terraces along high-gradient, rocky river reaches where depositional features are very poorly developed. These habitats are exposed to considerable scouring during major floods and are seasonally xeric. Bedrock parent material of sites in the fall-line gorge of the Potomac River includes metagraywacke and schist, with local mafic and ultramafic intrusive bodies. An additional site on the upper Potomac (Allegany County, Maryland) is on shale, and another potential site on the Shenandoah River is located on an exposure of dolomite. This vegetation occupies sites ranging from about 2 to 15 m above mean water level, and the flooding-return interval has been estimated at 2.5 to 7 years. Fifteen to 90% of the substrate consists of exposed bedrock, and soils are sandy loams or loamy sands with relatively high base status. Stands are dominated by warm-season grasses, with moderate to locally dense total herbaceous cover. *Andropogon gerardii* (big bluestem) is the most abundant species, with *Sorghastrum nutans* (Indiangrass), *Schizachyrium scoparium* (little bluestem), and *Panicum virgatum* (switchgrass) each occurring constantly and achieving codominance in a subset of stands. Other characteristic, but less constant, graminoid associates include *Sporobolus clandestinus* (rough dropseed), *Aristida purpurascens* (arrowfeather threeawn), *Dichanthelium depauperatum* (starved panicgrass), *Dichanthelium dichotomum* (cypress panicgrass), *Chasmanthium latifolium* (Indian woodoats), *Danthonia spicata* (poverty oatgrass), *Eragrostis spectabilis* (purple lovegrass), *Tripsacum dactyloides* (eastern gamagrass), *Scleria triglomerata* (whip nutrush), and *Muhlenbergia capillaris* (hairawn muhly). The type also contains a number of characteristic xerophytic forbs, the most constant of which are *Pycnanthemum tenuifolium* (narrowleaf mountainmint), *Solidago simplex var. racemosa* (Rand's goldenrod), *Symphyotrichum patens var. patens* (late purple aster), *Euphorbia corollata* (flowering spurge), *Allium cernuum* (nodding onion), *Cerastium arvense* (field chickweed), *Phlox subulata* (moss phlox), *Coreopsis tripteris* (tall tickseed), *Ionactis linariifolius* (flaxleaf whitetop aster), *Lespedeza virginica* (slender lespedeza), *Potentilla canadensis* (dwarf cinquefoil), *Veronicastrum virginicum* (Culver's root), *Lathyrus venosus* (veiny pea), and *Helianthus divaricatus* (woodland sunflower). Other noteworthy herbs occurring less frequently include *Asclepias verticillata* (whorled milkweed), *Cheilanthes lanosa* (hairy lipfern), *Dichanthelium laxiflorum* (openflower rosette grass), *Eupatorium hyssopifolium* (hyssopleaf thoroughwort) (two vars.), *Galactia volubilis* (downy milkpea), *Helianthus occidentalis ssp. occidentalis* (fewleaf sunflower), *Lespedeza capitata* (roundhead lespedeza), *Lespedeza violacea* (violet lespedeza), *Liatris spicata var. spicata* (dense blazing star), *Onosmodium virginianum* (wild Job's tears), *Paronychia virginica* (yellow nailwort), *Physostegia virginiana* (obedient plant), *Selaginella rupestris* (northern selaginella), *Solidago nemoralis* (gray goldenrod), *Stylosanthes biflora* (sidebeak pencilflower), and *Tridens flavus* (purpletop tridens). Scattered, stunted, flood-damaged trees and shrubs occasionally achieve 25% aggregate cover in an individual 400-m2 plot. Species richness of this community is typically high to exceptional, averaging 88 taxa per 400 m2 (range 51 to 138 taxa) in 16 plots.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This big bluestem - switchgrass herbaceous vegetation was sampled once in the Ridge and Valley section of the park. The site is a very steep, temporarily flooded lower sideslope. The soil is rapidly drained sandy loam. Most locations are in the Piedmont along the Potomac Gorge at Great Falls. These are on steeply sloping riverside outcrops and eroded bedrock terraces along high-gradient, rocky reaches of the Potomac River where depositional features are very poorly developed. These habitats are exposed to considerable scouring during major floods and are seasonally very dry. Bedrock parent material of sites in the Potomac Gorge includes metagraywacke and schist, with local mafic and ultramafic intrusive bodies. The unvegetated surface is dominated by exposed bedrock and large rocks with small amounts of leaf litter (6%), wood (1%), and bare soil (4%). Evidence of disturbance includes the impacts of flood scour and the presence of exotic species.

George Washington Memorial Parkway Environment: Piedmont-Central Appalachian Riverside Outcrop Prairie is a small-patch community that is restricted to the sideslopes and benches of the bedrock terraces in Mather Gorge, at Great Falls Park and on private land (Madeira School) downstream. Elevation varies from about 2 to 17 m (7-56 feet) above the channel shelf. Sites are often slightly concave, or locally so, with high overall microtopographic diversity, and >80% surface cover of bedrock and boulders. Small depressions and ledges where soils or water can accumulate are characteristic. Shallow, spotty soils and high bedrock cover probably keep actual site moisture in the xeric range. High-velocity, scouring floods with an average return interval of 2.5 to 7 years (Lea 2000) also impact the sites. Soils are probably all flood-deposited or colluvial, consisting mostly of coarse sand.

However, some deposits of deeper, loamy material are found at the larger sites. Samples collected from plots are all 100% base-saturated, with much higher pH (mean = 6.5), calcium, and magnesium, and much lower aluminum than soils of the associated bedrock terrace forest and woodland communities.

Global Environment: The type occupies steeply sloping riverside outcrops and eroded bedrock terraces along high-gradient, rocky river reaches where depositional features are very poorly developed. These habitats are exposed to considerable scouring during major floods and are seasonally xeric. Bedrock parent material of sites in the fall-line gorge of the Potomac River includes metagraywacke and schist, with local mafic and ultramafic intrusive bodies. An additional site on the upper Potomac (Allegany Co., MD) is on shale, and another potential site on the Shenandoah River is located on an exposure of dolomite. Lea (2000) estimated that sites on the Maryland side of the Potomac Gorge had a mean flood-return interval of 2.5 to 7 years, with 15 to 40% (up to 85%) of ground cover consisting of exposed rock and soils consisting of shallow (usually <10 cm), sandy loams or loamy sands. On the Virginia side of the Potomac Gorge, this vegetation occupies sites ranging from about 2 to 15 m above mean water level, with 15 to 90% of the substrate consisting of bedrock, and soils with moderately high pH and calcium levels. Some sites have very small, wet inclusions developed in bedrock depressions with impeded drainage.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: This community is defined by the sparse (20% cover) to locally dense herbaceous layer dominated by *Andropogon gerardii* (big bluestem) and *Panicum virgatum* (switchgrass) with *Sorghastrum nutans* (Indiangrass), and *Schizachyrium scoparium* each having dominance in some stands. Other characteristic, but less constant, graminoid associates include *Sporobolus clandestinus* (rough dropseed), *Aristida purpurascens* (arrowfeather threeawn), *Dichanthelium depauperatum* (starved panicgrass), *Dichanthelium villosissimum var. villosissimum* (whitehair rosette grass), *Danthonia spicata* (poverty oatgrass), *Eragrostis spectabilis* (purple lovegrass), and *Tripsacum dactyloides* (eastern gamagrass). The type also contains a number of characteristic forbs, including *Pycnanthemum tenuifolium* (narrowleaf mountainmint), *Symphyotrichum patens var. patens* (late purple aster), *Eupatorium hyssopifolium var. laciniatum* , *Euphorbia corollata* (flowering spurge), *Cerastium arvense var. velutinum* (field chickweed), *Phlox subulata* (moss phlox), *Lathyrus venosus* (veiny pea), and *Helianthus divaricatus* (woodland sunflower). In addition, a sparse (20%) short-shrub layer (1-6 m tall) can include *Carpinus caroliniana* (American hornbeam), *Carya glabra* (pignut hickory), *Celtis tenuifolia*, *Cercis canadensis var. canadensis* (eastern redbud), *Diospyros virginiana* , *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Juniperus virginiana* (eastern red-cedar), *Quercus stellata* (post oak), *Quercus rubra* (northern red oak), *Robinia pseudoacacia* (black locust), and *Viburnum prunifolium* . The herbaceous layer is sparse but diverse, including some exotic species. This community also supports Maryland state-critically imperiled *Paronychia virginica* (yellow nailwort) and state-imperiled *Sporobolus clandestinus* (rough dropseed).

George Washington Memorial Parkway Vegetation: This community is characterized by prairie-like, graminoid-dominated herbaceous vegetation with scrubby to moderate-sized trees (<10 m tall) and shrub patches scattered in the stands. Woody plants, which contribute about 25% mean cover to sampled stands, include both upland and floodplain species, including *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Robinia pseudoacacia* (black locust), *Ulmus americana* (American elm), *Quercus bicolor* (swamp white oak), *Carya glabra* (pignut hickory), *Carpinus caroliniana* (American hornbeam), *Ulmus rubra* (slippery elm), *Quercus rubra* (northern red oak), and *Quercus stellata* (post oak). True shrubs such as *Chionanthus virginicus* (white fringetree), *Physocarpus opulifolius var. opulifolius* (common ninebark), and *Hypericum prolificum* (shrubby St. Johnswort) occasionally achieve covers of 5% but are not highly constant. *Toxicodendron radicans* (eastern poison-ivy) is a constant, low woody plant.

The herb layer is patchy because of the high rock cover, but locally dense where soil is present (43% mean stratum cover). The warm-season grasses *Andropogon gerardii* (big bluestem) (usually most abundant), *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), and *Panicum virgatum var. virgatum* (switchgrass), along with the forbs *Pycnanthemum tenuifolium* (narrowleaf mountainmint), *Veronicastrum virginicum* (Culver's root), *Coreopsis tripteris* (tall tickseed), *Packera paupercula* (balsam groundsel), *Allium cernuum* (nodding onion), *Symphyotrichum patens var. patens* (late purple aster) and *Phlox subulata* (moss phlox) form an assemblage of constant species that are most characteristic of the George Washington Memorial Parkway stands. Associated herbaceous species are extremely diverse and variable from stand to stand; some less constant species that are particularly diagnostic include *Baptisia australis var. australis* (blue wild indigo), *Cerastium arvense ssp. arvense* (field chickweed), *Lathyrus venosus* (veiny pea), *Lespedeza violacea* (violet lespedeza), *Helianthus occidentalis ssp. occidentalis* (fewleaf sunflower), *Lespedeza virginica* (slender lespedeza), *Sporobolus clandestinus* (rough dropseed), *Lespedeza capitata* (roundhead lespedeza), *Solidago nemoralis* (gray goldenrod), and *Tripsacum dactyloides* (eastern gamagrass). A number of additional herbaceous and woody species, including

Liatris spicata var. spicata (dense blazing star), *Salix humilis var. humilis* (prairie willow), *Scleria triglomerata* (whip nutrush), *Spiraea alba var. latifolia* (white meadowsweet), *Physostegia virginiana ssp. virginiana* (obedient plant), and *Trautvetteria caroliniensis* (Carolina bugbane), are not found in any other community in the George Washington Memorial Parkway. Total species richness ranges from 51 to 110 taxa per 400 square meters.
Global Vegetation: The composition is dominated by warm-season grasses, with moderate to locally dense total herbaceous cover. *Andropogon gerardii* (big bluestem) is the most abundant species, with *Sorghastrum nutans* (Indiangrass), *Schizachyrium scoparium* (little bluestem), and *Panicum virgatum* (switchgrass) each occurring constantly and achieving codominance in a subset of stands. Other characteristic, but less constant, graminoid associates include *Sporobolus clandestinus* (rough dropseed), *Aristida purpurascens* (arrowfeather threeawn), *Dichanthelium depauperatum* (starved panicgrass), *Dichanthelium dichotomum* (cypress panicgrass), *Chasmanthium latifolium* (Indian woodoats), *Danthonia spicata* (poverty oatgrass), *Eragrostis spectabilis* (purple lovegrass), *Tripsacum dactyloides* (eastern gamagrass), *Scleria triglomerata* (whip nutrush), and *Muhlenbergia capillaris* (hairawn muhly). The type also contains a number of characteristic xerophytic forbs, the most constant of which are *Pycnanthemum tenuifolium* (narrowleaf mountainmint), *Solidago simplex var. racemosa* (Rand's goldenrod), *Symphyotrichum patens var. patens* (late purple aster), *Euphorbia corollata* (flowering spurge), *Allium cernuum* (nodding onion), *Cerastium arvense* (field chickweed), *Phlox subulata* (moss phlox), *Coreopsis tripteris* (tall tickseed), *Ionactis linariifolius* (flaxleaf whitetop aster), *Lespedeza virginica* (slender lespedeza), *Potentilla canadensis* (dwarf cinquefoil), *Veronicastrum virginicum* (Culver's root), *Lathyrus venosus* (veiny pea), and *Helianthus divaricatus* (woodland sunflower). Other noteworthy herbs occurring less frequently include *Asclepias verticillata* (whorled milkweed), *Cheilanthes lanosa* (hairy lipfern), *Dichanthelium laxiflorum* (openflower rosette grass), *Eupatorium hyssopifolium* (hyssopleaf thoroughwort) (two vars.), *Galactia volubilis* (downy milkpea), *Helianthus occidentalis ssp. occidentalis* (fewleaf sunflower), *Lespedeza capitata* (roundhead lespedeza), *Lespedeza violacea* (violet lespedeza), *Liatris spicata var. spicata* (dense blazing star), *Onosmodium virginianum* (wild Job's tears), *Paronychia virginica* (yellow nailwort), *Physostegia virginiana* (obedient plant), *Selaginella rupestris* (northern selaginella), *Solidago nemoralis* (gray goldenrod), *Stylosanthes biflora* (sidebeak pencilflower), and *Tridens flavus* (purpletop tridens). Scattered, stunted, flood-damaged trees and shrubs occasionally achieve 25% aggregate cover in an individual 400-m2 plot. The most frequent (>50% constancy) and abundant (>1% mean cover) of these woody species are *Fraxinus americana* (white ash), *Robinia pseudoacacia* (black locust), *Fraxinus pennsylvanica* (green ash), *Hypericum prolificum* (shrubby St. Johnswort), *Viburnum prunifolium* (blackhaw), *Rubus flagellaris* (northern dewberry), *Carpinus caroliniana* (American hornbeam), *Quercus rubra* (northern red oak), *Diospyros virginiana* (common persimmon), *Quercus stellata* (post oak), and *Carya glabra* (pignut hickory). Small wet depressions contain localized populations of wetland species such as *Carex straminea* (eastern straw sedge), *Eleocharis compressa* (flatstem spikerush), *Juncus dichotomus* (forked rush), *Juncus scirpoides* (needlepod rush), *Ludwigia alternifolia* (seedbox), *Mecardonia acuminata* (axilflower), *Rhynchospora capitellata* (brownish beaksedge), *Scirpus pendulus* (rufous bulrush), and *Trautvetteria caroliniensis* (Carolina bugbane). Species richness of this community is typically high to exceptional, averaging 88 taxa per 400 m2 (range 51 to 138 taxa) in 16 plots.

MOST ABUNDANT SPECIES

Global

Stratum	**Lifeform**	**Species**
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana* (white ash)
Herb (field)	Graminoid	*Andropogon gerardii* (big bluestem), *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Andropogon gerardii* (big bluestem), *Panicum virgatum* (switchgrass), *Sorghastrum nutans* (Indiangrass)
George Washington Memorial Parkway: *Andropogon gerardii* (big bluestem), *Panicum virgatum* var. *virgatum* (switchgrass), *Pycnanthemum tenuifolium* (narrowleaf mountainmint), *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), *Veronicastrum virginicum* (Culver's root)
Global: *Andropogon gerardii* (big bluestem), *Fraxinus americana* (white ash), *Pycnanthemum tenuifolium* (narrowleaf mountainmint), *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Paronychia virginica* (yellow nailwort, G4, MD-critically imperiled), *Sporobolus clandestinus* (rough dropseed, G5, MD-imperiled);

Invasive/Exotic Plants: *Allium vineale* (wild garlic, Medium/Insignificant), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Bromus sterilis* (poverty brome, Medium/Low), *Centaurea stoebe* ssp. *micranthos* (spotted knapweed, High/Medium), *Lespedeza cuneata* (sericea lespedeza, Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Sedum acre* (goldmoss stonecrop), *Setaria faberi* (Japanese bristlegrass), *Verbascum thapsus* (common mullein, Medium)
George Washington Memorial Parkway: Vulnerable Plants: *Baptisia australis* var. *australis* (blue wild indigo, G5T3T4, VA state-vulnerable), *Carex straminea* (eastern straw sedge, G5, VA state-critically imperiled), *Cerastium arvense* var. *velutinum* (field chickweed, G5T4?, VA state-imperiled), *Cornus obliqua* (silky dogwood, G5, VA state-imperiled), *Eleocharis compressa* (flatstem spikerush, G4, VA state-imperiled), *Helianthus occidentalis* ssp. *occidentalis* (fewleaf sunflower, G5T5, VA state-critically imperiled), *Onosmodium virginianum* (wild Job's tears, G4, VA state-imperiled), *Packera paupercula* (balsam groundsel, G5, VA state-vulnerable), *Rhododendron arborescens* (smooth azalea, G4G5, VA state-imperiled), *Solidago rupestris* (rock goldenrod, G4?, VA state-critically imperiled), *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?, VA state-critically imperiled), *Spartina pectinata* (prairie cordgrass, G5, VA state-imperiled); **Invasive/Exotic Plants**: *Lespedeza cuneata* (sericea lespedeza, Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium)
Global: Vulnerable Plants: *Baptisia australis* var. *australis* (blue wild indigo, G5T3T4), *Carex straminea* (eastern straw sedge, G5, MD & VA state-rare), *Eleocharis compressa* (flatstem spikerush, G4, MD & VA state-rare), *Helianthus occidentalis* ssp. *occidentalis* (fewleaf sunflower, G5T5, VA state-rare), *Onosmodium virginianum* (wild Job's tears, G4, MD & VA state-rare), *Paronychia virginica* (yellow nailwort, G4, MD & VA state-rare), *Solidago simplex* var. *racemosa* (Rand's goldenrod, G5T3?, MD & VA state-rare); **Invasive/Exotic Plants**: *Cerastium arvense* (field chickweed, VA state-rare)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (30-May-2007). There are probably fewer than ten occurrences of this community rangewide, all associated with a specific set of rare habitat conditions. Patch size is very small and the aggregate size of all known occurrences is probably <5 ha. The potential for additional occurrences in the Potomac or other watersheds is good, but new occurrences would probably not significantly increase the acreage of the type.

RELATED CONCEPTS

Global Similar Types:
- *(Hypericum prolificum, Eubotrys racemosa) / Schizachyrium scoparium - Solidago simplex var. racemosa - Ionactis linariifolius* Riverscour Sparse Vegetation (CEGL006491) a floristically depauperate type endemic to sparsely vegetated, xeric outcrops in the Potomac Gorge.
- *(Salix caroliniana, Rhododendron arborescens) / Andropogon gerardii - Baptisia australis - (Solidago simplex ssp. randii)* Riverscour Wet Meadow (CEGL008471) of rock outcrops and cobble bars on scoured rivershores in the Cumberlands of TN and KY.
- *Andropogon gerardii - Panicum virgatum - Baptisia australis* Riverscour Wet Meadow (CEGL006283) a less diverse riverside prairie associated with channel-shelf bedrock or boulder bars in the same region.

Global Related Concepts:
- *Fraxinus americana / Andropogon gerardii - Sorghastrum nutans - Schizachyrium scoparium - Pycnanthemum tenuifolium* Herbaceous Vegetation (Fleming and Taverna 2006) =
- *Fraxinus americana / Andropogon gerardii - Sorghastrum nutans - Schizachyrium scoparium - Pycnanthemum tenuifolium* Herbaceous Vegetation (Fleming 2007) =
- *Quercus stellata / Andropogon gerardii - Schizachyrium scoparium - Aristida purpurascens* Wooded Herbaceous Vegetation (Lea 2000) =
- *Quercus stellata / Andropogon gerardii - Sorghastrum nutans - Schizachyrium scoparium - Aristida purpurascens* Wooded Herbaceous Vegetation (Lea 2004) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: This community appears to be environmentally distinguished from wooded bedrock terrace communities by its more fertile soils and more frequent susceptibility to scouring floods, which increases damage to and removal of woody vegetation. In addition, although the overall moisture regime of sites can probably be considered xeric, the availability of local and/or ephemeral moisture in slow-draining bedrock depressions and pools may be a factor contributing to the high species diversity. In the Potomac Gorge, this community often co-occurs in small-scale mosaics and shares some species with

Potomac Gorge Riverside Outcrop Barrens (CEGL006491). The latter, however, differs in its sparse vascular vegetation that rarely exceeds 30 species in a 100-square-m quadrat. This association is mapped as Riverside Rock Outcrop and Prairie Map Class (COMP_RROP), which includes four associations at this park, Central Appalachian-Allegheny Calcareous Riverscour Prairie (CEGL006283), Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478), Piedmont Riverscour Shrubland (CEGL006484), and Potomac Gorge Riverside Outcrop Barrens (CEGL006491).

George Washington Memorial Parkway Classification Comments: This community is structurally and compositionally unique in the George Washington Memorial Parkway and is not likely to be confused with other units. It appears to be environmentally distinguished from wooded bedrock terrace communities by its more fertile soils and more frequent susceptibility to scouring floods, which increases damage to and removal of woody vegetation. In addition, although the overall moisture regime of sites can probably be considered xeric, the availability of local and/or ephemeral moisture in slow-draining bedrock depressions and pools may be a factor contributing to the high species diversity. This community often co-occurs in small-scale mosaics and shares some species with Potomac Gorge Riverside Outcrop Barrens (CEGL006491). The latter, however, differs in its sparse vascular vegetation that rarely exceeds 30 species in a 100-square-m quadrat. This association is mapped as Riverside Rock Outcrop and Prairie Map Class (COMP_RROP), which includes four associations at this park, Central Appalachian-Allegheny Calcareous Riverscour Prairie (CEGL006283), Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478), Piedmont Riverscour Shrubland (CEGL006484), and Potomac Gorge Riverside Outcrop Barrens (CEGL006491).

Global Classification Comments: The classification is supported by data analysis of 15 plots from metamorphic outcrops of the Potomac Gorge (Maryland and Virginia) and one from a shale outcrop in Allegany County, Maryland. This vegetation is probably best characterized as "wooded herbaceous," but the most appropriate alliance placement is in the herbaceous class. Although this community has some affinities to certain upland "barrens" vegetation types, its strongest affiliation is clearly with the periodically flood-scoured prairies in *~Andropogon gerardii - Sorghastrum nutans* Appalachian Gravel Riverscour Alliance (A2069)$$.

Element Distribution

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled at Bevan Bend Barrens (Canal mile 156) and Great Falls (Canal mile 12-14). At Chesapeake & Ohio Canal, COMP_RROP is described as any combination of shrublands, prairies, and barrens occurring on riverside rock outcrops and eroded bedrock terraces in association with high-gradient stretches of major rivers. All communities in this map class are influenced and shaped by major flood scouring events, although flood return intervals vary widely. Communities typically occur in a mosaic of patches too small to map separately. In NCR, this map class is restricted primarily to the Potomac Gorge, with a few outliers at Harpers Ferry. Riverside Rock Outcrop and Prairie (COMP_RROP) is documented with many plots.

George Washington Memorial Parkway Range: Eight patches of Piedmont-Central Appalachian Riverside Outcrop Prairie occur on the Virginia side of the Potomac Gorge, probably covering less than 1 ha (2.4 acres) in aggregate. In George Washington Memorial Parkway, this community is confined to the Mather Gorge portion of Great Falls Park, between Great Falls proper and the mouth of Difficult Run. This community appears to be equally rare on both sides of the Potomac Gorge.

Global Range: This association is known only from scattered riverside outcrops and bedrock terraces along the Potomac River in Maryland and Virginia. An additional dolomite outcrop along the Shenandoah River in Clarke County, Virginia, may also represent this type. Occurrences are concentrated in the high-gradient fall-line section (Potomac Gorge) of the river near Great Falls, with at least one occurrence along the upper Potomac in the Ridge and Valley province.

Nations: US
States/Provinces: MD:S1, VA:S1
TNC Ecoregions: 59:C, 61:C
Federal Lands: NPS (C&O Canal, George Washington Parkway)

Element Sources

Chesapeake & Ohio Canal National Historical Park Plots: (11 plots): CHOH.515, MADS_019, MADS_025, MADS_029, MADS_031, POTO_030.05, POTO_033.08, POTO_037.03, POTO_037.05, POTO_037.07, POTO_037.08.

George Washington Memorial Parkway Plots: GFNP_024, GFNP_026, GFNP_028, GFNP_029, GFNP_033.

Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo and C.W. Nordman

George Washington Memorial Parkway Description Author(s): G.P. Fleming

Global Description Author(s): G.P. Fleming and C. Lea
References: Eastern Ecology Working Group n.d., Fleming 2007, Fleming and Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2000, Lea 2000*, Lea 2004

[CEGL006477] *Panicum virgatum - Andropogon gerardii* Gravel Riverscour Wet Meadow

Translated Name: **Switchgrass - Big Bluestem Gravel Riverscour Wet Meadow**
Common Name: **Ridge and Valley Gravel Riverscour Prairie**

USNVC Classification

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Riverscour Vegetation (M881)
Group	Central Interior-Appalachian Riverscour Barrens & Prairie (G753)
Alliance	*Andropogon gerardii - Sorghastrum nutans* Appalachian Gravel Riverscour Alliance (A2069)

Element Concept

Global Summary: This association is known from several rivers and their major river tributaries (e.g., Potomac, James, Shenandoah, Monongahela, and Cheat rivers) in Maryland, Virginia, and West Virginia. It occurs primarily in the upper river sections on cobbly and gravelly depositional bars, primarily in river reaches that are underlain by shale bedrock. The substrate is sand, gravel, and cobble, with patches of gravelly sand or sandy loam soils. Flooding appears to occur several times a year, and stands may be inundated for long periods during the dormant season and occasionally during the growing season but are generally somewhat well-drained and seasonally dry. Hydrologic regime is best characterized as temporarily flooded. This association occurs in small patches, with some stands exceeding 500 m2 in area. The vegetation is strongly dominated by *Panicum virgatum* (switchgrass) and *Andropogon gerardii* (big bluestem) with relatively low species richness (Virginia samples: 38 taxa/plot in five 100-m2 and 200-m2 plots). Scattered, stunted, floodplain shrubs or small trees may be present, but the vegetation structure is a grassland. The only completely constant woody associate is *Platanus occidentalis* (American sycamore). Other shrubs or small trees may include *Salix caroliniana* (coastal plain willow), *Physocarpus opulifolius* (common ninebark), and the exotic *Rosa multiflora* (multiflora rose). Associated herbaceous species are weedy annuals or short-lived perennials that rarely attain as much as 2% cover in a given stand. *Dichanthelium clandestinum* (deertongue) and *Verbesina alternifolia* (wingstem) are the most frequent associates (>75%); other common associates include *Oxalis stricta* (common yellow oxalis), *Verbena urticifolia* (white vervain), *Cyperus strigosus* (strawcolored flatsedge), *Acalypha rhomboidea* (common threeseed mercury), *Viola sororia* (common blue violet), *Plantago lanceolata* (narrowleaf plantain), and the exotics *Microstegium vimineum* (Nepalese browntop), *Ambrosia artemisiifolia* (annual ragweed), *Daucus carota* (Queen Anne's lace), *Centaurea stoebe ssp. micranthos* (spotted knapweed), and *Solanum carolinense* (Carolina horsenettle).

Environmental Description

Chesapeake & Ohio Canal National Historical Park Environment: This big bluestem - switchgrass herbaceous vegetation was sampled at five plot locations in the park. Sites range from flat to gently undulating, temporarily flooded stream terraces, shorelines and bars. Soils are moderately well- to well-drained sand and loamy sand. The unvegetated surface is dominated by small rocks (0-98% cover) or exposed bedrock (0-96%) with some large rocks (0-5%), leaf litter (0-20%), wood (0-1%), and bare sand (1-64%). Evidence of disturbance includes flooding, grazing/browsing, and the abundance of exotic species.
Global Environment: The type occurs on cobbly and gravelly depositional bars, primarily in river reaches that are underlain by shale bedrock. Soil is probably gravelly sand or sandy loam. Flooding is estimated to occur several times a year, and stands may be inundated for long periods during the dormant season and occasionally during the growing season but are generally somewhat well-drained and seasonally dry. Hydrologic regime is best characterized as temporarily flooded. Soil samples collected from five plots had lower mean pH and much lower mean calcium levels than samples from most other alluvial vegetation in the Potomac drainage.

Vegetation Description

Chesapeake & Ohio Canal National Historical Park Vegetation: This community is defined by the moderate to very dense (40-80+% cover) herbaceous layer dominated by *Andropogon gerardii* (big bluestem) and *Panicum virgatum* (switchgrass). In addition, there may be a very sparse (<5-20%) short-shrub layer (1-6 m tall) of *Platanus occidentalis* (American sycamore). The herbaceous layer is diverse with over 120 taxa reported from four sampled

plots, with *Andropogon gerardii* (big bluestem) and *Panicum virgatum* (switchgrass) clear dominants. A total of 26 exotic species were recorded. In addition, this community supports Maryland state-critically imperiled *Rumex altissimus* (pale dock) and three state-vulnerable species.

Global Vegetation: This association occurs in small patches, with some stands exceeding 500 m2 in area. The vegetation is a grassland strongly dominated by *Panicum virgatum* (switchgrass) and *Andropogon gerardii* (big bluestem) (often more strongly dominated by the former) with relatively low species richness (38 taxa/plot in five 100-m2 and 200-m2 plots). Associated herbaceous species are weedy annuals or short-lived perennials that rarely attain as much as 2% cover in a given stand. Herbaceous associates occurring in at least three of five plot-sampled Virginia/Maryland stands were *Eupatorium serotinum* (lateflowering thoroughwort), *Oxalis stricta* (common yellow oxalis), *Verbena urticifolia* (white vervain), *Cyperus strigosus* (strawcolored flatsedge), *Dichanthelium clandestinum* (deertongue), *Polygonum punctatum* (dotted smartweed), *Acalypha rhomboidea* (common threeseed mercury), *Viola sororia* (common blue violet), and the exotics *Microstegium vimineum* (Nepalese browntop), *Setaria pumila* (yellow foxtail), *Lespedeza cuneata* (sericea lespedeza), and *Setaria faberi* (Japanese bristlegrass). Common associates in West Virginia stands that were absent from the Virginia and Maryland plots include *Sorghastrum nutans* (Indiangrass), *Solidago rugosa* (wrinkleleaf goldenrod), and the exotics *Centaurea stoebe ssp. micranthos* (spotted knapweed) and *Leucanthemum vulgare* (oxeye daisy). Occasional scattered, flood-damaged shrubby trees or seedlings of flood-tolerant woody species occur, with only *Platanus occidentalis* (American sycamore) occurring constantly. *Salix caroliniana* (coastal plain willow) is a frequent but low-cover shrub. *Physocarpus opulifolius* (common ninebark) and *Rosa multiflora* (multiflora rose) occur in the West Virginia portion of the range.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Herb (field)	Graminoid	*Andropogon gerardii* (big bluestem), *Panicum virgatum* (switchgrass)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Andropogon gerardii* (big bluestem), *Panicum virgatum* (switchgrass)

Global: *Andropogon gerardii* (big bluestem), *Panicum virgatum* (switchgrass)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Eupatorium altissimum* (tall thoroughwort, G5, MD-vulnerable), *Rumex altissimus* (pale dock, G5, MD-critically imperiled), *Salix caroliniana* (coastal plain willow, G5, MD-vulnerable), *Zizia aurea* (golden zizia, G5, MD-vulnerable); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Artemisia annua* (sweet sagewort, Medium/Insignificant), *Arthraxon hispidus* (small carpgrass, Medium/Low), *Brassica nigra* (black mustard, High/Low), *Cichorium intybus* (chicory, Medium/Insignificant), *Commelina communis* (Asiatic dayflower), *Datura stramonium* (jimsonweed, High/Low), *Daucus carota* (Queen Anne's lace, Low), *Echinochloa crus-galli* (barnyardgrass, Medium/Insignificant), *Eragrostis cilianensis* (stinkgrass, Medium/Insignificant), *Fallopia japonica* var. *japonica* (Japanese knotweed, High/Medium), *Hypericum perforatum* (common St. Johnswort, High/Medium), *Kickxia elatine* (sharpleaf cancerwort), *Kummerowia striata* (Japanese clover, Low), *Lespedeza cuneata* (sericea lespedeza, Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Perilla frutescens* (beefsteakplant, Low), *Plantago lanceolata* (narrowleaf plantain, High/Low), *Polygonum perfoliatum* (Asiatic tearthumb, Medium), *Polygonum persicaria* (spotted ladysthumb), *Rorippa sylvestris* (creeping yellowcress, Medium/Low), *Setaria faberi* (Japanese bristlegrass), *Setaria pumila* (yellow foxtail, Low/Insignificant), *Verbascum thapsus* (common mullein, Medium); **Other Plants**: *Dysphania ambrosioides* (Mexican tea, GNR)

Global: Invasive/Exotic Plants: *Cerastium biebersteinii* (Boreal chickweed, Low/Insignificant), *Lespedeza cuneata* (sericea lespedeza, Medium), *Leucanthemum vulgare* (oxeye daisy, Medium/Low), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Rosa multiflora* (multiflora rose, Medium/Low), *Setaria faberi* (Japanese bristlegrass), *Setaria pumila* (yellow foxtail, Low/Insignificant)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (08-Jan-2007). This is not abundant enough to be ranked G4.

RELATED CONCEPTS

Global Similar Types:

- *Andropogon gerardii - Panicum virgatum - Baptisia australis* Riverscour Wet Meadow (CEGL006283) is a more diverse riverside prairie of the Piedmont and Central Appalachians, often occurring on bedrock or boulder bars.
- *Salix* spp. / *Andropogon gerardii - Sorghastrum nutans* Riverscour Wet Meadow (CEGL005175) is a very similar, poorly documented and described type of the central U.S.; occupies the same type of habitats.

Global Related Concepts:

- *Panicum virgatum - Andropogon gerardii - Eupatorium serotinum* Herbaceous Vegetation (Lea 2003) =
- *Panicum virgatum - Andropogon gerardii* Gravel Wash Herbaceous Vegetation (Vanderhorst and Streets 2006) =
- *Panicum virgatum - Andropogon gerardii* Gravel Wash Herbaceous Vegetation [Switchgrass - Big Bluestem Riverscour Prairie] (Vanderhorst 2017b) =
- River scour prairies (Vanderhorst 2001a) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Chesapeake & Ohio Canal National Historical Park Classification Comments: Ridge and Valley Gravel Riverscour Prairie is sometimes referred to as Ridge and Valley Gravel-Wash Prairie. This association is mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP) which includes seven associations at this park: Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Ridge and Valley Gravel Riverscour Prairie (CEGL006477), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Water-willow Rocky Bar and Shore (CEGL004286), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).
Global Classification Comments: The classification is supported by analysis of plot data from riverside prairie vegetation during the National Capital Region Parks project and Camp Dawson and other projects in West Virginia. Consideration was given to whether this might be considered an extremely depauperate form of *~Andropogon gerardii - Panicum virgatum - Baptisia australis* Riverscour Wet Meadow (CEGL006283)$$, which is considerably more species-rich and has many perennial forbs of relatively stable habitats, compared to the depauperate, weedy herbaceous flora of this association (CEGL006477). However, the latter performed convincingly in analysis, arguing for its recognition as a USNVC type. The two types occur sympatrically in topographically adjacent zones near the west end of the Paw Paw Tunnel in the Ridge and Valley and in a small area of the Mather Gorge in the Piedmont. In these cases, CEGL006283 occupies a higher topographic position and is often a community of stable bedrock outcrops on the channel shelf or walls, as opposed to this association (CEGL006477), which occurs on less stable sand/cobble depositional bars. However, examples of *~Andropogon gerardii - Panicum virgatum - Baptisia australis* Riverscour Wet Meadow (CEGL006283)$$ along the New and Greenbrier rivers in West Virginia occur on ephemeral cobble bars (J. Vanderhorst pers. comm. 2006), suggesting that the differences between this community and related types may have more to do with flooding frequency/intensity and/or substrate chemistry than to topography (i.e., outcrop vs. cobble bar).

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled in plots at Bevan Bend Barrens, Outdoor Club Uplands, Little Orleans South, and Rocky Island Channel. Herbaceous Depositional Bar (COMP_HDEP) includes various predominantly herbaceous (and often ephemeral) communities subject to frequent high-energy floods, occurring on scoured shorelines or on sand, gravel, and cobble bars within the channels of rivers and streams. It is mapped at many locations, the length of the Chesapeake & Ohio Canal.
Global Range: This association is known from the Potomac and James rivers and their major river tributaries (e.g., the Shenandoah) in Maryland, Virginia, and West Virginia, and the Cheat and Monongahela rivers in West Virginia. It occurs primarily in the upper (Blue Ridge and Ridge and Valley) sections and is especially common where the rivers flow through resistant shale strata.
Nations: US
States/Provinces: MD:SNR, VA:S2, WV:S2
TNC Ecoregions: 59:C, 61:C
USFS Ecoregions (2007): M221Aa:CCP, M221Ab:CCC, M221Ba:CCP, M221Bb:CCC
Federal Lands: NPS (C&O Canal); USFS (Jefferson, Monongahela)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (5 plots): CHOH.213, CHOH.503, CHOH.512, CHOH.516, CHOH.632.

Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Global Description Author(s): C. Lea, G.P. Fleming, S.C. Gawler
References: Eastern Ecology Working Group n.d.*, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2003, Vanderhorst 2001a, Vanderhorst 2017b, Vanderhorst and Streets 2006, WVNHP unpubl. data

M303. Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland

This macrogroup includes disturbed marshes and wet meadows in the eastern and southeastern United States and southeastern Canada, which are dominated by native ruderal or exotic species. This macrogroup is composed of herbaceous- or shrub-dominated, temporarily, irregularly, seasonally or semipermanently flooded wetlands. Sites often have a history of significant disturbance such as heavy pasturing, agricultural or urban stormwater runoff, 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 herbaceous dominants include *Juncus effusus* (common rush), *Lythrum salicaria* (purple loosestrife), *Phalaris arundinacea* (reed canarygrass), exotic *Phragmites australis* (common reed) (chloroplast haplotype M), *Fallopia japonica var. japonica* (Japanese knotweed), *Scirpus cyperinus* (woolgrass), and *Typha* (cattail) spp. Typical shrubs include *Ligustrum sinense* (Chinese privet), *Lonicera maackii* (Amur honeysuckle), and in southern coastal areas *Tamarix* (tamarisk) spp.

G556. Eastern Ruderal Wet Meadow & Marsh

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* (purple loosestrife), *Phalaris arundinacea* (reed canarygrass), *Phragmites australis* (common reed), *Fallopia japonica var. japonica* (Japanese knotweed), and *Typha* (cattail) spp.

A1381 *Phalaris arundinacea* Eastern Ruderal Marsh Alliance

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* (reed canarygrass), which tends to occur in monocultures or associated with *Calamagrostis canadensis* (bluejoint). Other associates in the Northeast include *Agrostis gigantea* (redtop), *Alnus incana* (gray alder) or *Alnus serrulata* (hazel alder), *Viburnum dentatum* (southern arrow-wood), and *Viburnum nudum* (possumhaw). 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 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* (reed canarygrass) 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* (reed canarygrass) 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* (reed canarygrass), a 0.5- to 2-m tall perennial grass, which tends to occur in monocultures or associated with *Calamagrostis canadensis* (bluejoint). Associates in the glaciated Northeast include *Viburnum nudum* (possumhaw), *Alnus incana* (gray alder) or *Alnus serrulata* (hazel alder), *Viburnum dentatum* (southern arrow-wood), and *Agrostis gigantea* (redtop). In Central Appalachian bottomland old fields, characteristic associates include *Verbesina alternifolia* (wingstem) (which may be codominant), *Solidago rugosa* (wrinkleleaf goldenrod), *Boehmeria cylindrica* (small-spike false nettle), and *Euthamia graminifolia* (flat-top goldentop), along with exotic species such as *Glechoma hederacea* (ground ivy), *Securigera varia* (purple crownvetch), *Rosa multiflora* (multiflora rose), and *Elaeagnus umbellata* (autumn olive). Midwest associates include species characteristic of wet meadows. *Phalaris arundinacea* (reed canarygrass) 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

Catoctin Mountain Park Environment: This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.

Chesapeake & Ohio Canal National Historical Park Environment: This herbaceous vegetation is mapped along Chesapeake & Ohio Canal as Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.

Harpers Ferry National Historical Park Environment: Found in the abandoned basin of the Shenandoah Canal; located between the railroad and the road along the trail from the lower town to the Visitors' Center. This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.

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

Catoctin Mountain Park Vegetation: This vegetation is dominated by *Phalaris arundinacea* (reed canarygrass) (reed canarygrass).

Chesapeake & Ohio Canal National Historical Park Vegetation: This vegetation is dominated by *Phalaris arundinacea* (reed canarygrass) (reed canarygrass).

Harpers Ferry National Historical Park Vegetation: At Harper's Ferry, one stand observed in the abandoned basin of the Shenandoah Canal, located between the railroad and the road along the trail from the lower town to the Visitors' Center, is dominated by *Phalaris arundinacea* (reed canarygrass), and also contains *Alisma subcordatum* (American water plantain), *Bidens discoidea* (small beggarticks) (?), *Boehmeria cylindrica* (small-spike false nettle), *Impatiens pallida* (pale touch-me-not), *Mentha x piperita* (peppermint) (?), *Pilea pumila* (Canadian clearweed), *Polygonum* (knotweed) spp., *Rumex verticillatus* (swamp dock), *Sagittaria latifolia* (broadleaf arrowhead), *Solanum dulcamara* (climbing nightshade), and *Urtica dioica* (stinging nettle).

Global Vegetation: Stands are dominated by *Phalaris arundinacea* (reed canarygrass), 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* (bluejoint) or, less commonly, with a mixture of forbs equaling the graminoid cover. Associates in the glaciated Northeast include *Viburnum nudum* (possumhaw), *Salix* (willow) spp., *Alnus incana* (gray alder) or *Alnus serrulata* (hazel alder), *Viburnum dentatum* (southern arrow-wood), *Poa palustris* (fowl bluegrass), *Mentha arvensis* (wild mint), *Leersia virginica* (whitegrass), *Lythrum salicaria* (purple loosestrife), and *Agrostis gigantea* (redtop). In Central Appalachian bottomland old fields, characteristic associates include *Verbesina alternifolia* (wingstem) (which may be codominant), *Solidago rugosa* (wrinkleleaf goldenrod), *Boehmeria cylindrica* (small-spike false nettle), and *Euthamia graminifolia* (flat-top goldentop), along with exotic species such as *Glechoma hederacea* (ground ivy), *Securigera varia* (purple crownvetch), *Rosa multiflora* (multiflora rose), and *Elaeagnus umbellata* (autumn olive). Midwest associates

include species characteristic of wet meadows. *Phalaris arundinacea* (reed canarygrass) 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* (reed canarygrass) may respond well to summer drawdowns (Barnes 1999).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phalaris arundinacea* (reed canarygrass)

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Phalaris arundinacea* (reed canarygrass)
Chesapeake & Ohio Canal National Historical Park: *Phalaris arundinacea* (reed canarygrass)
Harpers Ferry National Historical Park: *Phalaris arundinacea* (reed canarygrass)
Global: *Phalaris arundinacea* (reed canarygrass)

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Elaeagnus umbellata* (autumn olive, High), *Glechoma hederacea* (ground ivy, Low), *Phalaris arundinacea* (reed canarygrass, High), *Rosa multiflora* (multiflora rose, Medium/Low), *Securigera varia* (purple crownvetch, High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (01-Dec-1997). *Phalaris arundinacea* (reed canarygrass) 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)

Global Related Concepts:
- *Phalaris arundinacea* temporarily flooded grasslands (Metzler and Barrett 2006) **=**
- Bottomland old fields (Vanderhorst 2001a) **=**
- Reed canary grass riverine grassland (Perles et al. 2004) **?**
- SNE low-energy riverbank community (Rawinski 1984a) **?**
- Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984a) **?**
- Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984a) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Catoctin Mountain Park Classification Comments: Eastern Ruderal Reed Canarygrass Marsh is sometimes referred to as Reed Canarygrass Eastern Marsh. This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes Eastern Ruderal Reed Canarygrass Marsh (CEGL006044) as well as unclassified successional herbaceous wetlands.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Eastern Ruderal Reed Canarygrass Marsh is sometimes referred to as Reed Canarygrass Eastern Marsh. This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which at this park includes four existing successional associations--Eastern Ruderal Reed Canarygrass Marsh (CEGL006044), Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026), Eastern Cattail Marsh (CEGL006153), and Northeastern Woolgrass Wet Meadow (CEGL006349)--as well as unclassified successional herbaceous wetlands.
Harpers Ferry National Historical Park Classification Comments: Eastern Ruderal Reed Canarygrass Marsh is sometimes referred to as Reed Canarygrass Eastern Marsh. This association has been documented as part of the Successional Herbaceous Wetland Map Class (COMP_HEWE) which includes two existing successional associations--Eastern Ruderal Reed Canarygrass Marsh (CEGL006044) and Eastern Cattail Marsh (CEGL006153)--as well as unclassified successional herbaceous wetlands.

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* (reed canarygrass). 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* (common rush), *Carex lurida* (shallow sedge), *Carex gynandra* (nodding sedge), and *Alnus serrulata* (hazel alder).

ELEMENT DISTRIBUTION

Catoctin Mountain Park Range: This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE) in the northeast portion of the park along Owens Creek.
Chesapeake & Ohio Canal National Historical Park Range: This herbaceous vegetation is mapped as Successional Herbaceous Wetland Map Class (COMP_HEWE) throughout the length of the Chesapeake & Ohio Canal.
Harpers Ferry National Historical Park Range: Probably restricted to the abandoned basin of the Shenandoah Canal, located between the railroad and the road along the trail from the lower town to the Visitors' Center.
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:SNA, DE:SNA, IA:SNA, IN:SNA, MA:SNA, MD:SNA, ME:SNA, MN:SNA, NH:SNA, NJ:S4, NY:SNA, OH:SNA, ON:SNA, PA:S5, QC?:SNA, RI:SNA, TN:SNA, VA:SNA, VT:SNR, WI?:SNA, WV:SNA
TNC Ecoregions: 46:P, 47:C, 48:C, 49:C, 50:C, 51:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions (2007): 211Fc:CCC, 211G:CP, 221Aa:CC?, 221Bc:CCP, 221Bd:CCP, 221Da:CCC, 221Ea:C??, 221Fa:CCC, 222Ib:CCC, 222Ic:CCC, 222Ja:CCC, 222L:CC, M221Ac:CCC, M221Ad:CCC, M221Bb: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, Pipestone, 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

Catoctin Mountain Park Description Author(s): J. Teague
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
Harpers Ferry National Historical Park Description Author(s): M. Pyne
Global Description Author(s): D. Faber-Langendoen and S.C. Gawler
References: Apfelbaum and Sams 1987, Barnes 1999, CDPNQ unpubl. data, Coxe 2009, Diamond et al. 2014, Edinger et al. 2014a, Edinger et al. 2014b, Fike 1999, Hop et al. 2005, Hop et al. 2009, Hop et al. 2013, Largay and Sneddon 2008, MNNHP 1993, 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 and Nichols 2004, Swain and Kearsley 2014, TNC and WPC 2004, Thompson and Sorenson 2005, Vanderhorst 2001a, Vanderhorst and Streets 2006, Zimmerman 2011h, Zimmerman et al. 2012

A1431 *Phragmites australis ssp. australis* Ruderal Marsh Alliance

This alliance consists of non-tidal *Phragmites australis ssp. australis* (European common reed) 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* (common reed), which is rapidly spreading in disturbed areas and excluding native vegetation. Stands may be composed entirely of *Phragmites australis* (common reed), 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 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* (common reed) 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* (European common reed), with few or no other vascular plants present.

Environmental Description

Global Environment: Stands occur in semipermanently flooded marshes, ditches, impoundments, etc. that have often been disturbed by human activity.

Vegetation Description

Global Vegetation: The vegetation is often variable, as *Phragmites australis ssp. australis* (European common reed) 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* (common reed), with few or no other vascular plants present.

Most Abundant Species

Global Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phragmites australis* ssp. *australis* (European common reed)

Characteristic Species

Global: *Phragmites australis* ssp. *australis* (European common reed)

Other Noteworthy Species

Global: Invasive/Exotic Plants: *Phragmites australis* ssp. *australis* (European common reed)

Conservation Status Rank

Global Rank & Reasons: GNA (ruderal) (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* (American common reed).

Related Concepts

Global Similar Types:

- *Phragmites australis ssp. australis* Tidal Ruderal Marsh (CEGL004187)
- *Phragmites australis ssp. australis* Western Ruderal Wet Meadow (CEGL001475)
- *Typha* spp. - *(Phragmites australis ssp. americanus)* - *Carex* spp. Floating Marshy Fen (CEGL002541) from Canada, is perhaps dominated by the native *Phragmites australis ssp. americanus* (American common reed).

Global Related Concepts:

- *Phragmites australis* temporarily flooded grasslands (Metzler and Barrett 2006) **>**
- Semi-Natural (Faber-Langendoen 2001) **>**
- Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984a) **?**
- Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984a) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Global Classification Comments: This is not a native community but is the result of the invasion of alien *Phragmites australis ssp. australis* (European common reed) into natural or semi-natural vegetation. The vegetation has variable hydrology and, unless *Phragmites* (reed) 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* (common reed) is classified in ~*Sagittaria lancifolia* (bulltongue arrowhead) Gulf Coast Tidal Freshwater Marsh Alliance (A1987)$$.

ELEMENT DISTRIBUTION

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:SNA, AR:SNA, CT:SNA, DE:SNA, FL:SNA, GA:SNR, IA:SNA, IN:SNA, LA:SNA, MA:SNA, MD:SNA, ME:SNA, MI:SNA, MN:SNA, MS:SNA, NC:SNA, NH:SNA, NJ:S4, NY:SNA, OH:SNA, ON:SNA, PA:SNA, QC?:SNA, RI:SNA, SC:SNA, TX:SNA, VA:SNA, VT:SNA, WI:SNA, WV?:SNA
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 (2007): 211C:CP, 211Fc:CCC, 212Ha:CCC, 212Hf:CCC, 212Hl:CCC, 221Aa:CC?, 221Ab:CCC, 221Ae:CCC, 221Ai:CCC, 221Bc:CCP, 221Da:CCC, 222Ic:CCC, 222Ja:CCC, 232Ab:CCC, 232Ac:CCP, 232Eb:CCP, 232G:CC, 232Ib:CCC, 232La:CC?, 232Lc:CC?, 234:P, 255Dc:CCC, M211:C, M221:P
Federal Lands: NPS (Antietam, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Assateague Island, Boston Harbor Islands, C&O Canal, Cape Cod, Catoctin Mountain, Cuyahoga Valley, George Washington Parkway, Harpers Ferry, Indiana Dunes, Manassas, Minute Man, Mississippi, Monocacy, National Capital-East, Padre Island, Prince William, Rock Creek, Roosevelt-Vanderbilt, Saint Croix, Saratoga, Sleeping Bear Dunes, Upper Delaware, Voyageurs, Wolf Trap); 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

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, Coxe 2009, Edinger et al. 2014b, Eichelberger 2011f, Faber-Langendoen 2001, GNHP unpubl. data 2018, Gawler et al. 2017, Harris et al. 1996, Homoya et al. 1988, Hop et al. 1999, Hop et al. 2009, Hop et al. 2013, INAI 2017, Kost et al. 2007, Largay and Sneddon 2017, MNNHP 1993, Metzler and Barrett 2006, NRCS 2004a, NatureServe 2009, Nelson 1986, ONHD unpubl. data, Perles et al. 2008, Rawinski 1984a, Schafale and Weakley 1990, Sechler et al. 2014, Sneddon et al. 2010, Sneddon et al. 2017, Southeastern Ecology Working Group n.d.*, Swain and Kearsley 2014, TNC 1995c, Zimmerman et al. 2012

[CEGL004187] *Phragmites australis ssp. australis* Tidal Ruderal Marsh

Translated Name: **European Common Reed Tidal Ruderal Marsh**
Common Name: **Ruderal Tidal Common Reed Marsh**

USNVC CLASSIFICATION

Division	Eastern North American Temperate 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 community is a dense tall grassland indicative of disturbance. It occurs in a range of tidal wetland habitats from fresh to brackish in salinity. It is characterized by dense stands of *Phragmites australis ssp. australis* (European common reed), an exotic taxon which tends to grow in colonies of tall, stout, leafy plants often

to the exclusion of all other vascular plant species. Associated species are highly variable, depending on the community that has been invaded. Spreading in large colonies, *Phragmites* (reed) eventually dominates disturbed areas at coverage up to 100%. More typically, though, scattered individuals of other species may occur, such as sparse *Morella cerifera* (wax-myrtle) shrubs, *Kosteletzkya virginica* (Virginia saltmarsh mallow), *Calystegia sepium* (hedge false bindweed), *Boehmeria cylindrica* (small-spike false nettle), *Typha angustifolia* (narrowleaf cattail), *Apocynum cannabinum* (Indianhemp), *Rosa palustris* (swamp rose), *Polygonum* (knotweed) sp., and *Mikania scandens* (climbing hempvine). Vines of *Toxicodendron radicans* (eastern poison-ivy) are also frequent, but typically occur at low cover. This community has a broad geographic range, including coastal areas of the eastern and southeastern United States and Canada.

Environmental Description

George Washington Memorial Parkway Environment: Ruderal Tidal Common Reed Marsh is a dense, tall grassland indicative of disturbance. It occurs on dredge spoils and other disturbed areas, generally in areas that are regularly flooded with tidal water. Substrates range from muck or peat to sand.
National Capital Parks-East Environment: The one documented stand of Ruderal Tidal Common Reed Marsh occurs on Holocene alluvium along the Anacostia River, near the DC-Maryland line.
Global Environment: This community is a dense tall grassland indicative of disturbance. It occurs in a range of tidal wetland habitats from fresh to brackish in salinity.

Vegetation Description

George Washington Memorial Parkway Vegetation: The vegetation is characterized by dense stands of the invasive, non-native grass *Phragmites australis* (common reed), nearly to the exclusion of all other vascular plant species. Scattered individuals of other tidal species may occur, but associated species are highly variable, depending on the community that has been invaded. Species that may occur with low cover include *Peltandra virginica* (green arrow-arum), *Typha angustifolia* (narrowleaf cattail), *Polygonum punctatum* (dotted smartweed), and *Impatiens capensis* (orange jewelweed).
National Capital Parks-East Vegetation: At NACE, the one documented stand contains *Phragmites australis* (common reed) and *Typha angustifolia* (narrowleaf cattail).
Global Vegetation: This community is a broadly defined reed grass marsh. It is characterized by dense stands of *Phragmites australis ssp. australis* (European common reed), an exotic taxon which tends to grow in colonies of tall, stout, leafy plants often to the exclusion of all other vascular plant species. Associated species are highly variable, depending on the community that has been invaded. Spreading in large colonies, *Phragmites* (reed) eventually dominates disturbed areas at coverage up to 100%. More typically, though, scattered individuals of other species may occur, such as sparse *Morella cerifera* (wax-myrtle) shrubs, *Kosteletzkya virginica* (Virginia saltmarsh mallow), *Calystegia sepium* (hedge false bindweed), *Boehmeria cylindrica* (small-spike false nettle), *Typha angustifolia* (narrowleaf cattail), *Apocynum cannabinum* (Indianhemp), *Rosa palustris* (swamp rose), *Polygonum* (knotweed) sp., and *Mikania scandens* (climbing hempvine). Vines of *Toxicodendron radicans* (eastern poison-ivy) are also frequent but typically occur at low cover.

Most Abundant Species

Global Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phragmites australis* ssp. *australis* (European common reed)

Characteristic Species

George Washington Memorial Parkway: *Phragmites australis* (common reed)
National Capital Parks-East: *Phragmites australis* (common reed), *Typha angustifolia* (narrowleaf cattail)
Global: *Phragmites australis* ssp. *australis* (European common reed)

Other Noteworthy Species

George Washington Memorial Parkway: Invasive/Exotic Plants: *Phragmites australis* (common reed, High)
National Capital Parks-East: Invasive/Exotic Plants: *Phragmites australis* (common reed, High), *Typha angustifolia* (narrowleaf cattail, High/Medium)
Global: Invasive/Exotic Plants: *Phragmites australis* ssp. *australis* (European common reed)

Conservation Status Rank

Global Rank & Reasons: GNA (ruderal) (22-Nov-1997).

RELATED CONCEPTS

Global Similar Types:
- *Phragmites australis ssp. australis* Eastern Ruderal Marsh (CEGL004141)
- *Phragmites australis ssp. berlandieri - (Sagittaria platyphylla, Vigna luteola)* Tidal Marsh (CEGL007891)

Global Related Concepts:
- *Phragmites australis* Herbaceous Wetland (Fleming and Moorhead 1998) =
- *Phragmites australis* Tidal Herbaceous Vegetation (Bowman 2000) =
- *Phragmites australis* temporarily flooded grasslands (Metzler and Barrett 2006) >
- *Phragmites australis* tidal marsh association (Clancy 1993b) =
- Brackish Tidal Marsh (Rawinski 1984a) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
George Washington Memorial Parkway Classification Comments: Ruderal Tidal Common Reed Marsh is sometimes referred to as Reed-grass Tidal Marsh, or Common Reed Tidal Herbaceous Vegetation, It is clearly distinguished from other tidal vegetation by being overwhelmingly dominated by *Phragmites australis* (common reed).
National Capital Parks-East Classification Comments: Ruderal Tidal Common Reed Marsh is sometimes referred to as Reed-grass Tidal Marsh, or Common Reed Tidal Herbaceous Vegetation. It is clearly distinguished from other tidal vegetation by being overwhelmingly dominated by *Phragmites australis* (common reed).
Global Classification Comments: Although *Phragmites australis* (common reed) rhizomes have been noted in salt marsh sediments exceeding three thousand years in age (Niering and Warren 1977) and is thus a native component of salt marshes in some areas in North America, the growth of the species in its native condition was likely to have been significantly different than the dense monotypic stands that characterize this community in parts of its range today. The invasive, non-native strain has been labeled haplotype M (Saltonstall 2002). The presence of the *Phragmites australis* (common reed) community in wetlands today generally indicates human-induced disturbance, either through direct habitat manipulation or through passive introduction of reproductive material to naturally disturbed substrates. Historically, without alteration, these sites would generally be more saline. In New England, *Phragmites* (reed) tends to invade behind artificial/man-made levees where regular salt input is blocked, making the sites more brackish and less saline than prior to levee construction and anthropogenic modification. In cases where *Phragmites australis* (common reed) is a significant component of the vegetation but the vegetation retains sufficient species composition to retain its identity, the site is considered an unhealthy or degraded example of that original community. Where *Phragmites australis* (common reed) cover is so high that native species have been excluded and the original community is no longer recognizable, the occurrence is treated as an example of ~*Phragmites australis ssp. australis* (European common reed) Tidal Ruderal Marsh (CEGL004187)$$.

ELEMENT DISTRIBUTION

George Washington Memorial Parkway Range: At the time field work was conducted for the NCR parks project, Ruderal Tidal Common Reed Marsh (or Reed-grass Tidal Marsh) occurred in three patches in the park. Two stands are located in Dyke Marsh and the third is at the edge of the waterfowl sanctuary, north of Washington National Airport. This status is likely to change in the future, both because of control efforts and the aggressive ability of this species to invade new sites.
National Capital Parks-East Range: Ruderal Tidal Common Reed Marsh (or Reed-grass Tidal Marsh) is known from one location along Anacostia Creek near the DC-Maryland line.
Global Range: This community has a broad geographic range, including coastal areas of the eastern and southeastern United States and Canada.
Nations: CA,US
States/Provinces: AL:SNA, CT:SNA, DC?:SNA, DE:SNA, FL:SNA, GA:SNR, LA:SNA, LB?:SNA, MA:SNA, MD:SNA, ME:SNA, MS:SNA, NC:SNA, NF?:SNA, NH:SNA, NJ:SNA, NS?:SNA, NY:SNA, PA:SNA, PE?:SNA, QC?:SNA, RI:SNA, SC:SNA, TX:SNA, VA:SNA
TNC Ecoregions: 31:C, 53:C, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions (2007): 221Ab:CCC, 221An:CC?, 232Ab:CCC, 232Ac:CCP, 232Ad:CCC, 232Ef:CPP, 232Hc:CCP, 232Ib:CCC, 232La:CC?, 232Lc:CC?
Federal Lands: NPS (Assateague Island, Boston Harbor Islands, Cape Cod, Cape Hatteras, Cape Lookout, Colonial, Fire Island, Gateway, George Washington Birthplace, George Washington Parkway, National

Capital-East, Saugus Iron Works); USFWS (Back Bay, Bon Secour, Cape May, Chesapeake Marshlands, E.B. Forsythe, Monomoy, Rachel Carson, Supawna Meadows)

ELEMENT SOURCES

George Washington Memorial Parkway Plots: None.
National Capital Parks-East Plots: None.
George Washington Memorial Parkway Description Author(s): K. Taverna and G.P. Fleming
National Capital Parks-East Description Author(s): M. Pyne
Global Description Author(s): R.E. Zaremba and M. Pyne
References: Bell et al. 2002, Bowman 2000, Breden 1989, CDPNQ unpubl. data, Clancy 1993b, Coulling 2002, Coxe 2009, Edinger et al. 2008a, Edinger et al. 2014a, Enser and Lundgren 2006, Fleming and Moorhead 1998, GNHP unpubl. data 2018, Harrison 2001, Harrison 2011, Klopfer et al. 2002, Largay and Sneddon 2008, Largay and Sneddon 2017, Metzler and Barrett 2006, NRCS 2001b, NatureServe 2009, Nelson 1986, Niering and Warren 1977, Odum et al. 1984, Overholt et al. 2014, Patterson 2008c, Patterson 2008d, Rawinski 1984a, Saltonstall 2002, Schafale and Weakley 1990, Sneddon et al. 2010, Sneddon et al. 2017, Southeastern Ecology Working Group n.d.*, Swain and Kearsley 2014, Swearingen and Saltonstall 2012, TNC 1995c, Walz et al. 2008

2.C.4.NE. ATLANTIC & GULF COASTAL MARSH, WET MEADOW & SHRUBLAND

The marshes are discontinuous along the Atlantic and Gulf coasts of the United States and adjacent Canada from Newfoundland to Texas. They include fresh and oligohaline tidal marshes, as well as non-tidal shrub and herb wetlands found in coastal plain depressions and basins, seepage slopes, interdunal swales and poorly drained wet flats.

M066. Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh

These fresh and oligohaline tidal marshes constitute the primary vegetation between outer tidal salt and brackish marshes and inland non-tidally influenced vegetation (upland or wetland). Examples are found from Newfoundland to Texas along the Atlantic and Gulf coasts of the United States and adjacent Canada. They may grade into uplands or non-tidal freshwater marshes and swamps. Most examples of this vegetation are characterized by a mixture of annual and perennial grasses, forbs, sedges, rushes, other grass-like plants, floating or submerged aquatics, shrubs, and scattered tree saplings. Dominance patterns change seasonally, yearly, and geographically. In addition to regional variability, freshwater tidal marshes may also exhibit floristic zonation based on age, water depth, tidal regime, and other factors, into a low and high marsh. This vegetation supports broad-leaved emergent plants such as *Nuphar advena* (yellow pond-lily), *Nuphar orbiculata* (yellow pond-lily), *Nuphar sagittifolia* (yellow pond-lily), *Peltandra virginica* (green arrow-arum), *Pontederia cordata* (pickerelweed), and *Sagittaria* (arrowhead) spp.; annual and perennial grasses such as *Calamagrostis canadensis* (bluejoint), *Leersia oryzoides* (rice cutgrass), *Panicum hemitomon* (maidencane), *Spartina cynosuroides* (big cordgrass), *Spartina patens* (saltmeadow cordgrass), *Zizania aquatica* (annual wildrice), *Zizaniopsis miliacea* (giant cutgrass); sedges and rushes such as *Carex* (sedge) spp., *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Eleocharis* (spikerush) spp., *Fuirena* (umbrella-sedge) spp., *Schoenoplectus pungens* (common threesquare), *Schoenoplectus tabernaemontani* (softstem bulrush); other grass-like plants and annual and perennial forbs such as *Acorus calamus* (calamus), *Amaranthus cannabinus* (tidalmarsh amaranth), *Ambrosia trifida* (great ragweed), *Bidens* (beggarticks) spp., *Impatiens capensis* (orange jewelweed), *Hibiscus moscheutos* (crimson-eyed rosemallow), *Kosteletzkya virginica* (Virginia saltmarsh mallow), *Polygonum* (knotweed) spp., *Sium suave* (hemlock waterparsnip), *Typha* (cattail) spp.; and scattered shrubs such as *Cephalanthus occidentalis* (common buttonbush) and *Morella cerifera* (wax-myrtle).

G914. NORTH ATLANTIC COASTAL TIDAL FRESHWATER MARSH

A1708 *Nuphar advena - Nuphar sagittifolia* Tidal Freshwater Marsh Alliance

These tidal mudflats of the eastern United States are dominated by species of *Nuphar* (pond-lily). Association dominants include *Nuphar advena* (yellow pond-lily) or *Nuphar sagittifolia* (yellow pond-lily). This alliance includes vegetation of freshwater tidal rivers where the water depth is approximately 2-3 m or less. *Nuphar* (pond-lily) sp. and *Nymphaea odorata* (American white waterlily) are dominant; these species quickly spread from their rhizomes and shade out other vegetation. Other species may include *Potamogeton epihydrus* (ribbonleaf

pondweed), *Peltandra virginica* (green arrow-arum), *Nymphoides cordata* (little floatingheart), and *Zizania aquatica* (annual wildrice). In Delaware, this alliance occurs in nearly pure stands below mean low water on mudflats that are exposed at low tide and on the submerged point bars of stream meanders.

[CEGL004472] *Nuphar advena* Tidal Marsh

Translated Name: **Broadleaf Pond-lily Tidal Marsh**
Common Name: **Broadleaf Pond-lily Tidal Marsh**

USNVC Classification

Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	North Atlantic Coastal Tidal Freshwater Marsh (G914)
Alliance	*Nuphar advena* - *Nuphar sagittifolia* Tidal Freshwater Marsh Alliance (A1708)

Element Concept

Global Summary: This association comprises submerged freshwater tidal mudflats of coastal rivers along the Atlantic coast that are dominated by *Nuphar advena* (yellow pond-lily). This association occurs at low elevations within freshwater tidal marshes, within tidal range but beyond the influence of salinity. It generally occurs below mean low-water level where water depth is approximately 1-3 m or less. It receives a relatively long duration of flooding and is infrequently exposed at only the lowest tides. The association occurs on unconsolidated tidal mudflats and submerged point bars of large coastal river meanders adjacent to open water of river or tidal creek channels. Substrate is silty alluvial mud that is reported to be high in organic matter content at some sites; soil samples from 10 Virginia sites for this vegetation vary in humic matter content from 2 to 26% (mean = 11.5%). Vegetation of this association is characterized by large clonal stands of dense leafy forbs dominated by *Nuphar advena* (yellow pond-lily). Associated species tend to occur as scattered individuals and include *Peltandra virginica* (green arrow-arum), which can also be locally codominant, *Pontederia cordata* (pickerelweed), *Zizania aquatica* (annual wildrice), *Sagittaria latifolia* (broadleaf arrowhead), *Bidens laevis* (smooth beggarticks), *Acorus calamus* (calamus), and/or *Bolboschoenus fluviatilis* (river bulrush). *Nuphar advena* (yellow pond-lily) forms nearly monotypic stands early in the growing season. Associated species emerge later in the season and can eventually overtop *Nuphar* (pond-lily) plants, which senesce and tend to become insect-infested in late summer. Submerged aquatic species can occur in this association, including *Potamogeton epihydrus* (ribbonleaf pondweed), *Ceratophyllum demersum* (coon's-tail), and the invasive exotic *Hydrilla verticillata* (waterthyme).

Environmental Description

George Washington Memorial Parkway Environment: Broadleaf Pond-lily Tidal Marsh is an herbaceous tidal wetland that occurs on low, intertidal to subtidal mudflats along the Potomac River and at the mouth of major tidal creeks and channels. Sites are exposed only at low tide. Soils are typically composed of silty clay deposited at slow-flowing discharge zones of tidal creeks and channels.
National Capital Parks-East Environment: This broadleaf pond-lily tidal marsh was sample twice in the park. It is positioned in low, intertidal and subtidal zones subject to regular freshwater tidal flooding. Water depth varies between 1 and 3 m, and substrates for the most part are unconsolidated tidal muck. The unvegetated ground surface is almost exclusively standing water with just a trace of leaf litter. No evidence of disturbance was reported. A large occurrence of this vegetation is found inside Mockley Point along the Piscataway Creek. Here, this association transitions to Freshwater Tidal Mixed High Marsh (CEGL006325).
Global Environment: This association occurs at low elevations within freshwater tidal marshes, within tidal range but beyond the influence of salinity. It generally occurs below mean low-water level where water depth is approximately 1-3 m or less. It receives a relatively long duration of flooding and is infrequently exposed at only the lowest tides. The association occurs on unconsolidated tidal mudflats and submerged point bars of large coastal river meanders adjacent to open water of river or tidal creek channels. Substrate is silty alluvial mud that is reported to be high in organic matter content at some sites; soil samples from 10 Virginia sites for this vegetation vary in humic matter content from 2 to 26% (mean = 11.5%).

Vegetation Description

George Washington Memorial Parkway Vegetation: This herbaceous tidal wetland has *Nuphar advena* (yellow pond-lily) dominant in nearly pure stands, the cover of which may range from 50% to >75%. Where present, the submerged aquatic species *Ceratophyllum demersum* (coon's-tail) may attain equal or greater cover and can be easily overlooked since it remains submerged during low tide. No other native species is consistently present in this

compositionally variable vegetation type. The only other native species recorded at stands in the park (with only 1-2% cover) is *Pontederia cordata* (pickerelweed). The aggressive exotic *Hydrilla verticillata* (waterthyme) has invaded some stands and should be considered a significant threat to native submerged aquatic vegetation.
National Capital Parks-East Vegetation: This vegetation forms a dense monotypic stand of *Nuphar advena* (yellow pond-lily) inside of Mockley Point. Submerged beds of the exotic *Hydrilla verticillata* (waterthyme) occur beneath *Nuphar advena* (yellow pond-lily) in deep (3 m) subtidal stands. In shallower zones inland, *Peltandra virginica* (green arrow-arum) is a low-cover associate and denotes a gradual transition to higher marsh types (i.e., Freshwater Tidal Mixed High Marsh (CEGL006325)).
Global Vegetation: Vegetation of this association is characterized by large clonal stands of dense leafy forbs dominated by *Nuphar advena* (yellow pond-lily). Associated species tend to occur as scattered individuals and include *Peltandra virginica* (green arrow-arum), which can also be locally codominant, *Pontederia cordata* (pickerelweed), *Zizania aquatica* (annual wildrice), *Sagittaria latifolia* (broadleaf arrowhead), *Bidens laevis* (smooth beggarticks), *Acorus calamus* (calamus), and/or *Bolboschoenus fluviatilis* (river bulrush). *Nuphar advena* (yellow pond-lily) forms nearly monotypic stands early in the growing season. Associated species emerge later in the season and can eventually overtop *Nuphar* (pond-lily) plants, which senesce and tend to become insect-infested in late summer. Submerged aquatic species can occur in this association, including *Potamogeton epihydrus* (ribbonleaf pondweed), *Ceratophyllum demersum* (coon's-tail), and the invasive exotic *Hydrilla verticillata* (waterthyme). In shallower waters, additional mudflat species can occur. In Virginia and Maryland stands, submerged aquatics such as *Ceratophyllum demersum* (coon's-tail) may have significant cover, but few other emergent species co-occur, even late in the season. The mean species richness of 19 Virginia and Maryland plot samples was 2 taxa per 100 m2.
Global Dynamics: Freshwater tidal marshes are naturally dynamic systems that are best developed where there is a major input of freshwater, a daily tidal range of at least 0.5 m, and a geomorphology that tends to constrict and magnify tidal influence in the upper reaches of the estuary (Odum et al. 1984). They are subject to diurnal flooding by tides and seasonal and episodic flooding from river discharge. Plant composition of freshwater tidal marshes generally occurs as a mosaic of patches dominated by a few or a single species. Species composition is determined by species life history characteristics, especially lifeform, phenology and mode of regeneration in response to microhabitat conditions, and the frequency and duration of flooding. Plant composition has seasonal variation.

Landward, this community can grade into other freshwater tidal marsh associations, especially ~*Peltandra virginica* - *Pontederia cordata* Tidal Marsh (CEGL004706)$$. Seaward, this association grades into submerged aquatic vegetation.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Nuphar advena* (yellow pond-lily)

CHARACTERISTIC SPECIES

George Washington Memorial Parkway: *Ceratophyllum demersum* (coon's-tail), *Nuphar advena* (yellow pond-lily)
National Capital Parks-East: *Nuphar advena* (yellow pond-lily)
Global: *Nuphar advena* (yellow pond-lily)

OTHER NOTEWORTHY SPECIES

George Washington Memorial Parkway: Invasive/Exotic Plants: *Hydrilla verticillata* (waterthyme, High/Medium)
Global: Invasive/Exotic Plants: *Hydrilla verticillata* (waterthyme, High/Medium, U.S. federal noxious weed)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (19-Jan-2006). This vegetation ranges from Delaware Bay to North Carolina, with a discontinuous range north to Maine. It occurs in the freshwater tidal portions of large rivers and embayments and can occupy large patches. This vegetation is vulnerable to pollution from coastal run-off as well as oil spills off the coast.

RELATED CONCEPTS

Global Similar Types:
- *Nuphar advena* - *Nymphaea odorata* Aquatic Vegetation (CEGL002386)
- *Peltandra virginica* - *Pontederia cordata* Tidal Marsh (CEGL004706)

Global Related Concepts:

- *Ceratophyllum demersum - Nuphar advena* Freshwater Tidal Mudflat (Walton et al. 2001) =
- *Nuphar advena - (Ceratophyllum demersum)* Tidal Herbaceous Vegetation (Coulling 2002) =
- *Nuphar advena - Peltandra virginica* Tidal Herbaceous Vegetation (Coulling 2002) **?**
- *Nuphar advena - Peltandra virginica* Tidally Flooded Herbaceous Vegetation (McCoy and Fleming 2000) **?**
- *Nuphar advena* (Good and Good 1975b) =
- *Nuphar advena* Tidal Herbaceous Vegetation (Harrison 2001) =
- FW Tidal Marsh (Rawinski 1984a) **?**
- Freshwater Tidal Marsh: Mud Flat Type (McCoy and Fleming 2000) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
George Washington Memorial Parkway Classification Comments: Broadleaf Pond-lily Tidal Marsh (also referred to as Pond-lily Tidal Marsh) is easily recognizable in the park as it is the only tidal wetland with *Nuphar advena* (yellow pond-lily) dominant in nearly pure stands. It often occurs adjacent to and at slightly lower elevations than Green Arrow-arum - Pickerelweed Tidal Marsh (CEGL004706), which can also have *Nuphar advena* (yellow pond-lily) as a component. The duration of inundation in Broadleaf Pond-lily Tidal Marsh is longer and stands have much lower species richness.
National Capital Parks-East Classification Comments: Broadleaf Pond-lily Tidal Marsh is also referred to as Pond-lily Tidal Marsh.
Global Classification Comments: In Virginia, this association is apparently absent from larger tidal rivers such as the Rappahannock and James rivers, where discharge and ebb currents are too great to permit the development of wide estuarine meanders and the deposition of extensive bars of silty clay (Coulling 2002). Taxonomic ambiguity between *Nuphar advena* (yellow pond-lily) and *Nuphar variegata* (variegated yellow pond-lily) in past inventory efforts obscures our current understanding of the range of this type in New England. More data are needed to determine the complete range with greater confidence.

ELEMENT DISTRIBUTION

George Washington Memorial Parkway Range: Broadleaf Pond-lily Tidal Marsh occurs in scattered patches south of Roosevelt Island. It occurs along the main stem of the Potomac River at Dyke Marsh and along the lower portions of Hunting Creek and Roaches Run.
National Capital Parks-East Range: Broadleaf Pond-lily Tidal Marsh was sampled in a cove of Mockley Point at Piscataway Park in Prince Georges County, Maryland. It has also been observed at Harmony Hall. These sites are along the Potomac River.
Global Range: This association occurs along tidal rivers from New York to North Carolina.
Nations: US
States/Provinces: DC:SNR, DE:S4, MD:S4, ME:SNR, NC:SNR, NJ:S2S3, NY:SNR, PA:SNR, VA:S3
TNC Ecoregions: 57:C, 58:C, 61:C, 62:C
USFS Ecoregions (2007): 221Ae:CCC, 232Ac:CCP, 232Ad:CCC, 232C:CC, 232Ha:CC?, 232Hb:CCC, 232Hc:CCP, 232Hd:CCP, 232Je:C??
Federal Lands: NPS (George Washington Parkway, National Capital-East, Roosevelt-Vanderbilt); USFWS (Chesapeake Marshlands, Prime Hook)

ELEMENT SOURCES

George Washington Memorial Parkway Plots: GWMP.33, GWMP.50.
National Capital Parks-East Plots: (2 plots: NACE.209, NACE.210).
George Washington Memorial Parkway Description Author(s): K. Taverna and G. Fleming
National Capital Parks-East Description Author(s): J.W. Harrison, mod. M.J. Russo
Global Description Author(s): S.L. Neid and G.P. Fleming
References: Breden 1989, Breden et al. 2001, Brumback and Mehrhoff 1996, Coulling 2002, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2014a, Fleming et al. 2007b, Fleming et al. 2017, Good and Good 1975b, Harrison 2001, Harrison 2004, Harrison 2011, McCormick and Ashbaugh 1972, McCormick et al. 1970, McCoy and Fleming 2000, Odum et al. 1984, Peet et al. unpubl. data, Rawinski 1984a, Reschke 1990, Rhoads and Block 2011c, Schafale 2012, Schafale and Weakley 1990, Sechler et al. 2014, Walton et al. 2001, Zimmerman et al. 2012

A4017 *Peltandra virginica - Pontederia cordata - Sagittaria* spp. Oligohaline Tidal Marsh Alliance

This alliance comprises vegetation of oligohaline marshes occurring on tidal rivers beyond significant influence by saline waters, as evidenced by the absence of halophytic species. The vegetation is widely variable and characterized by small to large leafy forbs and graminoids. Associations occur at various microtopographic positions, ranging from high marsh to low marsh and tidal flats. *Peltandra virginica* (green arrow-arum), *Pontederia cordata* (pickerelweed), and *Sagittaria* (arrowhead) spp. are characteristic and dominant to codominant. Other characteristic species are diverse and numerous, and may include *Acorus calamus* (calamus), *Amaranthus cannabinus* (tidalmarsh amaranth), *Hibiscus moscheutos* (crimson-eyed rosemallow), *Impatiens capensis* (orange jewelweed), and *Thelypteris palustris* (eastern marsh fern), as well as species of *Carex* (sedge), *Polygonum* (knotweed), *Sagittaria* (arrowhead), and *Schoenoplectus* (bulrush). This alliance occurs in coastal areas from Maine to Virginia and may occur in Quebec and maritime Canada.

[CEGL006833] *Acorus calamus* Tidal Marsh

Translated Name: **European Sweetflag Tidal Marsh**
Common Name: **Sweetflag Tidal Marsh**

USNVC Classification

Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	North Atlantic Coastal Tidal Freshwater Marsh (G914)
Alliance	*Peltandra virginica - Pontederia cordata - Sagittaria* spp. Oligohaline Tidal Marsh Alliance (A4017)

Element Concept

Global Summary: This is an association of tidal freshwater marsh dominated by *Acorus calamus* (calamus) that occurs in fresh to oligohaline reaches of tidal rivers along the Atlantic Coast from Massachusetts to Virginia. This association is best developed in higher, irregularly flooded elevations within freshwater tidal marshes but can occur in areas with a wide tidal range. Substrate is generally fine-particled, but varies from silts and silty mucks to peats and sands. The setting within the tidal marsh tends to be poorly drained; tidal flooding is ponded and of longer duration than adjacent areas. *Acorus calamus* (calamus) is dominant, generally comprising at least 50% cover, over extensive patches within the interior of high marshes. *Peltandra virginica* (green arrow-arum) is a frequent associate. Other associated species are variable and can include *Bolboschoenus fluviatilis* (river bulrush), *Sagittaria latifolia* (broadleaf arrowhead), *Polygonum punctatum* (dotted smartweed), and *Impatiens capensis* (orange jewelweed). Species that can occasionally occur include *Pontederia cordata* (pickerelweed), *Zizania aquatica* (annual wildrice), *Leersia oryzoides* (rice cutgrass), *Typha latifolia* (broadleaf cattail), *Polygonum arifolium* (halberdleaf tearthumb), *Bidens coronata* (crowned beggarticks), *Hibiscus moscheutos* (crimson-eyed rosemallow), and other *Schoenoplectus* (bulrush) spp. *Murdannia keisak* (wartremoving herb) has been noted in the southern portion of the range. *Acorus calamus* (calamus) is conspicuously dominant in spring and early summer. Later in the season, culms tend to lodge and form mats and be overtopped by other species.

Environmental Description

Global Environment: The association is best developed at higher, irregularly flooded elevations within fresh and oligohaline tidal marshes but can occur in areas with a wide tidal range. Substrate is generally fine-particled, but varies from silts and silty mucks to peats and sands. The setting within the tidal marsh tends to be poorly drained; tidal flooding is ponded and of longer duration than other areas. *Acorus calamus* (calamus) can occur in low mid-tidal areas, but extensive colonies do not tend to develop in these situations.

Vegetation Description

Global Vegetation: This is a tall tidally flooded grassland dominated by *Acorus calamus* (calamus), which can form dense colonies over extensive patches within the interior of high marshes. Associated species are variable and can include *Bolboschoenus fluviatilis* (river bulrush), *Peltandra virginica* (green arrow-arum), *Sagittaria latifolia* (broadleaf arrowhead), *Polygonum punctatum* (dotted smartweed), and *Impatiens capensis* (orange jewelweed). Species that can occasionally occur include *Pontederia cordata* (pickerelweed), *Zizania aquatica* (annual wildrice), *Leersia oryzoides* (rice cutgrass), *Typha latifolia* (broadleaf cattail), *Polygonum arifolium* (halberdleaf tearthumb), *Bidens coronata* (crowned beggarticks), *Hibiscus moscheutos* (crimson-eyed rosemallow), and other *Schoenoplectus*

(bulrush) spp. *Murdannia keisak* (wartremoving herb) has been noted in the southern portion of the range *Acorus calamus* (calamus) is conspicuously dominant in spring and early summer. Later in the season, culms tend to lodge and form mats and be overtopped by other species.

Global Dynamics: Freshwater tidal marshes are naturally dynamic systems that are best developed where there is a major input of freshwater, a daily tidal range of at least 0.5 m, and a geomorphology that tends to constrict and magnify tidal influence in the upper reaches of the estuary (Odum et al. 1984). They are subject to diurnal flooding by tides and seasonal and episodic flooding from river discharge. Plant composition of freshwater tidal marshes generally occurs as a mosaic of patches dominated by a few or a single species. Species composition is determined by species life history characteristics, especially lifeform, phenology and mode of regeneration in response to microhabitat conditions and the frequency and duration of flooding. Plant composition has seasonal variation.

Acorus calamus (calamus) forms large, clonal patches (Barrett 1989). Its rhizomes can locally raise the surface of the marsh, effectively ponding tidal waters and trapping debris and sediments in backmarsh areas (Caldwell 1990).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Acorus calamus* (calamus)

CHARACTERISTIC SPECIES

Global: *Acorus calamus* (calamus)

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Murdannia keisak* (wartremoving herb, Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR

RELATED CONCEPTS

Global Related Concepts:

- *Acorus calamus* tidally-flooded grasslands (Metzler and Barrett 2006) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: This vegetation is considered a modified type by the Delaware Natural Heritage Program. Although the native status of *Acorus calamus* (calamus) has been debated, North American specimens are apparently sterile triploids introduced from Europe (Coulling 2002).

ELEMENT DISTRIBUTION

Global Range: Currently described from Massachusetts to Virginia.
Nations: US
States/Provinces: CT:SNR, DC?:SNA, DE:SNR, MA:SNR, MD:S4?, NJ:SNR, VA:SU
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions (2007): 221Ad:CCC, 221Af:CCP, 221Ak:CC?, 232Ac:CCP, 232Ad:CCP, 232Ha:CC?, 232Hb:CCC, 232Hd:CCP, 232Je:C??
Federal Lands: NPS (George Washington Parkway?, National Capital-East?)

ELEMENT SOURCES

Global Description Author(s): S.L. Neid and L.A. Sneddon
References: Barrett 1989, Barrett 1994, Caldwell 1990, Coulling 2002, Coxe 2009, Eastern Ecology Working Group n.d.*, Fleming et al. 2017, Harrison 2001, Harrison 2004, Harrison 2011, McCormick and Ashbaugh 1972, Metzler and Barrett 2006, Odum et al. 1984, Swain and Kearsley 2014

[CEGL006325] *Impatiens capensis - Peltandra virginica - Polygonum arifolium - Bolboschoenus fluviatilis - Typha angustifolia* Tidal Marsh

Translated Name: **Orange Jewelweed - Green Arrow-arum - Halberd-leaf Tearthumb - River Bulrush - Narrowleaf Cattail Tidal Marsh**

Common Name: **Freshwater Tidal Mixed High Marsh**

USNVC Classification

Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	North Atlantic Coastal Tidal Freshwater Marsh (G914)
Alliance	*Peltandra virginica* - *Pontederia cordata* - *Sagittaria* spp. Oligohaline Tidal Marsh Alliance

(A4017)

Element Concept

Global Summary: This association occupies the higher elevation zone of freshwater to slightly oligohaline marshes along the Atlantic coast from Maine to Virginia. In the southern part of the range (northern Virginia, Maryland, and Delaware), this is the principal mixed freshwater tidal marsh community, forming extensive patches. The vegetation is typically mixed and dense, with highly variable species composition and patch dominance. *Impatiens capensis* (orange jewelweed), *Peltandra virginica* (green arrow-arum), *Polygonum* (knotweed) spp. (*Polygonum arifolium* (halberdleaf tearthumb), *Polygonum sagittatum* (arrowleaf tearthumb), *Polygonum punctatum* (dotted smartweed), *Polygonum hydropiperoides* (swamp smartweed)), *Bolboschoenus fluviatilis* (river bulrush), and *Typha angustifolia* (narrowleaf cattail) are characteristic and often abundant. Other species that may be abundant in a given stand include *Leersia oryzoides* (rice cutgrass), *Hibiscus moscheutos* (crimson-eyed rosemallow), *Mikania scandens* (climbing hempvine), *Sagittaria latifolia* (broadleaf arrowhead), *Amaranthus cannabinus* (tidalmarsh amaranth), *Zizania aquatica* (annual wildrice), *Bidens laevis* (smooth beggarticks), *Bidens coronata* (crowned beggarticks), *Pontederia cordata* (pickerelweed), *Typha latifolia* (broadleaf cattail), *Onoclea sensibilis* (sensitive fern), and *Carex comosa* (longhair sedge). Additional associates include *Boehmeria cylindrica* (small-spike false nettle), *Acorus calamus* (calamus), *Cicuta maculata var. maculata* (spotted water hemlock), *Cuscuta gronovii var. gronovii* (scaldweed), *Apios americana* (groundnut), *Schoenoplectus tabernaemontani* (softstem bulrush), *Bolboschoenus novae-angliae* (New England bulrush), *Echinochloa walteri* (coast cockspur grass), *Lycopus americanus* (American water horehound), *Pilea fontana* (lesser clearweed), *Eleocharis palustris* (common spikerush), *Iris versicolor* (harlequin blueflag), and *Sium suave* (hemlock waterparsnip). In the northern portion of the range, *Carex stricta* (upright sedge) is also common. On the Connecticut River, *Impatiens capensis* (orange jewelweed) is less important, and a levee is often present in the high marsh supporting such species as *Carex lacustris* (hairy sedge), *Ambrosia trifida* (great ragweed), and *Eupatorium perfoliatum* (common boneset).

Environmental Description

George Washington Memorial Parkway Environment: Freshwater Tidal Mixed High Marsh is a mixed marsh of freshwater to slightly oligohaline conditions. It forms extensive patches in the interior of the intertidal zone of the Potomac River. Soils are primarily dark brown mucky silts rich in fine organic matter and roots.

National Capital Parks-East Environment: This freshwater tidal marsh was sample at seven locations in the park. It is positioned in slightly elevated zones along small tidal creeks and coves bordering the Potomac River and Piscataway Creek. Patch shape and size are variable, ranging from small linear stands bordering coves to large expansive stands flanking tidal creeks with broader floodplains (i.e., Bull Cove). Stands range from regular to irregular tidal flooding depending on elevation and landscape position. Substrates are firm, dark brown tidal mucks with high amounts of sand and organic material. The unvegetated ground surface is dominated by leaf litter with some wood, standing water, and bare soil; one site is dominated by exposed sand. Evidence of disturbance includes the presence of exotic plants.

Global Environment: This association occupies the higher elevation zone of freshwater to slightly oligohaline river marshes. Soils are reported to be highly variable across the range, varying from silts and silty mucks to peats and sands. Samples collected from 18 Chesapeake Bay region plots were mostly dark brown mucky silts (rarely mucky clays) rich in fine organic matter and roots.

Vegetation Description

George Washington Memorial Parkway Vegetation: The vegetation of this marsh type is tall and mixed with variable patch-dominance by *Impatiens capensis* (orange jewelweed), *Typha angustifolia* (narrowleaf cattail), *Bolboschoenus fluviatilis* (river bulrush), *Polygonum arifolium* (halberdleaf tearthumb), *Bidens laevis* (smooth beggarticks), and *Sagittaria latifolia* (broadleaf arrowhead). Relative abundance of these key species is highly variable. Additional species that are constant in stands (but with lower cover) include *Peltandra virginica* (green arrow-arum), *Acorus calamus* (calamus), *Leersia oryzoides* (rice cutgrass), *Zizania aquatica var. aquatica* (annual wildrice), *Cuscuta gronovii var. gronovii* (scaldweed), and *Apios americana* (groundnut).

National Capital Parks-East Vegetation: The species assemblage of this densely vegetated freshwater marsh exhibits considerable variation and typically includes one or more patch dominant species. Stands sampled include species such as *Typha angustifolia* (narrowleaf cattail), *Polygonum arifolium* (halberdleaf tearthumb), *Bolboschoenus fluviatilis* (river bulrush) (MD-state critically imperiled), *Impatiens capensis* (orange jewelweed), *Zizania aquatica* (annual wildrice), and *Leersia oryzoides* (rice cutgrass) at high cover. *Typha angustifolia* (narrowleaf cattail) dominates most of the stands sampled. Other species characteristic of this type include *Polygonum punctatum* (dotted smartweed), *Pontederia cordata* (pickerelweed), *Acorus calamus* (calamus), *Peltandra virginica* (green arrow-arum), *Hibiscus moscheutos* (crimson-eyed rosemallow), *Echinochloa walteri* (coast cockspur grass), *Amaranthus cannabinus* (tidalmarsh amaranth), *Pilea pumila* (Canadian clearweed), *Bidens coronata* (crowned beggarticks), and *Boehmeria cylindrica* (small-spike false nettle). All stands sampled around Mockley Point contain the invasive exotic *Murdannia keisak* (wartremoving herb).
Global Vegetation: These are mixed, dense, and often diverse marshes with highly variable species composition and patch dominance. Despite compositional variation, *Impatiens capensis* (orange jewelweed), *Peltandra virginica* (green arrow-arum), *Polygonum* (knotweed) spp. (*Polygonum arifolium* (halberdleaf tearthumb), *Polygonum sagittatum* (arrowleaf tearthumb), *Polygonum punctatum* (dotted smartweed), *Polygonum hydropiperoides* (swamp smartweed)), *Bolboschoenus fluviatilis* (river bulrush), and *Typha angustifolia* (narrowleaf cattail) are characteristic and often abundant. Other species that may be abundant in a given stand include *Leersia oryzoides* (rice cutgrass), *Hibiscus moscheutos* (crimson-eyed rosemallow), *Mikania scandens* (climbing hempvine), *Sagittaria latifolia* (broadleaf arrowhead), *Amaranthus cannabinus* (tidalmarsh amaranth), *Zizania aquatica* (annual wildrice), *Bidens laevis* (smooth beggarticks), *Bidens coronata* (crowned beggarticks), *Pontederia cordata* (pickerelweed), *Typha latifolia* (broadleaf cattail), *Onoclea sensibilis* (sensitive fern), and *Carex comosa* (longhair sedge). Additional associates include *Boehmeria cylindrica* (small-spike false nettle), *Acorus calamus* (calamus), *Cicuta maculata var. maculata* (spotted water hemlock), *Cuscuta gronovii var. gronovii* (scaldweed), *Apios americana* (groundnut), *Schoenoplectus tabernaemontani* (softstem bulrush), *Bolboschoenus novae-angliae* (New England bulrush), *Echinochloa walteri* (coast cockspur grass), *Lycopus americanus* (American water horehound), *Pilea fontana* (lesser clearweed), *Eleocharis palustris* (common spikerush), *Iris versicolor* (harlequin blueflag), and *Sium suave* (hemlock waterparsnip). In the northern portion of the range, *Carex stricta* (upright sedge) is also common. On the Connecticut River, *Impatiens capensis* (orange jewelweed) is less important, and a levee is often present in the high marsh supporting such species as *Carex lacustris* (hairy sedge), *Ambrosia trifida* (great ragweed), and *Eupatorium perfoliatum* (common boneset). Mean species richness of 39 Maryland and Virginia plot samples was 19 taxa per 100 m2. The exotics *Murdannia keisak* (wartremoving herb), *Lythrum salicaria* (purple loosestrife), and *Phragmites australis* (common reed) have all been reported to be invasive in this association in various parts of its range.
Global Dynamics: Freshwater tidal marshes are naturally dynamic systems that are best developed where there is a major input of freshwater, a daily tidal range of at least 0.5 m, and a geomorphology that tends to constrict and magnify tidal influence in the upper reaches of the estuary (Odum et al. 1984). They are subject to diurnal flooding by tides and seasonal and episodic flooding from river discharge. Plant composition of freshwater tidal marshes generally occurs as a mosaic of patches dominated by a few or a single species. Species composition is determined by species life history characteristics, especially lifeform, phenology and mode of regeneration in response to microhabitat conditions, and the frequency and duration of flooding. Plant composition has seasonal variation. This association occurs in the higher elevation zones of freshwater tidal marsh systems.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Impatiens capensis* (orange jewelweed), *Peltandra virginica* (green arrow-arum), *Polygonum arifolium* (halberdleaf tearthumb)
Herb (field)	Graminoid	*Bolboschoenus fluviatilis* (river bulrush), *Typha angustifolia* (narrowleaf cattail)

CHARACTERISTIC SPECIES

George Washington Memorial Parkway: *Bolboschoenus fluviatilis* (river bulrush), *Impatiens capensis* (orange jewelweed), *Polygonum arifolium* (halberdleaf tearthumb), *Sagittaria latifolia* (broadleaf arrowhead), *Typha angustifolia* (narrowleaf cattail)
National Capital Parks-East: *Acorus calamus* (calamus), *Amaranthus cannabinus* (tidalmarsh amaranth), *Bidens coronata* (crowned beggarticks), *Boehmeria cylindrica* (small-spike false nettle), *Echinochloa walteri* (coast

cockspur grass), *Hibiscus moscheutos* (crimson-eyed rosemallow), *Peltandra virginica* (green arrow-arum), *Pilea pumila* (Canadian clearweed), *Polygonum punctatum* (dotted smartweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Pontederia cordata* (pickerelweed)
Global: *Bolboschoenus fluviatilis* (river bulrush), *Impatiens capensis* (orange jewelweed), *Peltandra virginica* (green arrow-arum), *Polygonum arifolium* (halberdleaf tearthumb), *Typha angustifolia* (narrowleaf cattail)

OTHER NOTEWORTHY SPECIES

George Washington Memorial Parkway: Vulnerable Plants: *Bolboschoenus fluviatilis* (river bulrush, G5, VA state-imperiled); **Invasive/Exotic Plants**: *Murdannia keisak* (wartremoving herb, Medium/Low), *Solanum dulcamara* var. *dulcamara* (climbing nightshade), *Typha angustifolia* (narrowleaf cattail, High/Medium)
National Capital Parks-East: Vulnerable Plants: *Bidens coronata* (crowned beggarticks, G5?, MD-vulnerable), *Bolboschoenus fluviatilis* (river bulrush, G5, MD-critically imperiled); **Invasive/Exotic Plants**: *Acorus calamus* (calamus), *Clematis terniflora* (sweet autumn virginsbower), *Murdannia keisak* (wartremoving herb, Medium/Low), *Poncirus trifoliata* (hardy orange), *Typha angustifolia* (narrowleaf cattail, High/Medium)
Global: Vulnerable Plants: *Bidens bidentoides* (Delmarva beggarticks, G3G4); **Invasive/Exotic Plants**: *Lythrum salicaria* (purple loosestrife, High), *Murdannia keisak* (wartremoving herb, Medium/Low), *Phragmites australis* (common reed, High)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (14-Jul-2016).

RELATED CONCEPTS

Global Similar Types:
- *Amaranthus cannabinus* Tidal Marsh (CEGL006080)
- *Carex stricta - Peltandra virginica - Sagittaria (lancifolia ssp. media, latifolia)* Tidal Marsh (CEGL004314)
- *Hibiscus moscheutos - Polygonum punctatum - Peltandra virginica* Tidal Marsh (CEGL006181)
- *Peltandra virginica - Pontederia cordata* Tidal Marsh (CEGL004706) often co-occurs at lower relative elevations.

Global Related Concepts:
- *Bidens laevis - Zizania aquatica var. aquatica - Hibiscus moscheutos* Tidal Herbaceous Vegetation (Walton et al. 2001) =
- *Carex lacustris* marsh community (Barrett 1989) <
- *Impatiens capensis - Polygonum sagittatum - Zizania aquatica - (Bidens laevis, coronata)* Tidal Herbaceous Vegetation (Coulling 2002) =
- *Impatiens capensis - Sagittaria latifolia - Peltandra virginica* Tidal Herbaceous Vegetation (Clancy 1996) =
- *Onoclea sensibilis - Schoenoplectus fluviatilis - Typha* spp. community (Metzler and Barrett 2006) =
- *Onoclea sensibilis / Thelypteris palustris* marsh community (Barrett 1989) <
- *Onoclea sensibilis* marsh community (Barrett 1989) <
- *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation (Harrison 2001) =
- *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation (Bartgis 1986) =
- *Peltandra virginica* marsh community (Barrett 1989) <
- *Polygonum punctatum - Bidens coronata* Freshwater Marsh (Walton et al. 2001) =
- *Typha latifolia - Scirpus fluviatilis - Carex comosa* Tidally Flooded Herbaceous Vegetation (McCoy and Fleming 2000) <
- FW Tidal Marsh (Rawinski 1984a) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
George Washington Memorial Parkway Classification Comments: Freshwater Tidal Mixed High Marsh is distinguished by its tall native herbaceous vegetation in marshes along the Potomac shoreline. It is the only marsh type that is dominated by dense tall native forbs. Common Reed Tidal Herbaceous Vegetation (CEGL004187) is also dominated by dense tall vegetation, but it is a disturbed type solely dominated by the exotic *Phragmites australis* (common reed).
Global Classification Comments: Classification of this type at the southern end of its range is supported by analysis of an 800-plot regional dataset of tidal vegetation assembled for the NCR and Mid-Atlantic region vegetation mapping projects. It is documented by 39 plots from the Chester, Choptank, James, Nanticoke, Pocomoke, and Potomac river drainages in Maryland and Virginia.

ELEMENT DISTRIBUTION

George Washington Memorial Parkway Range: Freshwater Tidal Mixed High Marsh occurs in scattered patches along the shoreline of the Potomac River in the park. Extensive stands occur at Dyke Marsh, where it is the dominant vegetation type.
National Capital Parks-East Range: This association occurs along the Potomac River and Piscataway Creek. It was sampled in a cove of Mockley Point, on a sand levee bordering the Potomac River, in another small cove west of Wharf Road and other locations at Piscataway Park in Prince Georges County, and at the mouth of a tributary entering Bull Cove of the Potomac at Marshall Hall in Charles County, Maryland. It is also found at Harmony Hall and Piscataway in Prince Georges County, Maryland.
Global Range: This association occurs in freshwater tidal marshes along the Atlantic coast from Maine to Virginia. Its southern limit is the intertidal portion of the James River in east-central Virginia. In the southern part of the range (northern Virginia, Maryland, and Delaware), this is the principal mixed freshwater tidal marsh community, forming extensive patches along many tidal rivers.
Nations: CA?,US
States/Provinces: CT:SNR, DC:SNR, DE:S1, MA:SNR, MD:S4?, ME:SNR, NJ:S3, NY:SNR, PA:SNR, QC?:SNA, VA:S3
TNC Ecoregions: 58:C, 61:C, 62:C
USFS Ecoregions (2007): 221Ac:CC?, 221Ad:CCC, 221Ak:CC?, 221Ba:CCC, 221D:CP, 232Ac:CCP, 232Ad:CCC, 232Ha:CC?, 232Hb:CCC, 232Hd:CCP, 232Je:C??
Federal Lands: DOD (Fort Belvoir); NPS (George Washington Parkway, National Capital-East); USFWS (Chesapeake Marshlands, Mason Neck)

ELEMENT SOURCES

George Washington Memorial Parkway Plots: GWMP.19, GWMP.20, GWMP.28, GWMP.29, GWMP.32.
National Capital Parks-East Plots: (7 plots: NACE.211, NACE.212, NACE.219, NACE.220, NACE.221, NACE.222, NACE.226).
George Washington Memorial Parkway Description Author(s): G. Fleming and K. Taverna
National Capital Parks-East Description Author(s): J.W. Harrison, mod. M.J. Russo
Global Description Author(s): S.L. Neid and G.P. Fleming
References: Barrett 1989, Barrett 1994, Bartgis 1986, Breden 1989, Breden et al. 2001, CDPNQ unpubl. data, Clancy 1996, Coulling 2002, Coxe 2009, Eastern Ecology Working Group n.d.*, Edinger et al. 2014a, Fleming et al. 2007b, Fleming et al. 2017, Gawler 2002, Gawler and Cutko 2010, Harrison 2001, Harrison 2004, Harrison 2011, McCoy and Fleming 2000, Metzler and Barrett 2006, Odum et al. 1984, Rawinski 1984a, Reschke 1990, Rhoads and Block 2011b, Swain and Kearsley 2014, Walton et al. 2001, Zimmerman et al. 2012

[CEGL004706] *Peltandra virginica - Pontederia cordata* Tidal Marsh

Translated Name: **Green Arrow-arum - Pickerelweed Tidal Marsh**
Common Name: **Green Arrow-arum - Pickerelweed Tidal Marsh**

USNVC CLASSIFICATION

Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	North Atlantic Coastal Tidal Freshwater Marsh (G914)
Alliance	*Peltandra virginica* - *Pontederia cordata* - *Sagittaria* spp. Oligohaline Tidal Marsh Alliance
(A4017)	

ELEMENT CONCEPT

Global Summary: This freshwater tidal marsh occurs from Maine to Virginia, excluding Rhode Island and New Hampshire. It is codominated by leafy forbs *Peltandra virginica* (green arrow-arum) and *Pontederia cordata* (pickerelweed). Associated species can include *Zizania aquatica* (annual wildrice), *Sagittaria latifolia* (broadleaf arrowhead), *Acorus americanus* (sweetflag), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum sagittatum* (arrowleaf tearthumb), and *Bidens* (beggarticks) spp. Species occurring less frequently can include *Typha* (cattail) spp. and *Impatiens capensis* (orange jewelweed). At the southern end of the range in Virginia, there is a well-marked variant in which *Nuphar advena* (yellow pond-lily) is codominant with *Peltandra virginica* (green arrow-arum) and *Pontederia cordata* (pickerelweed) in variable mixtures. This variant differs from the almost monospecific ~*Nuphar advena* (yellow pond-lily) Tidal Marsh

(CEGL004472)$$ in that it occurs on slightly higher landscape positions where the duration of inundation is shorter, supports higher mean species richness, and contains a number of taxa absent from the low intertidal portions of mudflats.

ENVIRONMENTAL DESCRIPTION

George Washington Memorial Parkway Environment: Green Arrow-arum - Pickerelweed Tidal Marsh is an herbaceous tidal wetland that occurs in the low intertidal zone near mouths of tidal creeks and channels, often bordering open water. It only occurs in the park at Dyke Marsh on mucky substrates of variable depth with a long duration of tidal flooding.

National Capital Parks-East Environment: Green Arrow-arum - Pickerelweed Tidal Marsh was sampled at two locations in the park. It occurs in shallow protected coves along Piscataway Creek. Stands occupy low intertidal and subtidal zones with long tidal hydroperiods (<1 m) and form a transition between higher marsh types, e.g., Freshwater Tidal Mixed High Marsh (CEGL006325) and Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest (CEGL006287), and tidal water. Substrates of stands sampled and observed range from muck to firm sand and gravel mixtures. The unvegetated ground surface is entirely standing water. No evidence of disturbance was reported other than the presence of the invasive/exotic *Hydrilla verticillata* (waterthyme).

Global Environment: This community occurs low within freshwater tidal marshes on muck substrates of variable depth. There is a long duration of tidal flooding, and the community is exposed only for a short period of time each day when the tide is out.

VEGETATION DESCRIPTION

George Washington Memorial Parkway Vegetation: This herbaceous tidal vegetation is typically dominated by variable combinations of *Peltandra virginica* (green arrow-arum), *Pontederia cordata* (pickerelweed), *Polygonum punctatum* (dotted smartweed), *Acorus americanus* (sweetflag), and *Nuphar advena* (yellow pond-lily). Other species that may occur as minor associates include *Zizania aquatica* (annual wildrice), *Sagittaria latifolia* (broadleaf arrowhead), *Bidens laevis* (smooth beggarticks), *Impatiens capensis* (orange jewelweed), *Polygonum arifolium* (halberdleaf tearthumb), *Amaranthus cannabinus* (tidalmarsh amaranth), and *Cuscuta gronovii var. gronovii* (scaldweed).

National Capital Parks-East Vegetation: The vegetation of this densely vegetated tidal marsh is strongly dominated by *Peltandra virginica* (green arrow-arum) and codominated by mixtures of *Pontederia cordata* (pickerelweed) and *Zizania aquatica* (annual wildrice). This type is transitional to Freshwater Tidal Mixed High Marsh (CEGL006325) and Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest (CEGL006287), and species more common to these may occur at low cover. Such species may include *Impatiens capensis* (orange jewelweed), *Acorus calamus* (calamus), *Sagittaria latifolia* (broadleaf arrowhead), *Boehmeria cylindrica* (small-spike false nettle), *Polygonum punctatum* (dotted smartweed), and *Typha angustifolia* (narrowleaf cattail). All stands sampled contain the invasive exotic *Hydrilla verticillata* (waterthyme).

Global Vegetation: This community is codominated by leafy forbs *Peltandra virginica* (green arrow-arum) and *Pontederia cordata* (pickerelweed). Associated species can include *Zizania aquatica* (annual wildrice), *Sagittaria latifolia* (broadleaf arrowhead), *Acorus americanus* (sweetflag), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum sagittatum* (arrowleaf tearthumb), and *Bidens* (beggarticks) spp. Species occurring less frequently can include *Typha* (cattail) spp. and *Impatiens capensis* (orange jewelweed). At the southern end of the range in Virginia, there is a well-marked variant in which *Nuphar advena* (yellow pond-lily) is codominant with *Peltandra virginica* (green arrow-arum) and *Pontederia cordata* (pickerelweed) in variable mixtures. This variant differs from the almost monospecific ~*Nuphar advena* (yellow pond-lily) Tidal Marsh (CEGL004472)$$ in that it occurs on slightly higher landscape positions where the duration of inundation is shorter, supports higher mean species richness, and contains a number of taxa absent from the low intertidal portions of mudflats.

Global Dynamics: Freshwater tidal marshes are naturally dynamic systems that are best developed where there is a major input of freshwater, a daily tidal range of at least 0.5 m, and a geomorphology that tends to constrict and magnify tidal influence in the upper reaches of the estuary (Odum et al. 1984). They are subject to diurnal flooding by tides and seasonal and episodic flooding from river discharge. Plant composition of freshwater tidal marshes generally occurs as a mosaic of patches dominated by a few or a single species. Species composition is determined by species life history characteristics, especially lifeform, phenology and mode of regeneration in response to microhabitat conditions, and the frequency and duration of flooding. Plant composition has seasonal variation.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Peltandra virginica* (green arrow-arum), *Pontederia cordata* (pickerelweed)

CHARACTERISTIC SPECIES

George Washington Memorial Parkway: *Acorus americanus* (sweetflag), *Nuphar advena* (yellow pond-lily), *Peltandra virginica* (green arrow-arum), *Polygonum punctatum* (dotted smartweed)
National Capital Parks-East: *Peltandra virginica* (green arrow-arum)
Global: *Peltandra virginica* (green arrow-arum), *Pontederia cordata* (pickerelweed)

OTHER NOTEWORTHY SPECIES

George Washington Memorial Parkway: Invasive/Exotic Plants: *Hydrilla verticillata* (waterthyme, High/Medium)
National Capital Parks-East: Invasive/Exotic Plants: *Hydrilla verticillata* (waterthyme, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (04-Nov-1998). This community is restricted in range (Atlantic Coast from Maine to Virginia, not including New Hampshire and Rhode Island) and available habitat (freshwater tidal rivers with broad shoreline expanses subjected to moderate to high tidal fluctuation), with a liberal estimate of <200 Element Occurrences and <35,000 acres rangewide. Many Element Occurrences have been impacted by the damming of tidal rivers and by pollution in urban areas.

RELATED CONCEPTS

Global Similar Types:
- *Impatiens capensis - Peltandra virginica - Polygonum arifolium - Bolboschoenus fluviatilis - Typha angustifolia* Tidal Marsh (CEGL006325)
- *Nuphar advena* Tidal Marsh (CEGL004472)
- *Peltandra virginica - Schoenoplectus (pungens, tabernaemontani)* Tidal Marsh (CEGL006578)
- *Pontederia cordata - Peltandra virginica - Sagittaria latifolia* Marsh (CEGL006191)

Global Related Concepts:
- *Nuphar advena - Peltandra virginica* Tidal Herbaceous Vegetation (Coulling 2002) **?**
- *Nuphar advena - Peltandra virginica* Tidally Flooded Herbaceous Vegetation (McCoy and Fleming 2000) **=**
- *Peltandra virginica - (Pontederia cordata)* Tidal Herbaceous Vegetation (Coulling 2002) **?**
- *Peltandra virginica - Cyperus strigosus* community (Metzler and Barrett 2006) **<**
- *Peltandra virginica - Eleocharis parvula - Sagittaria subulata* Oligohaline Tidal Mudflat (Walton et al. 2001) **=**
- *Peltandra virginica* marsh community (Barrett 1989) **><**
- Arrow-arum/Pickerelweed Community Type (Odum et al. 1984) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 1 - Strong
George Washington Memorial Parkway Classification Comments: Green Arrow-arum - Pickerelweed Tidal Marsh is sometimes referred to as Pickerelweed Tidal Marsh. It is similar to Broadleaf Pond-lily Tidal Marsh (CEGL004472) in that it can have high cover (up to 50%) of *Nuphar advena* (yellow pond-lily), and the two types can occur adjacent to one another. Green Arrow-arum - Pickerelweed Tidal Marsh can be distinguished by its location on slightly higher landscape positions where the duration of inundation is shorter. It also has a higher species richness with variable dominant species (compared to only one dominant species in Broadleaf Pond-lily Tidal Marsh), and a number of taxa absent from the low intertidal portions of mudflats.
National Capital Parks-East Classification Comments: Green Arrow-arum - Pickerelweed Tidal Marsh is sometimes referred to as Pickerelweed Tidal Marsh.
Global Classification Comments: Because of high seasonal variability, stands sampled in the early spring that may appear to be ~*Peltandra virginica - Pontederia cordata* Tidal Marsh (CEGL004706)$$ may be more appropriately classified as ~*Zizania aquatica* (annual wildrice) Tidal Marsh (CEGL004202)$$ (Coulling 2002). This vegetation is best sampled later in the season. This community occurs in very similar environmental settings as ~*Nuphar advena* (yellow pond-lily) Tidal Marsh (CEGL004472)$$, low freshwater tidal marshes with a long duration of flooding. Species composition has some overlap. These two associations are best expressed where the elevation gradient is

very mild, allowing the associations to occupy different zones, with this association (CEGL004706) occurring at slightly higher elevation than CEGL004472. *~Impatiens capensis - Peltandra virginica - Polygonum arifolium - Bolboschoenus fluviatilis - Typha angustifolia* Tidal Marsh (CEGL006325)$$ is a large-patch community that occupies higher elevations within freshwater marshes and differs in having a much more varied species composition.

ELEMENT DISTRIBUTION

George Washington Memorial Parkway Range: Green Arrow-arum - Pickerelweed Tidal Marsh occurs in five stands scattered throughout Dyke Marsh.
National Capital Parks-East Range: Green Arrow-arum - Pickerelweed Tidal Marsh occurs in small coves along the south side of Piscataway Creek between Wharf Road and Mockley Point.
Global Range: This freshwater tidal marsh occurs from Maine to Virginia, excluding Rhode Island and New Hampshire.
Nations: US
States/Provinces: CT:SNR, DC:SNR, DE:S4, MA:SNR, MD:S4?, ME:SNR, NJ:SNR, NY:SNR, VA:S3S4
TNC Ecoregions: 58:C, 61:C, 62:C
USFS Ecoregions (2007): 232Ab:CCP, 232Ac:CCP, 232Ad:CCC, 232Ha:CC?, 232Hb:CCP, 232Ib:CCC, 232Je:C??
Federal Lands: DOD (Fort Belvoir); NPS (Colonial, George Washington Parkway, National Capital-East); USFWS (Chesapeake Marshlands, Prime Hook)

ELEMENT SOURCES

George Washington Memorial Parkway Plots: GWMP.22, GWMP.23, GWMP.24, GWMP.26, GWMP.30.
National Capital Parks-East Plots: (2 plots: NACE.207, NACE.208).
George Washington Memorial Parkway Description Author(s): K. Taverna and G.P. Fleming
National Capital Parks-East Description Author(s): J.W. Harrison, mod. M.J. Russo
Global Description Author(s): S.L. Neid and G.P. Fleming
References: Barrett 1989, Breden et al. 2001, Coulling 2002, Coxe 2009, Eastern Ecology Working Group n.d., Edinger et al. 2014a, Fleming 2001a, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2001, Harrison 2004, Harrison 2011, McCoy and Fleming 2000, Metzler and Barrett 2006, Odum et al. 1984, Odum et al. 1984*, Patterson 2008c, Peet et al. unpubl. data, Swain and Kearsley 2014, Walton et al. 2001

2.C.5. Salt Marsh

Salt Marsh is a wetland that has shallow water and levels that usually fluctuate due primarily to tides along the coast or changes in water depth in depressions. Coastal salt marshes are primarily intertidal; that is, they are found in areas at least occasionally inundated by high tide but not flooded during low tide, including estuaries, lagoons, and the lee side of barrier islands. The vegetation comprises emergent shrubs and herbs with at least 10% cover, especially saline or halophytic species. They occur at all latitudes around the globe but are concentrated in the temperate mid-latitudes (23-70°N and S).

2.C.5.NB. NORTH AMERICAN ATLANTIC & GULF COASTAL SALT MARSH

This division comprises all regularly and irregularly flooded tidal marshes of the North Atlantic and Gulf coasts in North America, ranging from polyhaline (salt) marshes to mesohaline (brackish) marshes, dominated or characterized by an abundance of halophytic species, including *Distichlis spicata* (saltgrass), *Spartina alterniflora* (smooth cordgrass), *Spartina patens* (saltmeadow cordgrass), and species of *Salicornia* (pickleweed) and *Sarcocornia* (swampfire).

M079. North American Atlantic & Gulf Coastal Salt Marsh

This macrogroup encompasses eastern North American tidal marshes along the Atlantic and Gulf coasts, ranging in halinity from salt to brackish, and in tidal regime from regularly twice-daily flooding on low marshes to irregularly flooded high marshes, as well as hypersaline pannes. It also includes saline inland prairie. *Distichlis spicata* (saltgrass), *Spartina alterniflora* (smooth cordgrass), *Spartina patens* (saltmeadow cordgrass), and species of *Salicornia* (pickleweed) and *Sarcocornia* (swampfire) are characteristic throughout the range. These species are present but less abundant in brackish marshes that occur along tidal rivershores or in other settings receiving

freshwater mixing. Here, additional species include *Spartina cynosuroides* (big cordgrass), *Schoenoplectus americanus* (chairmaker's bulrush), *Typha angustifolia* (narrowleaf cattail), and others. Associated species vary across the north-to-south expanse of this macrogroup. Towards the north, common associates include *Juncus gerardii* (saltmeadow rush), *Limonium carolinianum* (lavender thrift), *Plantago maritima var. juncoides* (goose tongue), and *Triglochin maritima* (seaside arrowgrass). From the Chesapeake and mid-Atlantic south, *Batis maritima* (turtleweed), *Juncus roemerianus* (needlegrass rush), *Monanthochloe littoralis* (shoregrass), *Sesuvium portulacastrum* (shoreline seapurslane), *Spartina spartinae* (gulf cordgrass), and *Typha domingensis* (southern cattail) become increasingly common associates. Salt marshes and pannes are regularly to irregularly flooded by shallow polyhaline waters as a result of lunar, wind and storm tides. Brackish tidal marshes develop along estuaries where freshwater mixes with ocean saltwater moving up the estuary from the tidal force. Waters in brackish marshes are generally in the salinity range of 0.5-18 ppt, and the vegetation is subject to flooding from the twice-daily tides. This macrogroup ranges along the Atlantic Coast and Gulf of Mexico region from the New England states and the southern Maritime Provinces of Canada south to northern Mexico.

G120. ATLANTIC & GULF COASTAL BRACKISH SALT MARSH

Brackish tidal marshes develop where saltwater mixes with freshwater, primarily in estuaries but also sometimes on the lee side of barrier islands or in other settings. The vegetation is primarily herbaceous, but there may be areas of shrub dominance. Graminoids are prominent and typically include tall species such as *Typha angustifolia* (narrowleaf cattail), *Typha domingensis* (southern cattail), *Schoenoplectus americanus* (chairmaker's bulrush), *Schoenoplectus pungens* (common threesquare), *Bolboschoenus robustus* (sturdy bulrush), and *Spartina cynosuroides* (big cordgrass). The salt marsh grasses *Spartina patens* (saltmeadow cordgrass) and *Spartina alterniflora* (smooth cordgrass) may also be present, but generally are mixed with other species instead of exhibiting strong dominance as they do in the salt marsh setting. Those *Spartina* (cordgrass) are typically most abundant where brackish marsh is transitioning to salt marsh, for example at the estuary mouth. Some brackish tidal marshes are forb-dominated; common species in these settings include *Sagittaria subulata* (awl-leaf arrowhead), *Limosella australis* (Welsh mudwort), *Lilaeopsis chinensis* (eastern grasswort), *Sagittaria calycina var. spongiosa* (hooded arrowhead), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum hydropiperoides* (swamp smartweed), *Zannichellia palustris* (horned pondweed), *Eleocharis parvula* (dwarf spikerush), and *Amaranthus cannabinus* (tidalmarsh amaranth). Some of these forbs also occur as associates where graminoids are dominant.

In Atlantic Canada, the brackish marshes have a somewhat different character. They are characterized by *Carex paleacea* (chaffy sedge), *Hierochloe odorata* (sweetgrass), *Juncus arcticus ssp. littoralis* (mountain rush), *Spartina pectinata* (prairie cordgrass), and/or *Schoenoplectus maritimus/pungens*; *Solidago sempervirens* (seaside goldenrod) is frequent; freshwater species, such as *Typha latifolia* (broadleaf cattail), *Typha angustifolia* (narrowleaf cattail), *Solidago uliginosa* (bog goldenrod), among others, are typical; *Carex mackenziei* (Mackenzie's sedge), *Cladium mariscoides* (smooth sawgrass), *Eleocharis parvula* (dwarf spikerush), *Hordeum jubatum* (foxtail barley), *Limosella australis* (Welsh mudwort), *Samolus valerandi* (seaside brookweed), and *Teucrium canadense* (Canada germander) may be present. Coastal plain species such as *Schoenoplectus americanus* (chairmaker's bulrush), *Eleocharis rostellata* (beaked spikerush), and *Lilaeopsis chinensis* (eastern grasswort) (more typical in low salt marsh) are only found in western Nova Scotia.

A4493 *Spartina alterniflora - Spartina cynosuroides - Carex paleacea* Brackish Tidal Marsh Alliance

[CEGL004188] *Schoenoplectus pungens* Tidal Salt Marsh

Translated Name: **Common Threesquare Tidal Salt Marsh**
Common Name: **Atlantic Coast Brackish Tidal Marsh**

USNVC CLASSIFICATION

Division	North American Atlantic & Gulf Coastal Salt Marsh (2.C.5.Nb)
Macrogroup	North American Atlantic & Gulf Coastal Salt Marsh (M079)
Group	Atlantic & Gulf Coastal Brackish Salt Marsh (G120)
Alliance	*Spartina alterniflora - Spartina cynosuroides - Carex paleacea* Brackish Tidal Marsh Alliance
(A4493)	

ELEMENT CONCEPT

Global Summary: This association occurs on fresh to brackish, mid-tidal, sandy/gravelly rivershores along the north and mid-Atlantic coast. It occurs in low areas where there is a longer duration of flooding. Wave and ice scour can have a significant influence on the year-to-year appearance of the vegetation, which tends to be sparse. This vegetation often occurs in nearly pure stands of *Schoenoplectus pungens* (common threesquare) but can be intermixed with *Spartina alterniflora* (smooth cordgrass) or *Spartina cynosuroides* (big cordgrass) in more brackish areas. Species diversity tends to be low due to winter storm scour, but associates can include *Amaranthus cannabinus* (tidalmarsh amaranth), *Polygonum punctatum* (dotted smartweed), *Cyperus bipartitus* (slender flatsedge), and *Bidens* (beggarticks) spp. *Sagittaria graminea* (grassy arrowhead), *Sagittaria latifolia* (broadleaf arrowhead), *Eleocharis palustris* (common spikerush), *Gratiola virginiana* (roundfruit hedgehyssop), *Elatine americana* (American waterwort), *Isoetes riparia* (shore quillwort), and *Cyperus bipartitus* (slender flatsedge) can occur, but are absent in the northern part of the range. As the salinity decreases *Zizania aquatica* (annual wildrice) can also be an associate.

ENVIRONMENTAL DESCRIPTION

George Washington Memorial Parkway Environment: Atlantic Coast Brackish Tidal Marsh forms linear patches, chiefly <10 m wide, in the low intertidal zone along the Potomac River. It occurs on sandy or gravelly tidal shores and channel edges. The substrate is often rocky with patches of mineral soil. Soils are largely sandy with deeper patches of mucky clay. The type is restricted to areas with a climate subject to winter storm scour, which limits it in Virginia to the Potomac River drainage.

National Capital Parks-East Environment: This association occurs on narrow (2- to 5-m zone), sandy-gravelly intertidal shorelines along the Potomac River and its major tributaries. Habitats are regularly flooded by diurnal tides and subject to mechanical erosion by wave action and ice-scour. Substrates are primarily comprised of sand and gravel with a minor component of muck.

Global Environment: This association occurs in fresh to brackish reaches of tidal rivers with sandy or gravelly rivershores. It occurs in low areas where there is a longer duration of flooding. Ice-scour can have a significant effect on the species composition and percent cover from year to year.

VEGETATION DESCRIPTION

George Washington Memorial Parkway Vegetation: The vegetation occurs in patches and is dominated by short-statured herbaceous vegetation. Stands are typically dominated by some combination of *Schoenoplectus pungens* (common threesquare), *Schoenoplectus tabernaemontani* (softstem bulrush), *Justicia americana* (American water-willow), and *Polygonum punctatum* (dotted smartweed). Other associated species that occur with lower cover include *Helenium autumnale* (common sneezeweed), *Cyperus bipartitus* (slender flatsedge), *Peltandra virginica* (green arrow-arum), *Pontederia cordata* (pickerelweed), *Sagittaria subulata* (awl-leaf arrowhead), *Vernonia noveboracensis* (New York ironweed), and *Amaranthus cannabinus* (tidalmarsh amaranth). Atlantic Coast Brackish Tidal Marsh is inundated daily by fluctuating tidal waters, and the amount of exposed vegetation and substrate varies with the tide.

National Capital Parks-East Vegetation: The vegetation of this association is sparse, poorly developed, heterogeneous, and commonly made up of a few patch-dominant emergent species. Patch-dominant species found during sampling include *Schoenoplectus pungens* (common threesquare), *Polygonum punctatum* (dotted smartweed), *Sagittaria graminea* (grassy arrowhead), and *Justicia americana* (American water-willow). *Sagittaria graminea* (grassy arrowhead) and *Polygonum punctatum* (dotted smartweed) are the most constant and abundant species in these habitats along Piscataway Creek. Low-cover associates include *Isoetes riparia* (shore quillwort), *Cyperus bipartitus* (slender flatsedge), *Juncus acuminatus* (tapertip rush), *Echinochloa walteri* (coast cockspur grass), and *Zizania aquatica* (annual wildrice).

Global Vegetation: This vegetation often occurs in nearly pure stands of *Schoenoplectus pungens* (common threesquare) but can be intermixed with *Spartina alterniflora* (smooth cordgrass) or *Spartina cynosuroides* (big cordgrass) in slightly brackish areas. Species diversity tends to be low due to winter storm scour, but associates can include *Amaranthus cannabinus* (tidalmarsh amaranth), *Polygonum punctatum* (dotted smartweed), and *Bidens* (beggarticks) spp. *Sagittaria graminea* (grassy arrowhead), *Sagittaria latifolia* (broadleaf arrowhead), *Eleocharis palustris* (common spikerush), *Gratiola virginiana* (roundfruit hedgehyssop), *Elatine americana* (American waterwort), *Isoetes riparia* (shore quillwort), and *Cyperus bipartitus* (slender flatsedge) can occur but are absent in the northern part of the range. As the salinity decreases *Zizania aquatica* (annual wildrice) can also be an associate. At the southern end of the range in Maryland and Virginia, this type is more confined to fresh tidal shores. Here, *Schoenoplectus pungens* (common threesquare) is often abundant, but composition is variable, and patch-dominants

can also include *Polygonum punctatum* (dotted smartweed), *Justicia americana* (American water-willow), and *Schoenoplectus tabernaemontani* (softstem bulrush).
Global Dynamics: The species composition of brackish marsh associations is likely related to gradients in salinity and duration of tidal flooding. *Schoenoplectus pungens* (common threesquare) may dominate in areas with higher average water levels, lower salinities, and lower frequency of flooding than areas typically dominated by *Spartina patens* (saltmeadow cordgrass).

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Schoenoplectus pungens* (common threesquare)

CHARACTERISTIC SPECIES

George Washington Memorial Parkway: *Justicia americana* (American water-willow), *Polygonum punctatum* (dotted smartweed), *Schoenoplectus pungens* (common threesquare), *Schoenoplectus tabernaemontani* (softstem bulrush)
National Capital Parks-East: *Polygonum punctatum* (dotted smartweed), *Sagittaria graminea* (grassy arrowhead), *Schoenoplectus pungens* (common threesquare)
Global: *Schoenoplectus pungens* (common threesquare)

OTHER NOTEWORTHY SPECIES

George Washington Memorial Parkway: Invasive/Exotic Plants: *Hydrilla verticillata* (waterthyme, High/Medium), *Murdannia keisak* (wartremoving herb, Medium/Low)
National Capital Parks-East: Vulnerable Plants: *Bidens discoidea* (small beggarticks, G5, MD-vulnerable), *Hibiscus laevis* (halberdleaf rosemallow, G5, MD-vulnerable), *Limnobium spongia* (American spongeplant, G4, MD-critically imperiled); **Invasive/Exotic Plants**: *Hedera helix* (English ivy, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Murdannia keisak* (wartremoving herb, Medium/Low)
Global: Vulnerable Plants: *Bidens bidentoides* (Delmarva beggarticks, G3G4)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR

RELATED CONCEPTS

Global Similar Types:
- *Peltandra virginica - Schoenoplectus (pungens, tabernaemontani)* Tidal Marsh (CEGL006578)
- *Schoenoplectus americanus - Spartina patens* Salt Marsh (CEGL006612)
- *Schoenoplectus pungens - (Osmunda regalis var. spectabilis)* Tidal Marsh (CEGL004189) is a tidal fresh marsh type found in NC.
- *Schoenoplectus pungens - Eleocharis parvula* Salt Marsh (CEGL006398)

Global Related Concepts:
- *Eleocharis quadrangulata - Pontederia cordata - Schoenoplectus (pungens, tabernaemontani)* (Coulling 2002) **<**
- *Peltandra virginica - Echinochloa walteri - Schoenoplectus (pungens, tabernaemontani)* (Coulling 2002) **<**
- *Schoenoplectus pungens - Sagittaria* spp. community (Metzler and Barrett 2006) **<**
- *Schoenoplectus pungens - Schoenoplectus robustus* community (Metzler and Barrett 2006) **<**
- *Schoenoplectus pungens* Tidal Herbaceous Vegetation (Fleming 2007) **?**
- *Scirpus pungens* Herbaceous Vegetation (Bartgis 1986) **=**
- *Scirpus* marsh community (brackish mid-tidal marsh border) (Barrett 1989) **?**
- Brackish Tidal Marsh (Rawinski 1984a) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
George Washington Memorial Parkway Classification Comments: Atlantic Coast Brackish Tidal Marsh is sometimes referred to as Brackish Tidal Marsh. It is easily distinguished in the park, as it is the only tidal vegetation occurring as narrow linear patches on sandy or gravelly shores of the intertidal zone along the Potomac River. It is also distinguished by being dominated by *Schoenoplectus pungens* (common threesquare) and/or *Schoenoplectus tabernaemontani* (softstem bulrush). Despite its common name, this community commonly occurs in freshwater settings along the Potomac River, as well as at other Mid-Atlantic sites.

National Capital Parks-East Classification Comments: Atlantic Coast Brackish Tidal Marsh is sometimes referred to as Brackish Tidal Marsh. It is easily distinguished in the park, as it is the only tidal vegetation occurring as narrow linear patches on sandy or gravelly shores of the intertidal zone along the Potomac River. It is also distinguished by the importance of *Schoenoplectus pungens* (common threesquare) and/or *Schoenoplectus tabernaemontani* (softstem bulrush). Despite its common name, this community commonly occurs in freshwater settings along the Potomac River, as well as at other Mid-Atlantic sites.

ELEMENT DISTRIBUTION

George Washington Memorial Parkway Range: This association occurs on narrow (2 to 5 m zone), sandy-gravelly intertidal shorelines along the Potomac River near Jones Point and Dyke Marsh.
National Capital Parks-East Range: This association is found along Piscataway Creek, as well as the Suitland Parkway, Oxon Run Parkway, the central area, Greenbelt, and Patuxent North.
Global Range: This association occurs along the Atlantic coast from New Hampshire to Maryland.
Nations: US
States/Provinces: CT:SNR, MA:SNR, MD:SNR, NH:SNR, NJ:S1S3, PA:SNR
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions (2007): 221Ad:CCC, 232Ad:CCC, 232Hd:CCP, 232Ib:CCC
Federal Lands: NPS (George Washington Parkway, National Capital-East)

ELEMENT SOURCES

National Capital Parks-East Inventory Notes: Followed sparse vegetation sampling methodology developed by Chris Lea.
George Washington Memorial Parkway Plots: GWMP.21, GWMP.25, GWMP.51.
National Capital Parks-East Plots: (2 plots: NACE.223, NACE.224).
George Washington Memorial Parkway Description Author(s): M. Russo, K. Taverna and G. Fleming
National Capital Parks-East Description Author(s): J.W. Harrison
Global Description Author(s): S.L. Neid and G.P. Fleming
References: Barrett 1989, Bartgis 1986, Breden 1989, Breden et al. 2001, Caldwell 1990, Coulling 2002, Eastern Ecology Working Group n.d.*, Fleming 2007, Harrison 2004, Harrison 2011, Metzler and Barrett 2006, Metzler and Rosza 1982, Rawinski 1984a, Rhoads and Block 2011c, Swain and Kearsley 2014, Zimmerman et al. 2012

5. Aquatic Vegetation

Open freshwater and saltwater wetlands dominated by aquatic vegetation, either rooted with leaves rising up to or near the surface or floating freely on the water surface. Stands typically have surface water, generally up to 2 m in depth, along ocean, lake, pond, and river margins in non-tidal, tidal and intertidal habitats.

5.B.2. Temperate to Polar Freshwater Aquatic Vegetation

Temperate to Polar Freshwater Aquatic Vegetation occurs in shallow to deep freshwater habitats (e.g., lakes, ponds, canals, streams, rivers, and freshwater portions of estuaries) where emergent vegetation is <10% cover, and submerged or floating aquatic plants have >1% cover, occurring around the globe in both hemispheres, from the tropics north and south to the polar regions.

5.B.2.NA. NORTH AMERICAN FRESHWATER AQUATIC VEGETATION

Floating-leaved and submergent aquatic vegetation found in permanently flooded but shallow freshwater sites across North America.

M108. Eastern North American Freshwater Aquatic Vegetation

Aquatic beds 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. Stands in this macrogroup 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. Emergent vegetation has <10% total cover. Common aquatic plant species include *Brasenia schreberi* (watershield), *Ceratophyllum demersum* (coon's-tail), *Eleocharis robbinsii* (Robbins' spikerush), *Elodea canadensis* (Canadian waterweed), *Eriocaulon*

aquaticum (sevenangle pipewort), *Heteranthera dubia* (grassleaf mudplantain), *Heteranthera reniformis* (kidneyleaf mudplantain), *Bidens beckii* (Beck's watermarigold), *Myriophyllum* (watermilfoil) spp., *Najas flexilis* (nodding waternymph), *Nuphar advena* (yellow pond-lily), *Nuphar microphylla* (yellow pond-lily), *Nuphar variegata* (variegated yellow pond-lily), *Nymphaea odorata* (American white waterlily), *Nymphaea tetragona* (pygmy waterlily) (in central Canada), *Nymphoides aquatica* (big floatingheart), *Nymphoides cordata* (little floatingheart), *Potamogeton amplifolius* (largeleaf pondweed), *Potamogeton epihydrus* (ribbonleaf pondweed), *Potamogeton friesii* (Fries' pondweed), *Potamogeton gramineus* (variableleaf pondweed), *Potamogeton natans* (floating pondweed), *Potamogeton perfoliatus* (claspingleaf pondweed), *Potamogeton nodosus* (longleaf pondweed), *Potamogeton richardsonii* (Richardson's pondweed), *Potamogeton zosteriformis* (flatstem pondweed), *Ruppia maritima* (widgeongrass), *Stuckenia pectinata* (sago pondweed), *Utricularia* (bladderwort) spp., and *Vallisneria americana* (American eel-grass). *Zannichellia palustris* (horned pondweed) is a common component in the Great Plains. Alkaline sites may contain *Chara* (stonewort) spp. Water salinity varies from fresh to saline, with the saline and brackish sites tending to occur in the Great Plains.

G114. EASTERN NORTH AMERICAN FRESHWATER AQUATIC VEGETATION

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.

A4064 *Nymphaea odorata - Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance

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* (pond-lily) spp., with or without *Nymphaea odorata* (American white waterlily) and *Nymphoides aquatica* (big floatingheart). Emergent vegetation is less than 25%, and typically plant species diversity is low. Other species present may include *Utricularia* (bladderwort) spp., *Potamogeton* (pondweed) spp., and others. In the north, *Brasenia schreberi* (watershield) may be locally dominant. Other characteristic northern species include *Nymphaea tetragona* (pygmy waterlily) and *Potamogeton amplifolius* (largeleaf pondweed). Associates found in the Midwest include *Polygonum amphibium* (water knotweed). 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 (A4064)	*Nymphaea odorata - Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance

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* (yellow pond-lily) and *Nymphaea odorata* (American white waterlily) are dominants, either in combination together, or each singly. Other species present include *Brasenia schreberi* (watershield), various *Potamogeton* (pondweed) and *Stuckenia* (pondweed) spp., *Eleocharis robbinsii*

(Robbins' spikerush) and other *Eleocharis* (spikerush) spp., *Polygonum amphibium* (water knotweed), *Polygonum amphibium var. emersum* (longroot smartweed), *Sparganium americanum* (American bur-reed), *Lemna* (duckweed) spp., *Spirodela polyrrhiza* (common duckmeat), *Typha latifolia* (broadleaf cattail), and *Saururus cernuus* (lizard's-tail). Submerged aquatics more common in the southern part of the range include *Cabomba caroliniana* (Carolina fanwort), *Ceratophyllum demersum* (coon's-tail), and *Heteranthera dubia* (grassleaf mudplantain).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: Permanently flooded or semipermanently flooded pools along the Potomac River and in artificial ponds along the C&O Canal.
George Washington Memorial Parkway Environment: This community occurs along the Potomac River in pools water held in low areas on bedrock terraces in the vicinity of the Potomac Gorge.
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* (yellow pond-lily) is rooted in sandy substrate (Schmalzer and DeSelm 1982).

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: This vegetation is characterized by *Nuphar advena.*
George Washington Memorial Parkway Vegetation: This vegetation is characterized by *Nuphar advena.*
Global Vegetation: This community is dominated by rooted, floating-leaved aquatic species, with both submergent and emergent aquatics also present. *Nuphar advena* (yellow pond-lily) and *Nymphaea odorata* (American white waterlily) are dominants, either in combination together, or each singly. Other species present include *Brasenia schreberi* (watershield), various *Potamogeton* (pondweed) and *Stuckenia* (pondweed) spp., *Eleocharis robbinsii* (Robbins' spikerush) and other *Eleocharis* (spikerush) spp., *Polygonum amphibium* (water knotweed), *Polygonum amphibium var. emersum* (longroot smartweed), *Sparganium americanum* (American bur-reed), *Lemna* (duckweed) spp., *Spirodela polyrrhiza* (common duckmeat), *Typha latifolia* (broadleaf cattail), and *Saururus cernuus* (lizard's-tail) (Anderson 1982, G. Fleming pers. comm.). Submerged aquatic species more common in the southern part of the range include *Cabomba caroliniana* (Carolina fanwort), *Ceratophyllum demersum* (coon's-tail), and *Heteranthera dubia* (grassleaf mudplantain). This broadly conceived type may include ponds, or zones of ponds, dominated by *Nymphaea odorata* (American white waterlily), with or without *Nuphar advena* (yellow pond-lily).

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Nuphar advena* (yellow pond-lily), *Nymphaea odorata* (American white waterlily)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Nuphar advena* (yellow pond-lily)
George Washington Memorial Parkway: *Nuphar advena* (yellow pond-lily)
Global: *Nuphar advena* (yellow pond-lily), *Nymphaea odorata* (American white waterlily)

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)

Global Related Concepts:
- *Nuphar advena - Nymphaea odorata* Herbaceous Vegetation (Clancy 1996) =
- *Nuphar lutea ssp. advena - Nymphaea odorata* Herbaceous Vegetation (Faber-Langendoen 2001) =

- L5D2aI1a. *Nuphar lutea* (Foti et al. 1994) **?**
- New England coastal plain pondshore (Rawinski 1984a) **?**
- Open water marsh with floating-leaved plants (NAP pers. comm. 1998) **?**
- Variegated yellow pond-lily - American white waterlily (*Nuphar advena - Nymphaea odorata*) community (Metzler and Barrett 2006) **=**

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
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* (American white waterlily) and *Nuphar advena* (yellow pond-lily).

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: Water-lily Aquatic Wetland occurs in the Ridge and Valley near Oldtown (Canal mile 165 - 166 and 168 - 169), in the Hagerstown Valley at Little Pool (Canal mile 121), and in the Outer Piedmont on Bear Island (Canal mile 13).
George Washington Memorial Parkway Range: Water-lily Aquatic Wetland is mapped at two locations on the eastern end of Bear Island vicinity of the Mather Gorge.
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:S1, AR:SNR, CT:SNR, DE:SNR, FL:SNR, GA:SNR, IA:SU, IL:SNR, IN:SNR, KY:SNR, LA:SNR, MA:SNR, MD:SNR, ME:SNR, MI:SNR, MN:SNR, MO:SNR, MS:SNR, NC:SNR, NH:SNR, NJ:S4, NY:SNR, OH:SNR, OK:SNR, ON:SNR, PA:SNR, RI:SNR, SC:SNR, TN:SNR, TX:SNR, VA:SU, VT:SNR, WI:SNR, WV:S3
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 (2007): 211Aa:CCC, 211Ba:CCC, 211Bb:CCC, 211Ca:C??, 211Cb:C??, 211Da:CCC, 211Db:CC?, 211Dc:CC?, 211Fa:CCP, 211Fb:CCP, 211Fc:CCP, 211Fd:CCP, 211Ga:CCP, 211Gb:CCP, 211Ia:CCP, 211Ib:CCP, 212Jb:CPP, 212Jc:CPP, 212Ka:CPP, 212Ta:CPP, 212Tb:CPP, 212Xa:CCP, 212Xb:CCC, 212Xc:CCP, 212Xd:CCP, 212Xe:CCP, 212Ya:CCP, 221Aa:CC?, 221Ab:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Am:CCC, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Ea:CCP, 221Ed:CC?, 221Ef:CCC, 221Fa:CCC, 221Hc:CCC, 221He:CC?, 222Ha:CPP, 222Ja:CCC, 222Jb:CCC, 222Ji:CCC, 222Kf:CCC, 222Kg:CCC, 222Kh:CCC, 222Kj:CCC, 222L:CC, 223Db:CCC, 223Gc:C??, 231Bc:CCC, 231Bd:CCC, 231Eo:C??, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 231Hf:CCC, 232C:CC, 232D:CC, 232Ef:CPP, 232Kb:CCC, 234Aa:CCC, 234Ad:CCC, 234Cb:CCC, 234Cc:CCC, 234Da:CCC, 234Dc:CCC, 234Do:CCC, 234Ea:CCC, 251Cf:CCC, 251Dd:CCC, 251Dg:CCC, 251Eb:CCC, M211Af:CCC, M211Bb:CCC, M211Bc:CCC, M211Bd:CCC, M211Cb:CCC, M211Cc:CCP, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be: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

Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
George Washington Memorial Parkway Description Author(s): J. Teague
Global Description Author(s): D. Faber-Langendoen, C.W. Nordman, S.C. Gawler and M. Pyne
References: ALNHP unpubl. data 2018, Anderson 1982, Breden et al. 2001, Chastain et al. 2006, Clancy 1996, Coxe 2009, Edinger et al. 2014a, Eichelberger 2011a, Evans et al. 2009, Faber-Langendoen 2001, Faber-Langendoen 2001*, Fike 1999, Fleming 2007, Fleming and Coulling 2001, Fleming et al. 2017, Foti et al. 1994, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Gawler et al. 2017, Harrison 2004, Harrison 2011, Hoagland 2000, Hop et al. 2005, Hop et al. 2009, Hop et al. 2013, INAI 2017, Kost et al. 2007, Lubinski et al. 2003, MNNHP 1993, MSNHP 2006, Metzler and Barrett 2006, Midwestern Ecology Working Group

n.d., NAP pers. comm. 1998, NatureServe Ecology - Southeastern U.S. unpubl. data, 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, Sperduto and Nichols 2004, Swain and Kearsley 2014, TNHS unpubl. data, Thompson and Jenkins 1992, Thompson and Sorenson 2005, WDNR 2015, White 2003, White and Madany 1978, Zanoni et al. 1979, Zimmerman et al. 2012

G924. ATLANTIC & GULF COAST FRESHWATER SUBTIDAL MARSH

A4486 *Stuckenia pectinata - Zannichellia palustris - Ceratophyllum demersum* Northern Freshwater Subtidal Marsh Alliance

[CEGL006048] *Ceratophyllum demersum - Vallisneria americana - Najas* spp. Tidal Marsh

Translated Name: **Coon's-tail - American Eel-grass - Waternymph species Tidal Marsh**
Common Name: **Mixed Freshwater Subtidal Marsh**

USNVC CLASSIFICATION

Division	North American Freshwater Aquatic Vegetation (5.B.2.Na)
Macrogroup	Eastern North American Freshwater Aquatic Vegetation (M108)
Group	Atlantic & Gulf Coast Freshwater Subtidal Marsh (G924)
Alliance	*Stuckenia pectinata - Zannichellia palustris - Ceratophyllum demersum* Northern Freshwater Subtidal Marsh Alliance (A4486)

ELEMENT CONCEPT

Global Summary: This association comprises mixed freshwater subtidal aquatic beds of the mid-Atlantic coast. It occurs in fresh reaches of upper bays and tributaries within estuarine systems. Species composition is variable and includes *Vallisneria americana* (American eel-grass), *Ceratophyllum demersum* (coon's-tail), *Heteranthera dubia* (grassleaf mudplantain), *Elodea canadensis* (Canadian waterweed), *Najas guadalupensis* (southern waternymph), *Najas gracillima* (slender waternymph), *Najas minor* (brittle waternymph), *Potamogeton pusillus* (small pondweed), *Stuckenia pectinata* (sago pondweed), and others. There is often a strong component of exotic species that can be locally or extensively dominant, including *Myriophyllum spicatum* (Eurasian watermilfoil), *Hydrilla verticillata* (waterthyme), and *Potamogeton crispus* (curly pondweed). This association can have dramatic seasonal fluctuations in species composition and biomass.

ENVIRONMENTAL DESCRIPTION

George Washington Memorial Parkway Environment: Mixed Freshwater Subtidal Community occurs as submerged tidal aquatic vegetation. It develops in fresh reaches of upper bays and tributaries and is scattered along the shoreline of the Potomac River.
National Capital Parks-East Environment: This American eel-grass tidal community was sampled once in the park. The site is a permanently flooded - tidal riverbed with very poorly-drained gravelly sand. water depth 2 hours after low tide 30-60 cm. The unvegetated ground surface is dominated by exposed sand with only trace amounts of large and small rocks and shell fragments. Evidence of disturbance includes the presence of exotic plants.
Global Environment: This type occurs in fresh reaches of upper bays and tributaries within estuarine systems.

VEGETATION DESCRIPTION

George Washington Memorial Parkway Vegetation: The vegetation is dominated by submerged aquatic species. Composition is variable and includes *Vallisneria americana* (American eel-grass), *Ceratophyllum demersum* (coon's-tail), *Elodea canadensis* (Canadian waterweed), and *Stuckenia pectinata* (sago pondweed). Exotic species, particularly *Myriophyllum spicatum* (Eurasian watermilfoil) and *Hydrilla verticillata* (waterthyme), can be locally or extensively dominant.
National Capital Parks-East Vegetation: This densely vegetated tidal community is strongly dominated by *Vallisneria americana* (American eel-grass) with only trace amounts of a few species, including *Ceratophyllum demersum* (coon's-tail), *Elodea nuttallii* (western waterweed), *Heteranthera dubia* (grassleaf mudplantain), and exotics *Hydrilla verticillata* (waterthyme), *Myriophyllum spicatum* (Eurasian watermilfoil), and *Najas minor* (brittle waternymph).

Global Vegetation: Species composition is variable and includes *Vallisneria americana* (American eel-grass), *Ceratophyllum demersum* (coon's-tail), *Heteranthera dubia* (grassleaf mudplantain), *Elodea canadensis* (Canadian waterweed), *Najas guadalupensis* (southern waternymph), *Najas gracillima* (slender waternymph), *Najas minor* (brittle waternymph), *Potamogeton pusillus* (small pondweed), *Stuckenia pectinata* (sago pondweed), and others. There is often a strong component of exotic species that can be locally or extensively dominant, including *Myriophyllum spicatum* (Eurasian watermilfoil), *Hydrilla verticillata* (waterthyme), and *Potamogeton crispus* (curly pondweed). This association can have dramatic seasonal fluctuations in species composition and biomass.
Global Dynamics: This association occurs upstream from, but also intergrades with, fresh/brackish associations.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Submerged aquatic	Aquatic herb	*Ceratophyllum demersum* (coon's-tail), *Hydrilla verticillata* (waterthyme), *Myriophyllum spicatum* (Eurasian watermilfoil), *Najas gracillima* (slender waternymph), *Najas minor* (brittle waternymph), *Potamogeton crispus* (curly pondweed), *Vallisneria americana* (American eel-grass)

CHARACTERISTIC SPECIES

George Washington Memorial Parkway: *Ceratophyllum demersum* (coon's-tail), *Elodea canadensis* (Canadian waterweed), *Stuckenia pectinata* (sago pondweed), *Vallisneria americana* (American eel-grass)
National Capital Parks-East: *Vallisneria americana* (American eel-grass)
Global: *Ceratophyllum demersum* (coon's-tail), *Najas gracillima* (slender waternymph), *Najas minor* (brittle waternymph), *Vallisneria americana* (American eel-grass)

OTHER NOTEWORTHY SPECIES

George Washington Memorial Parkway: Invasive/Exotic Plants: *Hydrilla verticillata* (waterthyme, High/Medium), *Myriophyllum spicatum* (Eurasian watermilfoil, High)
National Capital Parks-East: Invasive/Exotic Plants: *Hydrilla verticillata* (waterthyme, High/Medium), *Myriophyllum spicatum* (Eurasian watermilfoil, High), *Najas minor* (brittle waternymph, High/Medium)
Global: Invasive/Exotic Plants: *Hydrilla verticillata* (waterthyme, High/Medium, U.S. federal noxious weed), *Myriophyllum spicatum* (Eurasian watermilfoil, High), *Potamogeton crispus* (curly pondweed, Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR

RELATED CONCEPTS

Global Similar Types:
- *Stuckenia pectinata - Potamogeton perfoliatus - (Zannichellia palustris)* Tidal Marsh (CEGL006027)

Global Related Concepts:
- *Myriophyllum spicatum - Vallisneria americana - Stuckenia pectinata* Permanently Flooded - Tidal Herbaceous Vegetation (Coulling 2002) =
- Freshwater Mixed Community (Moore et al. 2000) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
George Washington Memorial Parkway Classification Comments: Mixed Freshwater Subtidal Community is easily distinguished as it is the only fully submerged aquatic vegetation in the park.
Global Classification Comments: This association is similar to *~Stuckenia pectinata - Potamogeton perfoliatus - (Zannichellia palustris)* Tidal Marsh (CEGL006027)$$ in environment and has some overlap in species composition. It is distinguished by its higher species diversity (including the presence of several exotics) and the lack of dominance by *Potamogeton* (pondweed) species.

ELEMENT DISTRIBUTION

George Washington Memorial Parkway Range: Mixed Freshwater Subtidal Community is documented at only one point in the park, in the Potomac River south of Fort Hunt Park, but it likely occurs in scattered patches along the Potomac shoreline.
National Capital Parks-East Range: This herbaceous association was sampled at Mockley Point in Piscataway Park in Prince Georges County, Maryland.
Global Range: The geographic range of this type is centered in the Chesapeake Bay estuary, it but likely occurs in other locations.
Nations: US
States/Provinces: DC:SNR, DE:SNR, MA:SNR, MD:SNR, ME:SNR, NJ:SNR, NY:SNR, PA:SNR, RI:SNR, VA:SNR
TNC Ecoregions: 58:C
USFS Ecoregions (2007): 232Ad:CCC, 232Ha:CC?, 232Hb:CCC, 232Hd:CCP, 232Ib:CCC, 232Je:C??
Federal Lands: NPS (George Washington Parkway?, National Capital-East?); USFWS (Back Bay)

ELEMENT SOURCES

George Washington Memorial Parkway Plots: None.
National Capital Parks-East Plots: (1 plot: NACE.241).
George Washington Memorial Parkway Description Author(s): K. Taverna and G.P. Fleming
National Capital Parks-East Description Author(s): M.J. Russo
Global Description Author(s): S.L. Neid
References: Coulling 2002, Eastern Ecology Working Group n.d.*, Fleming 2001a, Fleming et al. 2007b, Fleming et al. 2017, Harrison 2004, Harrison 2011, Moore et al. 2000, Orth and Moore 1988

6. Open Rock Vegetation

Tropical, temperate, and boreal habitats are characterized or dominated by plant growth forms, such as *lichen*, *bryophyte*, *alga*, or *fern*, that have structural adaptations for living on stable rock surfaces or on unstable rocky substrates, such as cliffs, talus, scree, pavement, cobble, lava or boulderfields, and with associated mesomorphic grass, shrub and tree growth forms.

6.B.1. Temperate & Boreal Cliff, Scree & Other Rock Vegetation

Vegetation in temperate and boreal habitats found in rocky or rocklike habitats (such as cliffs, talus, scree, pavement, cobbles, lava, boulderfields, or badlands) at low elevations at mid-latitudes around the globe characterized by nonvascular plant growth forms that have structural adaptations for living on stable rock surfaces or in unstable rocky substrates. A sparse cover of vascular mesomorphic growth forms, including needle-leaved and cold-deciduous broad-leaved woody plants, may be present.

6.B.1.NA. EASTERN NORTH AMERICAN TEMPERATE CLIFF, SCREE & ROCK VEGETATION

This type encompasses vegetation of eastern and boreal North America found on somewhat to strongly vertical cliffs, talus slopes, and erosional bluffs and characterized by sparse and patchy vascular vegetation and often high nonvascular and fern cover.

M111. Eastern North American Cliff & Rock Vegetation

This type encompasses vegetation of eastern temperate and boreal North American cliffs, talus slopes and erosional bluffs characterized by often sparse and patchy vascular vegetation and often high nonvascular cover. It ranges from the East Coast west to the Ouachitas and upper Great Lakes and through central and eastern boreal Canada. Vegetation structure varies widely, and may include scattered small trees such as *Betula papyrifera* (paper birch), *Juniperus virginiana* (eastern red-cedar), *Picea glauca* (white spruce), *Pinus banksiana* (jack pine), *Pinus strobus* (eastern white pine), *Thuja occidentalis* (arborvitae), and *Quercus* (oak) spp. Other commonly encountered species may include *Asplenium* (spleenwort) spp., *Cystopteris fragilis* (brittle bladderfern), *Danthonia spicata* (poverty oatgrass), *Dasiphora fruticosa ssp. floribunda* (shrubby-cinquefoil), *Deschampsia cespitosa* (tufted hairgrass),

Dryopteris marginalis (marginal woodfern), *Hydrangea arborescens* (wild hydrangea), *Parthenocissus quinquefolia* (Virginia creeper), *Polypodium virginianum* (rock polypody), *Ribes* (currant) spp., *Rubus pubescens* (dwarf red blackberry), *Sibbaldiopsis tridentata* (shrubby fivefingers), and *Toxicodendron radicans* (eastern poison-ivy). Characteristic foliose and fruticose macrolichen genera include *Cladonia* (cup lichen), *Lasallia* (blistered navel lichen), *Stereocaulon* (snow lichen), and *Umbilicaria* (navel lichen). Crustose lichens are also common. Substrates include all lithologies from acidic granites to circumneutral basalts to calcareous limestones, with concomitant floristic variation. These cliffs are prone to harsh climatic conditions; frequent disturbances include drought stress and wind and storm damage. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present. The vegetation is patchy and sparse overall, except in some wet, or seepy, areas where the rocks are often densely or moderately covered with bryophytes or algae. Outside of the glaciated regions and the Appalachian Mountains, this vegetation is primarily limited to river gorges and bluffs. A specialized habitat within this macrogroup is the vertical walls of limestone sinkholes. Vegetation occurring on shoreline examples seems to be mostly restricted to areas protected from wave action, ice-scour, and wind.

G840. APPALACHIAN CLIFF & ROCK VEGETATION

This group includes vegetation of acidic and alkaline dry to wet igneous, metamorphic, and sedimentary rock outcrops and cliffs in the Central and Southern Appalachian and Piedmont regions.

A2071 Appalachian Acidic Cliff Alliance

This alliance is made up of sparse, patchy vascular vegetation with variable nonvascular cover occurring on cliff faces of acidic rock types in the Southern Appalachian and Piedmont regions of the 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. Common ferns and forbs include *Asplenium montanum* (mountain spleenwort), *Deschampsia flexuosa* (wavy hairgrass), *Polypodium appalachianum* (Appalachian polypody), and *Polypodium virginianum* (rock polypody), as well as scattered shrubs, such as *Hydrangea arborescens* (wild hydrangea), *Kalmia latifolia* (mountain laurel), and *Rhododendron* (rhododendron, azalea) spp.

[CEGL004391] *Asplenium montanum* Central Appalachian Sandstone Cliff Vegetation

Translated Name: **Mountain Spleenwort Central Appalachian Sandstone Cliff Vegetation**
Common Name: **Central Appalachian Spleenwort Acidic Cliff**

USNVC CLASSIFICATION

Division	Eastern North American Temperate 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 type includes acidic cliffs with sparse vegetation. It is typically scattered on quartzite and sandstone cliffs in the Central Appalachians, with a few disjunct occurrences on river bluffs, foothills and monadnocks of the western Piedmont in Virginia and Maryland. Vegetation is characterized by species such as *Asplenium montanum* (mountain spleenwort), *Deschampsia flexuosa* (wavy hairgrass), *Polypodium appalachianum* (Appalachian polypody), and *Polypodium virginianum* (rock polypody).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This sparse vegetation was sampled at two plot locations in the park. The sites are extremely steep, mid and upper escarpments with west and northwest aspects. Soils are rapidly drained. The unvegetated surface is dominated exclusively by exposed bedrock (100% cover) with some leaf litter (1%), bare soil (1%), and mosses and lichens (20-25%). There is no evidence of disturbance.

Monocacy National Battlefield Environment: This association occurs on steep, north-facing outcrops of acidic sandstone. The soil that surrounds the outcrops and occurs in the crevices of the rocks is a xeric, rapidly drained black sandy loam with organics derived from sandstone. Falling trees and the erosion of soil and rocks downslope are the major disturbances here.

Global Environment: This association typically occupies more-or-less vertical faces of quartzite and sandstone cliffs. Local moisture conditions and degree of shading from overhanging trees varies among sites.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: The very sparse (<5% cover) herbaceous layer of *Asplenium montanum* (mountain spleenwort), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Deschampsia flexuosa var. flexuosa* (wavy hairgrass) defines this community. There may also be very sparse (<5%) short-shrub (1-6 m) and dwarf-shrub (<0.5 m) layers that can include *Amelanchier arborea* (common serviceberry), *Betula lenta* (sweet birch), *Kalmia latifolia* (mountain laurel), *Rhododendron maximum* (great laurel), and *Rubus allegheniensis* (Allegheny blackberry). Nonvascular species (mosses and lichens) cover up to 25% of the ground surface.
Monocacy National Battlefield Vegetation: This association is characterized by sparse vegetation that grows in cracks and crevices of boulders and large rock outcrops of acidic sandstone. The dominant strata are the herbaceous and nonvascular layers. The moderate (25-50%) herbaceous layer includes *Polypodium virginianum* (rock polypody), *Asplenium montanum* (mountain spleenwort), *Carex argyrantha* (hay sedge) (regionally rare), *Eurybia divaricata* (white wood aster), *Danthonia spicata* (poverty oatgrass), and *Solidago caesia* (wreath goldenrod). The moderate (25-50%) nonvascular layer is made up of numerous mosses and lichens. However, there is a very sparse (<1%) emergent tree layer (10-20 m tall) of *Quercus montana* (chestnut oak) and a sparse (5-10%) emergent shrub layer (1-6 m) of *Carya glabra* (pignut hickory), *Amelanchier arborea* (common serviceberry), and *Fraxinus americana* (white ash).
Global Vegetation: The community is characterized by sparse herbaceous vegetation rooted in crevices and on shelves. Characteristic species include *Asplenium montanum* (mountain spleenwort), *Asplenium pinnatifidum* (lobed spleenwort), *Deschampsia flexuosa* (wavy hairgrass), *Carex argyrantha* (hay sedge), *Polypodium virginianum* (rock polypody) (lower elevations), *Polypodium appalachianum* (Appalachian polypody) (higher elevations), *Dennstaedtia punctilobula* (eastern hayscented fern), *Dicentra eximia* (turkey corn), *Paronychia argyrocoma* (silvery nailwort) (drier sites), and *Heuchera villosa* (hairy alumroot). Small seedlings of woody species such as *Betula lenta* (sweet birch), *Kalmia latifolia* (mountain laurel), *Rhododendron maximum* (great laurel), and *Quercus montana* (chestnut oak) may also be present.

MOST ABUNDANT SPECIES

Global Stratum	Lifeform	Species
Herb (field)	Fern (Spore-bearing forb)	*Asplenium montanum* (mountain spleenwort)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Asplenium montanum* (mountain spleenwort)
Monocacy National Battlefield: *Asplenium montanum* (mountain spleenwort)
Global: *Asplenium montanum* (mountain spleenwort)

OTHER NOTEWORTHY SPECIES

Monocacy National Battlefield: Vulnerable Plants: *Carex argyrantha* (hay sedge, G5, MD state-vulnerable); **Invasive/Exotic Plants**: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Stellaria media* (common chickweed, Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR

RELATED CONCEPTS

Global Similar Types:
- Appalachian - Alleghenian Sandstone Dry Cliff Vegetation (CEGL006435)

Global Related Concepts:
- SNE acidic cliff community (Rawinski 1984a) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Chesapeake & Ohio Canal National Historical Park Classification Comments: Central Appalachian Spleenwort Acidic Cliff is also referred to as Spleenwort Acidic Cliff.

Monocacy National Battlefield Classification Comments: Central Appalachian Spleenwort Acidic Cliff is also referred to as Spleenwort Acidic Cliff.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled in plots near Old Towne (Lock 68). It is mapped in the Ridge and Valley on steep southeast to west facing cliffs from Paw Paw Tunnel to Irons Mountain (Canal mile 155 - 175).
Monocacy National Battlefield Range: This association occurs occasionally in the Brooks Hill area of the park.
Global Range: This community is scattered throughout the Central Appalachians, with a few disjunct occurrences on river bluffs, foothills and monadnocks of the western Piedmont in Virginia and Maryland.
Nations: US
States/Provinces: MD:SNR, TN?:SNA, VA:SU, WV?:SNA
TNC Ecoregions: 52:C, 59:C, 61:C
USFS Ecoregions (2007): 211D:CP, 221A:CP
Federal Lands: NPS (C&O Canal, Monocacy)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (2 plots): CHOH.043, CHOH.044.
Monocacy National Battlefield Plots: (1 plot): MONO.2.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Monocacy National Battlefield Description Author(s): S. Perles and M. Russo
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d.*, Fleming et al. 2017, Harrison 2004, Harrison 2011, Rawinski 1984a

A3991 Appalachian Lichen Boulderfield Alliance

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* (blistered naval lichen) and *Lasallia pensylvanica* (Pennsylvania blistered naval lichen) (either singly or together), *Lasallia papulosa* (blistered naval lichen) and *Lasallia caroliniana* (Carolina navel lichen), and *Umbilicaria mammulata* (navel lichen). Some other examples are dominated by *Umbilicaria muhlenbergii* (Muehlenberg's navel lichen), *Lasallia papulosa* (blistered naval lichen), and *Melanelia stygia* (melanelia lichen). 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: **(Common 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 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*

(blistered naval lichen) and *Lasallia pensylvanica* (Pennsylvania blistered naval lichen), either singly or in combination, are generally abundant and conspicuous. *Dimelaena oreina* (mountain lichen) abundantly covers many dry, exposed rock surfaces that are not covered with *Lasallia* (blistered navel lichen) 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* (sweet birch), *Sassafras albidum* (sassafras), and *Quercus montana* (chestnut oak), ericaceous shrubs, and scrambling vines of *Parthenocissus quinquefolia* (Virginia creeper).

ENVIRONMENTAL DESCRIPTION

Catoctin Mountain Park Environment: This association occurs on vertical or near-vertical rock faces and is uncommon in the park.

Harpers Ferry National Historical Park Environment: This association occurs on vertical or near-vertical rock faces and is uncommon in the park.

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

Catoctin Mountain Park Vegetation: Lichens are the only vegetation occurring in this association; occasional seedlings of *Betula lenta* (sweet birch) may be found.

Harpers Ferry National Historical Park Vegetation: Lichens are the dominant vegetation in this community.

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* (blistered naval lichen) and *Lasallia pensylvanica* (Pennsylvania blistered naval lichen), either singly or in combination, are generally abundant and conspicuous. *Dimelaena oreina* (mountain lichen) abundantly covers many dry, exposed rock surfaces that are not covered with *Lasallia* (blistered navel lichen) 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* (tube lichen), *Physcia subtilis* (rosette lichen), *Umbilicaria muhlenbergii* (Muehlenberg's navel lichen), *Xanthoparmelia conspersa* (xanthoparmelia lichen), and *Xanthoparmelia plittii* (Plitt's xanthoparmelia lichen). Many crustose species occur, including *Aspicilia cinerea* (rimmed lichen), *Fuscidea recensa* (fuscidea lichen), *Lecanora* (rim lichen) spp., *Lepraria* (dust lichen) spp., *Rhizocarpon reductum*, and *Sarcogyne clavus* (sarchgyne lichen). Flat surfaces and interstices that have thin deposits of organic matter often support a variety of fruticose lichens, including *Cladonia rangiferina* (greygreen reindeer lichen), *Cladonia uncialis* (cup lichen), *Cladonia crispata* (cup lichen), *Cladonia macilenta* (cup lichen), *Cladonia ochrochlora* (cup lichen), and *Cladonia squamosa* (cup lichen). In the upper elevation range, boreal lichens such as *Melanelia stygia* (melanelia lichen) and *Arctoparmelia centrifuga* (arctoparmelia lichen) are present, but they are not abundant. Along the edges of the boulderfields, scattered individuals of *Parthenocissus quinquefolia* (Virginia creeper), *Vaccinium* (blueberry) 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* (sweet birch), *Sassafras albidum* (sassafras), *Quercus montana* (chestnut oak), *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Carya glabra* (pignut hickory), and *Carya ovalis* (red hickory). Widely scattered shrubs may include *Kalmia latifolia* (mountain laurel) and other ericads. Herbs are usually absent, but *Dicentra eximia* (turkey corn) 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

Global

Stratum	Lifeform	Species
Nonvascular	Lichen	*Dimelaena oreina* (mountain lichen), *Lasallia papulosa* (blistered naval lichen), *Lasallia pensylvanica* (Pennsylvania blistered naval lichen)

CHARACTERISTIC SPECIES

Global: *Dimelaena oreina* (mountain lichen), *Lasallia papulosa* (blistered naval lichen), *Lasallia pensylvanica* (Pennsylvania blistered naval lichen), *Melanelia culbersonii* (culberson's black-parmelia)

OTHER NOTEWORTHY SPECIES

Global: Vulnerable Plants: *Melanelia culbersonii* (culberson's black-parmelia, 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 muhlenbergii - Lasallia papulosa - (Melanelia stygia)* Nonvascular Vegetation (CEGL004389) occurs at higher elevations in the same region and has different dominant species.

Global Related Concepts:

- *Lasallia (papulosa, pensylvanica) - Dimelaena oreina - (Melanelia culbersonii)* Nonvascular Vegetation (Fleming et al. 2007a) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate
Catoctin Mountain Park Classification Comments: Central Appalachian Acidic Boulderfield is sometimes referred to as Acidic Boulderfield.
Harpers Ferry National Historical Park Classification Comments: Central Appalachian Acidic Boulderfield is sometimes referred to as Acidic Boulderfield.
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 Shenandoah National 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 montana / 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

Catoctin Mountain Park Range: Central Appalachian Acidic Boulderfield is documented in four places in the eastern portion of the park along an unnamed ridge that includes Wolf Rock and Chimney Rock.
Harpers Ferry National Historical Park Range: One polygon of Central Appalachian Acidic Boulderfield was mapped in the Short Hill region of the park.

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:SNR, NJ:SNR, PA:SNR, VA:S4, WV:S3
TNC Ecoregions: 52:C, 59:C, 60:C, 61:C
USFS Ecoregions (2007): 211Fc:CCC, 221Da:CCC, 221De:CCC, 231A:CC, M221Aa:CCP, 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

Catoctin Mountain Park Plots: CATO.23.
Catoctin Mountain Park Description Author(s): L. Sneddon
Harpers Ferry National Historical Park Description Author(s): J. Teague
Global Description Author(s): G.P. Fleming
References: Eastern Ecology Working Group n.d., Fleming et al. 2007a, Fleming et al. 2007a*, Fleming et al. 2017, Flenniken 1999, Perles et al. 2007, Smith, T. pers. comm., WVNHP unpubl. data, Young et al. 2009

A2072 *Hydrangea arborescens / Heuchera villosa* Appalachian Circumneutral Cliff Alliance

These are moist shaded cliffs, usually with some seasonal seepage that occur in the Appalachian region on a variety of substrates, from siltstones and shales, to limestones, including some calcareous sandstones. Herbaceous species are variable among associations and even patchily within a stand. Most typical vascular species are *Heuchera villosa var. villosa* (hairy alumroot), *Asplenium trichomanes ssp. trichomanes* (maidenhair spleenwort), and *Thalictrum clavatum* (mountain meadowrue). Other vascular species present include *Asplenium montanum* (mountain spleenwort), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Hydrangea arborescens* (wild hydrangea), *Laportea canadensis* (Canadian woodnettle), *Polypodium appalachianum* (Appalachian polypody), *Rhododendron maximum* (great laurel), *Trautvetteria caroliniensis var. caroliniensis* (Carolina bugbane), and (rarely) *Eurybia divaricata* (white wood aster), *Phegopteris connectilis* (long beechfern), and *Saxifraga caroliniana* (Carolina saxifrage). *Conocephalum conicum* is a common and conspicuous nonvascular plant.

[CEGL006479] *Hydrangea arborescens / Sedum ternatum - Polypodium virginianum* Cliff Shrubland

Translated Name: **Wild Hydrangea / Woodland Stonecrop - Rock Polypody Cliff Shrubland**
Common Name: **Piedmont-Central Appalachian Subcalcareous Cliff & Rock Outcrop**

USNVC CLASSIFICATION

Division	Eastern North American Temperate Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Appalachian Cliff & Rock Vegetation (G840)
Alliance	*Hydrangea arborescens / Heuchera villosa* Appalachian Circumneutral Cliff Alliance (A2072)

ELEMENT CONCEPT

Global Summary: This association is currently known only from the Potomac River drainage in the Piedmont Triassic Basin of Virginia and Maryland and the adjacent Blue Ridge of Virginia. It occupies cliff-faces weathered from siltstone, shale, calcareous sandstone, and metabasalt. Sites are next to rivers and large streams, where progressive stream incision through resistant strata has formed escarpments of exposed bedrock. All of the

documented cliffs have northerly aspects and are partly to heavily shaded by overhanging trees or trees growing in the cliff-base floodplains. Microhabitat conditions are characterized by vertical to very steep faces, with much exposed bedrock, numerous fissures and shelves, and considerable local deposition of organic-rich, colluvial soil material. Vegetation cover ranges from sparse or somewhat sparse (5-20% vascular cover) on the most massive cliffs, to moderately dense (20-50% vascular cover) on other examples. Saplings and stunted trees of *Fraxinus americana* (white ash), *Ostrya virginiana* (hophornbeam), *Tsuga canadensis* (eastern hemlock), *Ulmus rubra* (slippery elm), *Ulmus americana* (American elm), *Acer saccharum* (sugar maple), *Acer nigrum* (black maple), *Tilia americana* (American basswood), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Carpinus caroliniana* (American hornbeam), *Quercus rubra* (northern red oak), and *Quercus montana* (chestnut oak) may occur on the cliff-faces. *Hydrangea arborescens* (wild hydrangea) is a characteristic and sometimes abundant shrub, while *Toxicodendron radicans* (eastern poison-ivy) and *Parthenocissus quinquefolia* (Virginia creeper) are constant vines. Less constant shrubs include *Physocarpus opulifolius* (common ninebark), *Ptelea trifoliata* (common hoptree), *Hamamelis virginiana* (American witch-hazel), and *Viburnum acerifolium* (mapleleaf viburnum). Characteristic herbaceous species include *Polypodium virginianum* (rock polypody) (locally abundant), *Sedum ternatum* (woodland stonecrop) (locally abundant), *Symphyotrichum cordifolium* (common blue wood aster) (locally abundant), *Dryopteris marginalis* (marginal woodfern), *Pilea pumila* (Canadian clearweed), *Asplenium trichomanes* (maidenhair spleenwort), *Woodsia obtusa ssp. obtusa* (bluntlobe cliff fern), *Aquilegia canadensis* (red columbine), *Saxifraga virginiensis* (early saxifrage), *Eurybia divaricata* (white wood aster), *Asplenium rhizophyllum* (walking fern), *Ageratina altissima* (white snakeroot), *Carex communis* (fibrousroot sedge), *Carex platyphylla* (broadleaf sedge), *Heuchera americana* (American alumroot), *Arabis laevigata var. laevigata* (smooth rockcress), *Polymnia canadensis* (whiteflower leafcup), *Polystichum acrostichoides* (Christmas fern), and *Solidago caesia* (wreath goldenrod). Exotic weeds, including *Stellaria media* (common chickweed), *Lonicera japonica* (Japanese honeysuckle), *Alliaria petiolata* (garlic mustard), and *Microstegium vimineum* (Nepalese browntop), are problematic invaders at most sites.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This wild hydrangea shrubland was sampled in plots at four locations in the park. The sites are extremely steep escarpments with rapidly to well-drained clay loam soil (where reported). The unvegetated surface is dominated, in some cases exclusively, by exposed bedrock (70-100% cover) with mosses and lichens (50-90%) with some leaf litter (0-30%) or bare soil (0-3%). Evidence of disturbance includes the presence of exotic species.

Harpers Ferry National Historical Park Environment: This type occurs on metabasalt cliff-faces subtending the Potomac River. The sites are formed by downcutting of the Potomac River and have vertical to very steep faces, exposed bedrock, numerous fissures and shelves, eroding soil pockets, and very irregular microtopography. The two documented cliffs in the park have a northeast and southwest aspect and are partly shaded by overhanging trees.

Global Environment: This association is currently known from cliff-faces weathered from siltstone, shale, calcareous sandstone, and metabasalt. Sites subtend rivers and large streams, where progressive stream incision through resistant strata has formed escarpments of exposed bedrock. All of the documented cliffs have northerly aspects and are partly to heavily shaded by overhanging trees or trees growing in the cliff-base floodplains. Microhabitat conditions are characterized by vertical to very steep faces, with much exposed bedrock, numerous fissures and shelves, and considerable local deposition of organic-rich, colluvial soil material. Examples on siltstone readily erode along horizontal, slab-forming fissures, forming loose, fissile channery. There is some variation in the microtopographic character of these cliffs, with the larger, more exposed examples having a more massive, less weathered character. Soil samples collected from plots had moderate calcium concentrations (900 to 1000 ppm).

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: This community is defined by *Hydrangea arborescens* (wild hydrangea) in the very sparse (10% cover) short-shrub layer (1-6 m tall). In addition, there may be a sparse (10-20% cover) tree canopy (10-20 m) of *Acer saccharum var. saccharum* (sugar maple), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm) and a sparse (20%) tall-shrub layer of *Acer saccharum var. saccharum* (sugar maple), *Celtis occidentalis* (common hackberry), *Ostrya virginiana* (hophornbeam), and *Ulmus rubra* (slippery elm). The herbaceous layer (<5-20%) includes *Aquilegia canadensis* (red columbine), *Campanula rotundifolia* (bluebell bellflower) (Maryland state-imperiled), *Polypodium virginianum* (rock polypody), *Rhus aromatica var. aromatica* (fragrant sumac), *Hylotelephium telephioides* (Allegheny stonecrop), and *Symphyotrichum cordifolium* (common blue wood aster). Nonvascular species cover 50-90% of the ground surface. A total of six exotic species were reported from sampled stands.

Harpers Ferry National Historical Park Vegetation: Vegetation is fairly diverse, rooting in numerous holes, crevices, and moss- or humus-covered shelves. Rock-face vegetation is dominated by lithophytic herbaceous species, such as *Polypodium virginianum* (rock polypody), *Dryopteris marginalis* (marginal woodfern), and *Sedum ternatum* (woodland stonecrop). Other herbaceous species common on the rock-face or base of cliff include *Symphyotrichum cordifolium* (common blue wood aster), *Solidago flexicaulis* (zigzag goldenrod), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Aquilegia canadensis* (red columbine), *Sanicula canadensis* (Canadian blacksnakeroot), and *Impatiens pallida* (pale touch-me-not). Woody species are often rooted on the cliffs and in deeper soil pockets below the cliffs. *Betula lenta* (sweet birch) is the dominant overstory species from overhanging trees. *Acer rubrum* (red maple) and *Fraxinus pennsylvanica* (green ash) are common in the subcanopy. Common shrubs at the cliff include *Hydrangea arborescens* (wild hydrangea), *Physocarpus opulifolius var. opulifolius* (common ninebark), *Rubus argutus* (sawtooth blackberry), and *Lindera benzoin* (northern spicebush). *Toxicodendron radicans* (eastern poison-ivy) can also be abundant as a low shrub. Species richness for the one plot in the park is 29 species in 100 square meters.

Global Vegetation: Vegetation cover ranges from sparse or somewhat sparse (5-20% vascular cover) on massive cliffs at Red Rock Wilderness Regional Park and Chilton Woods (C&O Canal), to moderately dense (20-50% vascular cover) on the other examples along the Potomac River and Bull Run. Saplings and stunted trees of *Fraxinus americana* (white ash), *Ostrya virginiana* (hophornbeam), *Tsuga canadensis* (eastern hemlock), *Ulmus rubra* (slippery elm), *Ulmus americana* (American elm), *Acer saccharum* (sugar maple), *Acer nigrum* (black maple), *Tilia americana* (American basswood), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Carpinus caroliniana* (American hornbeam), *Quercus rubra* (northern red oak), and *Quercus montana* (chestnut oak) may occur on the cliff-faces. *Hydrangea arborescens* (wild hydrangea) is a characteristic and sometimes abundant shrub, while *Toxicodendron radicans* (eastern poison-ivy) and *Parthenocissus quinquefolia* (Virginia creeper) are constant vines. Less constant shrubs include *Physocarpus opulifolius* (common ninebark), *Ptelea trifoliata* (common hoptree), *Hamamelis virginiana* (American witch-hazel), and *Viburnum acerifolium* (mapleleaf viburnum). Characteristic herbaceous species include *Polypodium virginianum* (rock polypody) (locally abundant), *Sedum ternatum* (woodland stonecrop) (locally abundant), *Symphyotrichum cordifolium* (common blue wood aster) (locally abundant), *Dryopteris marginalis* (marginal woodfern), *Pilea pumila* (Canadian clearweed), *Asplenium trichomanes* (maidenhair spleenwort), *Woodsia obtusa ssp. obtusa* (bluntlobe cliff fern), *Aquilegia canadensis* (red columbine), *Saxifraga virginiensis* (early saxifrage), *Eurybia divaricata* (white wood aster), *Asplenium rhizophyllum* (walking fern), *Ageratina altissima* (white snakeroot), *Carex communis* (fibrousroot sedge), *Carex platyphylla* (broadleaf sedge), *Heuchera americana* (American alumroot), *Arabis laevigata var. laevigata* (smooth rockcress), *Polymnia canadensis* (whiteflower leafcup), *Polystichum acrostichoides* (Christmas fern), and *Solidago caesia* (wreath goldenrod). Species that may be confined to the large, exposed cliff at Red Rock Wilderness Regional Park include *Cerastium arvense* (field chickweed), *Hylotelephium telephioides* (Allegheny stonecrop), and *Solidago arguta var. harrisii* (Harris' goldenrod). Exotic weeds, including *Stellaria media* (common chickweed), *Lonicera japonica* (Japanese honeysuckle), *Alliaria petiolata* (garlic mustard), and *Microstegium vimineum* (Nepalese browntop), are problematic invaders at most sites.

Global Dynamics: The known substrates of this type (siltstone, shale, calcareous sandstone, metabasalt) could be characterized as "subcalcareous" or moderately calcareous, at least compared to carbonate parent material. The vegetation composition is thus somewhat intermediate between that of strongly calcareous rock habitats and that of more acidic habitats. With a few rare exceptions, it lacks many of the obligate calciphiles (*Thuja occidentalis* (arborvitae), *Cystopteris bulbifera* (bulblet bladderfern), *Asplenium ruta-muraria* (wallrue), *Asplenium resiliens* (blackstem spleenwort), *Pellaea atropurpurea* (purple cliffbrake), *Carex eburnea* (bristleleaf sedge), etc.) of limestone and dolomite cliffs, and contains species of more acidic rock outcrops that are generally absent on limestone (e.g., *Polypodium virginianum* (rock polypody), *Polystichum acrostichoides* (Christmas fern), *Dryopteris marginalis* (marginal woodfern), *Hamamelis virginiana* (American witch-hazel)). Many of the characteristic species (*Hydrangea arborescens* (wild hydrangea), *Sedum ternatum* (woodland stonecrop), *Polypodium virginianum* (rock polypody), *Asplenium trichomanes* (maidenhair spleenwort), *Woodsia obtusa* (bluntlobe cliff fern), etc.) occur on a fairly wide range of substrates but prefer at least subacidic or somewhat calcareous conditions.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hydrangea arborescens* (wild hydrangea)
Herb (field)	Flowering forb	*Sedum ternatum* (woodland stonecrop)
Herb (field)	Fern (Spore-bearing forb)	*Polypodium virginianum* (rock polypody)

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Hydrangea arborescens* (wild hydrangea), *Polypodium virginianum* (rock polypody)
Harpers Ferry National Historical Park: *Hydrangea arborescens* (wild hydrangea), *Polypodium virginianum* (rock polypody), *Solidago flexicaulis* (zigzag goldenrod), *Symphyotrichum cordifolium* (common blue wood aster)
Global: *Hydrangea arborescens* (wild hydrangea), *Polypodium virginianum* (rock polypody), *Sedum ternatum* (woodland stonecrop)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Campanula rotundifolia* (bluebell bellflower, G5, MD-imperiled); **Invasive/Exotic Plants**: *Ailanthus altissima* (tree of heaven, Medium), *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Poa compressa* (Canada bluegrass, High/Low), *Stellaria media* (common chickweed, Low)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Global: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium), *Stellaria media* (common chickweed, Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (14-Jul-2016). More data on the global distribution is needed to rank this association.

RELATED CONCEPTS

Global Similar Types:
- *(Hydrangea arborescens, Toxicodendron radicans) / Heuchera americana - (Dichanthelium depauperatum, Woodsia obtusa)* Cliff Shrubland (CEGL004395) a more southern type of dry, mafic cliffs; widespread in the Southern Blue Ridge, Cumberlands and Southern Ridge and Valley, and peripheral in the western Piedmont.
- Piedmont Mafic Cliff Sparse Vegetation (CEGL003982)

Global Related Concepts:
- *Hydrangea arborescens / Arabis laevigata - Sedum ternatum* Sparse Vegetation (Lea 2003) ><
- *Hydrangea arborescens / Sedum ternatum - Polypodium virginianum* Shrubland (Fleming and Taverna 2006) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Chesapeake & Ohio Canal National Historical Park Classification Comments: Piedmont-Central Appalachian Subcalcareous Cliff & Rock Outcrop is also referred to as Basic Cliff.
Harpers Ferry National Historical Park Classification Comments: Piedmont-Central Appalachian Subcalcareous Cliff & Rock Outcrop (also referred to as Basic Cliff) is clearly distinguishable in the park, occurring on nearly vertical cliff-faces along the Potomac River with vegetation rooting in numerous holes, crevices, and moss- or humus-covered shelves.
Harpers Ferry National Historical Park Other Comments: Examples in the park have considerable (10 to 25%) cover of woody plants rooted on the cliffs within plots and directly below the cliffs. Herbaceous cover within plots, enhanced with opportunities provided by the ledgy, steeply sloping (but not vertical) outcrops, ranges from 15 to 35%.
Global Classification Comments: The classification is supported by quantitative data from three plots.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: This community was sampled near Marble Quarry / Chilton Woods (Canal mile 38-39) and Sorrel Ridge / Tunnel Hollow (Canal mile 154). It was also mapped at Harpers Ferry (between Canal mile 60 and 61) and Paw Paw (Canal mile 156-157).
Harpers Ferry National Historical Park Range: This community is documented at two cliff sites along the Potomac River, below the overlook on Maryland Heights and on the east end of Short Hill Mountain. It is currently known only from the Potomac River drainage in Maryland and Virginia, in the Piedmont Triassic Basin and the adjacent Blue Ridge.
Global Range: This association is currently known only from the Potomac River drainage in Maryland and Virginia, in the Piedmont Triassic Basin and the adjacent Blue Ridge. Depending on the extent of bedrock types that

might support the type, this range could be potentially much larger. A tentative report (Lea 2003) of comparable vegetation on Devonian shales of the Ridge and Valley province needs additional investigation.
Nations: US
States/Provinces: MD:SNR, VA:S1?, WV?:SNA
TNC Ecoregions: 52:C, 59:C
Federal Lands: NPS (C&O Canal, Harpers Ferry)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (4 plots): CHOH.076, CHOH.233, CHOH.234, CHOH.235.
Harpers Ferry National Historical Park Plots: HAFE.113.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Harpers Ferry National Historical Park Description Author(s): K. Taverna and G. Fleming
Global Description Author(s): G.P. Fleming and C. Lea
References: Davis 2014, Eastern Ecology Working Group n.d., Fleming and Taverna 2006, Fleming et al. 2017, Harrison 2004, Harrison 2011, Lea 2003, Lea 2003*

A2076 *Pellaea atropurpurea - Cystopteris bulbifera* Appalachian Circumneutral Cliff Alliance

This alliance includes vegetation of dry to rather moist igneous, metamorphic, and sedimentary rock outcrops and cliffs of essentially neutral base status. Vascular plants are generally confined to crevices. Stands are usually shaded by trees rooted in adjacent forested communities, generally with very little vascular vegetation and little nonvascular vegetation. Characteristic species include *Aquilegia canadensis* (red columbine), *Aralia racemosa* (American spikenard), *Asplenium* (spleenwort) spp., *Cystopteris fragilis* (brittle bladderfern), *Pellaea* (cliffbrake) spp., *Rubus odoratus* (purpleflowering raspberry), and *Solidago canadensis* (Canada goldenrod). Examples may have low cover of vascular plants. The moister microhabitats of crevices may have mosses such as *Anomodon rostratus* (anomodon moss) and *Anomodon attenuatus* (anomodon moss). Examples are found primarily in the Ridge and Valley, Blue Ridge, Cumberland Plateau, Central Appalachians, and Allegheny Plateau, extending into the northern Piedmont of New Jersey and New York. This vegetation occurs primarily on limestone and dolomite, but there are some examples on apparently nutrient-rich sandstones.

[CEGL004476] *Asplenium ruta-muraria - Pellaea atropurpurea* Cliff Sparse Vegetation

Translated Name: **Wall-rue - Purple Cliffbrake Cliff Sparse Vegetation**
Common Name: **Montane Cliff (Calcareous Type)**

USNVC CLASSIFICATION

Division	Eastern North American Temperate Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Appalachian Cliff & Rock Vegetation (G840)
Alliance	*Pellaea atropurpurea - Cystopteris bulbifera* Appalachian Circumneutral Cliff Alliance (A2076)

ELEMENT CONCEPT

Global Summary: This community includes calcareous cliffs associated with limestone or dolomite geology in Alabama, Kentucky, Maryland, North Carolina, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia. This community includes dry to rather moist limestone and dolomite outcrops, usually shaded by trees rooted in adjacent forested communities. It has little vegetative cover, often with 90% of the rock surface unvegetated. Mosses and lichens can have moderate coverage; vascular plants occur on ledges and rooted in cracks. Calciphilic herbs such as *Asplenium ruta-muraria* (wallrue), *Pellaea atropurpurea* (purple cliffbrake), *Pellaea glabella ssp. glabella* (smooth cliffbrake), *Asplenium resiliens* (blackstem spleenwort), *Aquilegia canadensis* (red columbine) are characteristic. Moister microhabitats of the crevice may have mosses such as *Anomodon rostratus* (anomodon moss) and *Anomodon attenuatus* (anomodon moss).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: This sparse vegetation was sampled at five plot locations in the park. The sites are extremely steep mid and lower escarpments with west and southwest aspects,

often exposed to full sun. Soils are rapidly drained. The unvegetated surface is dominated almost exclusively by exposed bedrock (90-99% cover) with some leaf litter (1-5%), bare soil (1-5%), and mosses and lichens (0-30%). Evidence of disturbance includes the presence of exotic species.

Global Environment: This community occurs on calcareous cliffs, outcrops, and rocky slopes and is often shaded by trees rooted in adjacent forested communities and/or the outcrops. It has little vegetative cover, often with 90% of the rock surface unvegetated. Mosses and lichens can have moderate coverage, and vascular plants occur on ledges and rooted in cracks.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: The very sparse (<5-20% cover) herbaceous layer defines this community. Common and/or characteristic species include *Aquilegia canadensis* (red columbine), *Asplenium ruta-muraria* (wallrue), *Heuchera americana* (American alumroot), *Pellaea atropurpurea* (purple cliffbrake), *Phlox subulata* (moss phlox), *Hylotelephium telephioides* (Allegheny stonecrop), and *Symphyotrichum oblongifolium* (aromatic aster). There may also be very sparse (<5%) short-shrub (1-6 m) and dwarf-shrub (<0.5 m) layers that can include *Acer negundo* (box-elder), *Celtis occidentalis* (common hackberry), *Cercis canadensis* (eastern redbud), *Juniperus virginiana* (eastern red-cedar), and *Ulmus americana* (American elm). Nonvascular species (mosses and lichens) cover up to 30% of the ground surface. A total of 16 exotic species were reported from sampled stands. This community also supports Maryland state-critically imperiled *Amelanchier humilis* (low serviceberry) and *Thuja occidentalis* (arborvitae), state-imperiled *Juglans cinerea* (butternut), and three state-vulnerable species.

Global Vegetation: Calciphilic herbs such as *Aquilegia canadensis* (red columbine), *Dodecatheon meadia* (pride of Ohio), *Symphyotrichum ericoides* (white heath aster), *Symphyotrichum oblongifolium* (aromatic aster), *Cystopteris bulbifera* (bulblet bladderfern), *Bouteloua curtipendula* (sideoats grama), *Pellaea atropurpurea* (purple cliffbrake), *Dryopteris marginalis* (marginal woodfern), *Allium cernuum* (nodding onion), *Heuchera americana* (American alumroot), *Carex oligocarpa* (richwoods sedge), *Asplenium trichomanes* (maidenhair spleenwort), *Arabis hirsuta* (hairy rockcress), *Arabis lyrata* (lyrate rockcress), *Phlox subulata* (moss phlox), *Hylotelephium telephioides* (Allegheny stonecrop), and *Saxifraga virginiensis* (early saxifrage) are characteristic. Woody species may occur scattered throughout or at the margins; these species include *Juniperus virginiana* (eastern red-cedar), *Rhus aromatica* (fragrant sumac), *Toxicodendron radicans* (eastern poison-ivy), *Hydrangea arborescens* (wild hydrangea), *Fraxinus americana* (white ash), *Parthenocissus quinquefolia* (Virginia creeper), *Cercis canadensis* (eastern redbud), *Tilia americana* (American basswood), *Carya* (hickory) spp., *Quercus muehlenbergii* (chinquapin oak), *Ostrya virginiana* (hophornbeam), and *Cornus florida* (flowering dogwood).

Global Dynamics: Species composition varies with moisture, shade and exposure on the rocky surface. Introduced weeds, including *Ailanthus altissima* (tree of heaven), *Centaurea stoebe ssp. micranthos* (spotted knapweed), *Sedum acre* (goldmoss stonecrop), *Verbascum thapsus* (common mullein), *Lonicera japonica* (Japanese honeysuckle), and *Melilotus officinalis* (yellow sweetclover), may become established on more sheltered and mesic faces.

MOST ABUNDANT SPECIES

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Asplenium ruta-muraria* (wallrue), *Pellaea atropurpurea* (purple cliffbrake)

Global: *Aquilegia canadensis* (red columbine), *Asplenium resiliens* (blackstem spleenwort), *Asplenium ruta-muraria* (wallrue), *Pellaea atropurpurea* (purple cliffbrake), *Pellaea glabella* ssp. *glabella* (smooth cliffbrake)

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Amelanchier humilis* (low serviceberry, G5, MD-critically imperiled), *Asplenium ruta-muraria* (wallrue, G5, MD-vulnerable), *Juglans cinerea* (butternut, G3, MD-vulnerable), *Ribes cynosbati* (eastern prickly gooseberry, G5, MD-vulnerable), *Symphyotrichum shortii* (Short's aster, G5, MD-vulnerable), *Thuja occidentalis* (arborvitae, G5, MD-critically imperiled);
Invasive/Exotic Plants: *Ailanthus altissima* (tree of heaven, Medium), *Allium vineale* (wild garlic, Medium/Insignificant), *Centaurea stoebe* ssp. *micranthos* (spotted knapweed, High/Medium), *Euonymus fortunei* (winter creeper, High/Medium), *Hieracium lachenalii* (common hawkweed), *Lonicera japonica* (Japanese honeysuckle, High/Medium), *Lonicera morrowii* (Morrow's honeysuckle, High/Medium), *Nepeta cataria* (catnip), *Poa compressa* (Canada bluegrass, High/Low), *Rubus phoenicolasius* (wine raspberry, Medium), *Sedum acre* (goldmoss stonecrop), *Setaria faberi* (Japanese bristlegrass), *Setaria pumila* (yellow foxtail, Low/Insignificant), *Stellaria media* (common chickweed, Low), *Taraxacum officinale* (common dandelion), *Verbascum thapsus* (common mullein, Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (11-Aug-1997).

RELATED CONCEPTS

Global Related Concepts:

- IE1a. Southern Appalachian Calcareous Cliff (Allard 1990) **?**
- Spleenwort-cliffbrake calcareous cliff (CAP pers. comm. 1998) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: This community is scattered in the Central Appalachian and Ridge and Valley provinces but is extremely uncommon in the Southern Blue Ridge.

ELEMENT DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: Montane Cliff (Calcareous Type) was sampled in plots in the Hagerstown Valley near at Lock 37 (Canal mile 67), Cedar Grove and Falling Water Road (Canal mile 88 - 92), and Two Locks / Dam #5 (Canal mile 107). It was also mapped at Williamsport (Canal mile 99).
Global Range: This community occurs in areas of limestone or dolomite geology from Pennsylvania south to Alabama. It is found primarily in the Ridge and Valley and Cumberland Plateau, but ranges into scattered areas in the Blue Ridge.
Nations: US
States/Provinces: AL:SNR, GA?:SNA, KY:SNR, MD:SNR, NC:SNR, PA:SNR, SC:SNR, TN:SNR, VA:S2?, WV:S1
TNC Ecoregions: 50:C, 51:C, 59:C, 60:P
USFS Ecoregions (2007): 221Hb:CCP, 221Hc:CCC, 221Ja:CCC, M221Aa:CCP, M221Ac:CCC, M221Bb:CCP, M221Be:CCC, M221Dc:CCC
Federal Lands: NPS (C&O Canal, Chickamauga-Chattanooga?, Great Smoky Mountains); USFS (Pisgah)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Plots: (6 plots): CHOH_004, CHOH.015, CHOH.022, CHOH.033, CHOH.500, CHOH.501.
Chesapeake & Ohio Canal National Historical Park Description Author(s): M.J. Russo
Global Description Author(s): E. Largay and G.P. Fleming
References: Allard 1990, CAP pers. comm. 1998, Fike 1999, Fleming et al. 2017, Harrison 2004, Harrison 2011, Metzler and Barrett 2006, Nelson 1986, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.*, WVNHP unpubl. data

7. Agricultural & Developed Vegetation

Agricultural crops dominated by shrub and tree vegetation, including orchards, vineyards, woody berry crops, intensive (often short-rotation) forest plantations, various agroforestry woody crops, and woody wetland crops, such as cranberries.

7.A.2. Forest Plantation & Agroforestry

7.A.2.1. FOREST PLANTATION

CGR007. Temperate & Boreal Plantation

CSG005. EASTERN NORTH AMERICAN TEMPERATE FOREST PLANTATION

Native pines exceed other conifers (native *Pinus* (pine) spp. ≥50% cover); tree composition typically dominated by *Pinus banksiana* (jack pine), *Pinus resinosa* (red pine), *Pinus strobus* (eastern white pine), but other native *Pinus* (pine) spp. are also possible.

CTY009 Native Northern Pine Plantation Cultural Type

Native pines exceed other conifers (native *Pinus* (pine) spp. ≥50% cover); tree composition typically dominated by *Pinus banksiana* (jack pine), *Pinus resinosa* (red pine), *Pinus strobus* (eastern white pine), but other native *Pinus* (pine) spp. are also possible.

[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* (eastern white pine) 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* (eastern white pine). *Pinus resinosa* (red pine) or *Pinus virginiana* (Virginia pine) is occasionally present in small amounts. In older stands or gaps, regenerating trees may include *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), and *Prunus serotina* (black cherry); *Robinia pseudoacacia* (black locust) and *Betula lenta* (sweet birch) are occasionally present. *Acer pensylvanicum* (striped maple) and *Ostrya virginiana* (hophornbeam) 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

Catoctin Mountain Park Environment: This association occurs in two small areas within the park, both in upland settings. Leaf litter composed largely of pine needles carpets the ground surface.
Global Environment: Stands contain plantations of *Pinus strobus* (eastern white pine) 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

Antietam National Battlefield Vegetation: Forest canopy is dominated by even-aged *Pinus strobus* (eastern white pine) typically planted in rows or other linear patterns. Adventitious deciduous hardwood species can also be present in the canopy or subcanopy.
Catoctin Mountain Park Vegetation: This planted forest is characterized by a dense canopy dominated by *Pinus strobus* (eastern white pine), with abundant *Liriodendron tulipifera* (tuliptree) and occasional *Quercus* (oak) spp. The stands lack the characteristic row structure seen in typical active plantations, suggesting abandonment as a plantation some time ago. The shrub layer is characterized by 50-75% cover of *Lindera benzoin* (northern spicebush). The herbaceous layer is approximately 50% cover, and is comprised largely of native species such as *Galium circaezans* (licorice bedstraw), *Viola canadensis* (Canadian white violet), *Arisaema triphyllum* (Jack in the pulpit), *Hepatica nobilis* (hepatica), *Dryopteris intermedia* (intermediate woodfern), and *Parthenocissus quinquefolia* (Virginia creeper). The invasive species *Berberis thunbergii* (Japanese barberry) forms an interrupted short-shrub layer. *Microstegium vimineum* (Nepalese browntop) and *Alliaria petiolata* (garlic mustard) are present at low cover.

Monocacy National Battlefield Vegetation: The forest canopy is dominated by even-aged *Pinus strobus* (eastern white pine) typically planted in rows or other linear patterns. Adventitious hardwood species can also be present in the canopy or subcanopy.
Global Vegetation: The tree canopy at maturity is usually dense and contains a monospecific layer of *Pinus strobus* (eastern white pine). *Pinus resinosa* (red pine) or *Pinus virginiana* (Virginia pine) is occasionally present in small amounts. In older stands or gaps, regenerating trees may include *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), and *Prunus serotina* (black cherry); *Robinia pseudoacacia* (black locust) and *Betula lenta* (sweet birch) are occasionally present. *Acer pensylvanicum* (striped maple) and *Ostrya virginiana* (hophornbeam) 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* (eastern white pine) 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

Global Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus* (eastern white pine)

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Pinus strobus* (eastern white pine)
Catoctin Mountain Park: *Liriodendron tulipifera* (tuliptree), *Pinus strobus* (eastern white pine)
Monocacy National Battlefield: *Pinus strobus* (eastern white pine)
Global: *Pinus strobus* (eastern white pine)

OTHER NOTEWORTHY SPECIES

Catoctin Mountain Park: Invasive/Exotic Plants: *Alliaria petiolata* (garlic mustard, High/Medium), *Berberis thunbergii* (Japanese barberry, High/Medium), *Microstegium vimineum* (Nepalese browntop, High/Medium)
Global: Vulnerable Plants: *Rhus aromatica* var. *arenaria* (fragrant sumac, G5T3Q)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (cultural) (08-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)

Global Related Concepts:
- *Pinus strobus* Planted Forest (Fleming and Coulling 2001) =
- IF3b. Plantation (Hardwood or Conifer) (Allard 1990) >
- Pine Plantation (Vanderhorst 2001b) =
- Unclassified Clearcut Regeneration (Fleming and Moorhead 2000) **?**
- White Pine Plantation (Edinger et al. 2014b) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Antietam National Battlefield Classification Comments: This vegetation is mapped as part of the Planted Evergreen Forest Map Class (COMP_PLEV) which includes one association at this park, Eastern White Pine Plantation (CST007178).
Catoctin Mountain Park Classification Comments: This vegetation is mapped as part of the Planted Evergreen Forest Map Class (COMP_PLEV) which includes one association at this park, Eastern White Pine Plantation (CST007178).

Chesapeake & Ohio Canal National Historical Park Classification Comments: This vegetation is mapped as part of the Planted Evergreen Forest Map Class (COMP_PLEV) which includes three associations at this park, Norway Spruce Plantation (CST007167), Eastern White Pine Plantation (CST007178), and Loblolly Pine Plantation (CST007179).
Monocacy National Battlefield Classification Comments: This vegetation is mapped as part of the Planted Evergreen Forest Map Class (COMP_PLEV) which includes one association at this park, Eastern White Pine Plantation (CST007178).
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* (eastern white pine) 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

Catoctin Mountain Park Range: Only two small patches of this vegetation have been mapped in the park; one is located in the Owens Creek area, on a horse trail approximately 250 m south of the junction of Catoctin Trail. The other patch is situated southeast of the Foxville-Deerfield Road off the Browns Farm Trail.
Monocacy National Battlefield Range: This association occurs in at least one location in the Brooks Hill area and may be present in other areas of the park.
Global Range: This white pine plantation is found throughout the northeastern and midwestern United States and adjacent Canada.
Nations: CA,US
States/Provinces: CT:SNA, DE:SNA, GA:SNA, IN:SNA, KY:SNA, MD:SNA, NC:SNA, NH:SNA, NJ:SNA, NY:SNA, OH:SNA, PA:SNA, SC:SNA, TN:SNA, VA:SNA, VT:SNA, WV:SNA
TNC Ecoregions: 47:C, 48:C, 51:C, 52:C, 59:C, 61:C, 62:C, 63:C
USFS Ecoregions (2007): 211:C, 221Ae:CCC, 221Ai:CCC, 221Bc:CPP, 221Db:CCC, 221He:C??, 222Ja:CCC, 223:C, 232Ab:CCC, 232Ac:CCP, M211Ba:CPP, M221Aa:CPP, M221Bb:CCC, M221Ce:CPP, 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, Roosevelt-Vanderbilt, 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

Catoctin Mountain Park Inventory Notes: No additional inventory was attempted to locate additional stands.
Antietam National Battlefield Plots: None.
Catoctin Mountain Park Plots: None.
Monocacy National Battlefield Plots: None.
Antietam National Battlefield Description Author(s): S. Perles
Catoctin Mountain Park Description Author(s): L. Sneddon
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
Monocacy National Battlefield Description Author(s): S. Perles
Global Description Author(s): D. Faber-Langendoen and S.C. Gawler
References: Allard 1990, Coxe 2009, Edinger et al. 2014b, Fleming and Coulling 2001, Fleming and Moorhead 2000, Hop et al. 2009, NRCS 2004a, NatureServe 2009, Patterson 2008b, Podniesinski et al. 2005b, Reschke 1990, Sechler et al. 2014, Southeastern Ecology Working Group n.d.*, Vanderhorst 2001a, Vanderhorst 2001b, Vanderhorst and Streets 2006, Vanderhorst et al. 2007

CTY012 Native Southern Pine Plantation Cultural Type

Native southern pine conifers exceed native non-conifers (native *Pinus* (pine) spp. >50% cover); tree composition typically dominated by *Pinus clausa* (sand pine), *Pinus elliottii* (slash pine), *Pinus palustris* (longleaf pine), or *Pinus taeda* (loblolly pine).

[CST007179] *Pinus taeda* Forest Plantation

Translated Name: **Loblolly Pine Forest Plantation**
Common Name: **Loblolly 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 Southern Pine Plantation Cultural Type (CTY012)

Element Concept

Global Summary: This association represents young, monospecific planted stands of *Pinus taeda* (loblolly pine). Due to the commercial value of this species, this type is widely distributed across much of the southeastern United States from the Interior Highlands to the Coastal Plain, including areas outside the natural range of the species. The core concept of stands attributable to this type are those which support dense, often perfect rows of planted *Pinus taeda* (loblolly pine) or otherwise dense, young stands which are established, managed, and/or maintained for the extraction of forest products (usually pulpwood). In most cases these stands support almost no other tree species in the overstory. Understory composition and density can vary widely depending upon location, management history, and stand age. Stands are typically established with mechanical planting but may also be established through other means. This association rarely exceeds 20-40 years of age on most timberlands. Excluded from this association are plantation stands which have "broken up" with age or thinning to approximate a more natural structure. Dense planting in rows, if successful, tends to result in nearly complete canopy closure which persists until the stand has either been regenerated or transitions into a different association. Herbaceous ground cover of any kind tends to be sparse due to reduction during site preparation, the typically dense canopy cover, and to the fact that many young plantations are infrequently burned at best.

Environmental Description

Manassas National Battlefield Park Environment: *Pinus taeda* (loblolly pine) is not indigenous anywhere in the Culpeper Basin or western Prince William County. In Manassas National Battlefield Park, it only grows as plantations or as trees that have naturalized from plantations. Stands occur on dry, upland sites and typically have acidic soils with low fertility.
National Capital Parks-East Environment: Stands of this type are most likely to be found on abandoned agricultural lands, including upper terraces of floodplains.
Global Environment: Environmental setting varies widely by site. Stands often occur on level to gently sloping areas, on soils that range from dry to poorly drained.

Vegetation Description

Manassas National Battlefield Park Vegetation: Loblolly Pine Plantation is an evergreen forest that results from planting *Pinus taeda* (loblolly pine). Stands can occur as perfect rows of planted *Pinus taeda* (loblolly pine) or as dense, young stands. These stands support almost no other tree species in the overstory and typically very little understory and no herbaceous species. Loblolly Pine Plantations in the park may have small areas with associated *Pinus virginiana* (Virginia pine) or other small hardwood trees, but *Pinus taeda* (loblolly pine) is always dominant.
National Capital Parks-East Vegetation: The canopies of stands of this evergreen plantation forest are heavily dominated by *Pinus taeda* (loblolly pine), typically to the exclusion of other species. Lower-statured woody species (subcanopy and tall shrubs) include *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Pinus virginiana* (Virginia pine), *Acer negundo* (box-elder), *Fagus grandifolia* (American beech), *Ilex opaca var. opaca* (American holly), and *Ulmus americana* (American elm). Other shrubs may include small individuals of tree species, including, but not limited to *Quercus phellos* (willow oak), *Fraxinus pennsylvanica* (green ash), *Liquidambar styraciflua* (sweetgum), and *Prunus serotina var. serotina* (black cherry). Herbs may include *Boehmeria cylindrica* (small-spike false nettle), *Botrychium dissectum* (cutleaf grapefern), and *Lycopodium digitatum* (fan clubmoss). Vines may include *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), and the exotic *Lonicera japonica* (Japanese honeysuckle).
Global Vegetation: There is considerable local variation among stands of this planted vegetation type across its broad range (from the Interior Highlands to the Coastal Plain, including areas outside the natural range of the species). In the Ouachita Mountains planted loblolly is found with a variable amount of *Quercus alba* (white oak), *Quercus falcata* (southern red oak), *Quercus marilandica* (blackjack oak), *Quercus stellata* (post oak), and *Quercus velutina* (black oak); on drier sites *Pinus echinata* (shortleaf pine), *Carya tomentosa* (mockernut hickory), and *Carya texana* (black hickory); and *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), and *Quercus*

nigra (water oak) on wetter sites. The understory can be thick especially after thinning and/or burning. Common understory species are *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium arboreum* (farkleberry), *Vaccinium stamineum* (deerberry), *Cornus florida* (flowering dogwood), *Ulmus alata* (winged elm), and others. Vines are an important component, including *Berchemia scandens* (Alabama supplejack), *Lonicera japonica* (Japanese honeysuckle), *Parthenocissus quinquefolia* (Virginia creeper), *Vitis* (grape) spp., *Smilax* (greenbrier) spp., and *Toxicodendron radicans* (eastern poison-ivy). In dense stands the herbaceous layer is suppressed by dense needle litter. In thinned and burned stands the plantations are often grazed. Herbaceous species can include *Solidago ulmifolia* (elmleaf goldenrod), *Chasmanthium sessiliflorum* (longleaf woodoats), *Schizachyrium scoparium* (little bluestem), *Danthonia spicata* (poverty oatgrass), *Tephrosia virginiana* (Virginia tephrosia), *Lespedeza* (lespedeza, bushclover) spp., *Symphyotrichum patens* (late purple aster), *Eupatorium* (thoroughwort) spp., and others. In Oklahoma, associates include *Rhus copallinum* (winged sumac), *Hypericum densiflorum* (bushy St. Johnswort), *Liquidambar styraciflua* (sweetgum) and *Toxicodendron radicans* (eastern poison-ivy) (Hoagland 2000). Additional data on several stands on the Croatan National Forest can be found in Doyle and Allard (1990).

Global Dynamics: This association is heavily managed for pulpwood to remove hardwood species that would otherwise become established in the understory. The closed canopy results in a poorly developed herbaceous layer, if it is present at all. Stands are typically maintained on a 20- to 25-year rotation.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus taeda* (loblolly pine)

CHARACTERISTIC SPECIES

Global: *Pinus taeda* (loblolly pine)

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Lonicera japonica* (Japanese honeysuckle, High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (cultural) (08-Aug-2000). This community represents vegetation which has been planted in its current location by humans and/or is treated with intensive management or manipulation. It is not a conservation priority and does not receive a conservation rank.

RELATED CONCEPTS

Global Similar Types:

- *Pinus taeda - Liriodendron tulipifera / Acer saccharum* Ruderal Forest (CEGL007105)
- *Pinus taeda - Quercus falcata - Liquidambar styraciflua / Rhus copallinum* Ruderal Forest (CEGL008450)
- *Pinus taeda / Liquidambar styraciflua - Acer rubrum / Vaccinium stamineum* Ruderal Forest (CEGL006011) develops when stands develop typical two-layered structure with well-developed subcanopy.
- *Pinus taeda / Rhus copallinum* Forest Plantation (CST007108) may replace this association as stands mature.
- *Pinus taeda / Saccharum alopecuroides - Andropogon* spp. Ruderal Forest (CEGL007109)

Global Related Concepts:

- Loblolly Pine: 81 (Eyre 1980) >

CLASSIFICATION

Status: Standard

Classification Confidence: 3 - Weak

Chesapeake & Ohio Canal National Historical Park Classification Comments: This vegetation is mapped as part of the Planted Evergreen Forest Map Class (COMP_PLEV) which includes three associations at this park, Norway Spruce Plantation (CST007167), Eastern White Pine Plantation (CST007178), and Loblolly Pine Plantation (CST007179).

Manassas National Battlefield Park Classification Comments: This vegetation is mapped as part of the Planted Evergreen Forest Map Class (COMP_PLEV) which includes one association at this park, Loblolly Pine Plantation (CST007179).

Manassas National Battlefield Park Other Comments: Although native to the Coastal Plain in northern Virginia and Maryland, *Pinus taeda* (loblolly pine) is not indigenous anywhere in the Culpeper Basin or western Prince William County. Consequently, these *Pinus taeda* (loblolly pine) plantations represent a historically inaccurate

landscape condition since the species would not have been present at this site during the Civil War. We recommend replacement of these stands with native forest species.
National Capital Parks-East Classification Comments: This vegetation is mapped as part of the Planted Evergreen Forest Map Class (COMP_PLEV) which includes one association at this park, Loblolly Pine Plantation (CST007179).
Rock Creek Park Classification Comments: This vegetation is mapped as part of the Planted Evergreen Forest (COMP_PLEV) which includes one association at this park, Loblolly Pine Plantation (CST007179).
Global Classification Comments: At Arnold Air Force Base, Coffee and Franklin counties, Tennessee, *Pinus taeda* (loblolly pine) is near the edge of its putative natural range (Burns and Honkala 1990a) and was apparently absent prior to being planted there between 1945 and 1950 on abandoned agricultural land and along roadsides. Older plantings have not been intensively managed, and many have become "modified" vegetation (e.g., CEGL007109) and are no longer regarded as plantations. More recently (1998-2001) some of these older pine stands have been harvested and replaced with true *Pinus taeda* (loblolly pine) plantations. *Pinus taeda* (loblolly pine) also invades seasonally wet hardwood depressions, but these stands remain recognizable as to their natural identity (e.g., CEGL007364). Associations occur as plantations and on old fields on Kisatchie and Sumter national forests and after blowdowns on the Kisatchie. South Carolina information after Jones et al. (1981b). In the Coastal Plain of South Carolina, there are mature loblolly plantations, often with *Prunus serotina* (black cherry) in the understory, that have been prescribed burned (based on seven plots at Savannah River Site) - such stands are presumably better covered under *~Pinus taeda - Liriodendron tulipifera - Liquidambar styraciflua* Ruderal Forest Alliance (A3231)$$. Plantations occur in obvious rows in the aerial photos of the Delmarva Peninsula in Maryland.

ELEMENT DISTRIBUTION

Manassas National Battlefield Park Range: Two silvicultural stands of *Pinus taeda* (loblolly pine) were mapped in the park, near Matthews Hill and east of the Stone House, north of U.S. Route 29.
National Capital Parks-East Range: Stands of this type are limited in their presence at NACE, but could occur anywhere that the species has been planted. This is most likely on abandoned agricultural lands, including upper terraces of floodplains. At the latitude of NACE, native *Pinus taeda* (loblolly pine) is confined to the Outer Coastal Plain, slightly to the east of NACE (Burns and Honkala 1990a).
Global Range: This association is found throughout the southeastern United States.
Nations: US
States/Provinces: AL:SNA, AR:SNA, DC?:SNA, DE:SNA, FL:SNA, GA:SNA, KY:SNA, LA:SNA, MD:SNA, MS:SNA, NC:SNA, OK:SNA, SC:SNA, TN:SNA, TX:SNA, VA:SNA
TNC Ecoregions: 38:C, 39:C, 40:C, 41:C, 42:P, 43:C, 44:C, 50:C, 51:C, 52:C, 53:C, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions (2007): 221Hc:CCC, 221He:CC?, 221Jb:CCC, 223Eb:CCC, 223Eg:CCC, 231Aa:CPP, 231Ba:CCC, 231Bk:CCC, 231Ca:CPP, 231Cd:CPP, 231E:CC, 231Ha:CCC, 231Hb:CCC, 231Hc:CCC, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ac:CCP, 232Ad:CCC, 232Bm:CCC, 232Ca:CCC, 232Cb:CCP, 232Ce:CCP, 232Ha:CC?, 232Hb:CCC, 232Ja:CCC, 232Je:CC?, 234:C, M221Cd:CCC, M221D:CC, M223A:CC, M231A:CC
Federal Lands: DOD (Arnold, Fort Benning, Fort Bragg, Fort Gordon, Fort Stewart); DOE (Savannah River Site); NPS (Appomattox Court House, Assateague Island, Buffalo River?, C&O Canal, Chickamauga-Chattanooga?, Colonial, Fredericksburg-Spotsylvania, George Washington Birthplace, Mammoth Cave?, Manassas, Moores Creek, Natchez Trace, National Capital-East, Obed River, Petersburg, Richmond, Rock Creek, Timucuan?, Vicksburg); USFS (Angelina, Bankhead?, Bienville, Cherokee, Conecuh, Croatan, Davy Crockett, De Soto, Delta, Francis Marion, Holly Springs, Kisatchie, Land Between the Lakes, Oconee, Ouachita, Ouachita (Coastal Plain), Ouachita (Mountains), Ozark, Sabine, Sam Houston, St. Francis?, Sumter, Sumter (Mountains), Sumter (Piedmont), Talladega, Talladega (Oakmulgee), Talladega (Talladega), Tombigbee, Tuskegee); USFWS (Blackwater, Chesapeake Marshlands, Eufaula, Prime Hook)

ELEMENT SOURCES

Manassas National Battlefield Park Plots: None.
National Capital Parks-East Plots: (1 plot: 90901a).
Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
Manassas National Battlefield Park Description Author(s): K. Taverna and G. Fleming
National Capital Parks-East Description Author(s): M. Pyne
Rock Creek Park Description Author(s): J. Teague
Global Description Author(s): A.S. Weakley and L.A. Sneddon
References: ALNHP 2002, Burns and Honkala 1990a, Coxe 2009, Doyle and Allard 1990, Eyre 1980, Hoagland 1998a, Hoagland 2000, Hop et al. 2012a, Jones et al. 1981b, Lea et al. 2013, McCrain and Church 1985, Nordman et

al. 2011, Patterson 2008a, Patterson 2008c, Patterson 2008d, Patterson 2008e, Patterson 2008f, Pyne et al. 2010, Southeastern Ecology Working Group n.d.*, TNC 1998a, Taverna and Patterson 2008

CTY013 Native Miscellaneous Southern Conifer Plantation Cultural Type

Native southern pine conifers do not exceed native non-conifers (native *Pinus* (pine) spp. >50% cover); tree composition typically dominated by species other than *Pinus clausa* (sand pine), *Pinus elliottii* (slash pine), *Pinus palustris* (longleaf pine), or *Pinus taeda* (loblolly pine).

[CST007452] *Taxodium distichum* Forest Plantation

Translated Name: **Bald-cypress Forest Plantation**
Common Name: **Bald-cypress 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 Miscellaneous Southern Conifer Plantation Cultural Type (CTY013)

Element Concept

Global Summary: Plantations of *Taxodium distichum* (bald-cypress), grown for timber.

Environmental Description

Global Environment: Examples of this type are presumably planted in floodplains, although the dominant nominal species will survive in upland soils once it is planted.

Vegetation Description

Global Vegetation: Examples of this type are planted, monospecific stands of *Taxodium distichum* (bald-cypress).

Most Abundant Species

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Taxodium distichum* (bald-cypress)

Characteristic Species

Global: *Taxodium distichum* (bald-cypress)

Conservation Status Rank

Global Rank & Reasons: GNA (cultural) (24-Oct-2002). This forest represents silviculturally planted and managed vegetation and is not of conservation concern, and therefore does not receive a conservation status rank.

Related Concepts

Classification

Status: Standard
Classification Confidence: 3 - Weak
National Capital Parks-East Classification Comments: Bald-cypress Plantation (CST007452) is mapped as part of Planted Deciduous Forest (COMP_PLDE).
Global Classification Comments: Stands are planted at Land Between the Lakes, Tennessee, Kentucky?

Element Distribution

National Capital Parks-East Range: Bald-cypress Plantation (CST007452) is documented in one location in the park near where the Baltimore Washington Parkway crosses Beck Branch near Beaver Dam Rd.
Global Range: This planted vegetation type could occur in various coastal and interior provinces of the eastern and southeastern United States.
Nations: US
States/Provinces: DC?:SNA, NC:SNA, TN:SNA
TNC Ecoregions: 44:C, 52:C, 57:C
USFS Ecoregions (2007): 223:C, 231A:CC, 232Ad:CCC
Federal Lands: NPS (National Capital-East); USFS (Land Between the Lakes)

ELEMENT SOURCES

National Capital Parks-East Plots: None.
National Capital Parks-East Description Author(s): M. Pyne
Global Description Author(s): A.S. Weakley
References: Southeastern Ecology Working Group n.d.*

CTY014 Exotic Northern Conifer Plantation Cultural Type

Exotic northern conifers exceed native conifers (native *Pinus* (pine) spp. <50% cover).

[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* (Norway spruce), which typically 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

Global Environment: This community represents vegetation that has been planted in its current location by humans.

VEGETATION DESCRIPTION

Global Vegetation: These plantation forests are dominated by the exotic species *Picea abies* (Norway spruce), 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

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Picea abies* (Norway spruce)

CHARACTERISTIC SPECIES

Global: *Picea abies* (Norway spruce)

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Picea abies* (Norway spruce)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (cultural) (08-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 Related Concepts:
- IF3b. Plantation (Hardwood or Conifer) (Allard 1990) >

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak

Chesapeake & Ohio Canal National Historical Park Classification Comments: This vegetation is mapped as part of the Planted Evergreen Forest Map Class (COMP_PLEV) which includes three associations at this park, Norway Spruce Plantation (CST007167), Eastern White Pine Plantation (CST007178), and Loblolly Pine Plantation (CST007179).
George Washington Memorial Parkway Classification Comments: This vegetation is part of the Planted Evergreen Forest Map Class (COMP_PLEV) which includes one association at this park, Norway Spruce Plantation (CST007167).

ELEMENT DISTRIBUTION

George Washington Memorial Parkway Range: Norway Spruce Plantation occurs in patches too small to map at this park.
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:SNA, ME:SNA, NC:SNA, NJ:SNA, NY:SNA, OH:SNA, PA:SNA, VA?:SNA, VT:SNA
TNC Ecoregions: 48:C, 49:C, 51:C, 61:C, 62:C, 63:C
USFS Ecoregions (2007): 211Ab:CCC, 221Ae:CCC, 221Bc:CPP, 221Fa:CCC, 222Ib:CCC, 223:C, 232Ac:CCP, M211Ba:CCP, 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, Roosevelt-Vanderbilt, Saratoga); USFWS (Aroostook, Erie, Iroquois, Supawna Meadows)

ELEMENT SOURCES

Chesapeake & Ohio Canal National Historical Park Description Author(s): J. Teague
George Washington Memorial Parkway Description Author(s): J. Teague
Global Description Author(s): S.C. Gawler
References: Allard 1990, Coxe 2009, Edinger et al. 2014b, Hop et al. 2013, NRCS 2004a, Sechler et al. 2014, Southeastern Ecology Working Group n.d.*

PARK SPECIALS

The following vegetation was described from a limited number of sites. Current data and knowledge are currently insufficient for supporting inclusion in the USNVC.

[CEPS006675] *Impatiens capensis* Herbaceous Vegetation

Translated Name: **Orange Jewelweed Herbaceous Vegetation**
Common Name: **Orange Jewelweed Flotsam Pile Vegetation**

CONCEPT

Summary: This vegetation occurs on flotsam piles of flood-deposited driftwood along shores and within low floodplain forests. It is species-poor and typically dominated by the annual herbaceous species *Impatiens capensis* (orange jewelweed) and/or *Impatiens pallida* (pale touch-me-not). Plant cover is variable but is usually less than 10%. The most frequent associates are *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), *Bidens frondosa* (devil's beggarticks), and seedlings of *Acer saccharinum* (silver maple). It is mapped as part of the Herbaceous Depositional Bar Map Class (COMP_HDEP) at the following NCR parks: Chesapeake & Ohio Canal National Historic Park and Harpers Ferry National Historical Park.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historic Park Environment: Orange Jewelweed Herbaceous Vegetation occurs in alluvial situations within a river shore or depositional bar complex. Alluvial examples are most likely ephemeral and successional in nature, becoming dominated by woody vegetation over the course of a few years. It may also occur in a variety of other disturbed open wetlands.
Harpers Ferry National Historical Park Environment: Orange Jewelweed Herbaceous Vegetation occupies flotsam piles of flood-deposited driftwood along shores of the Potomac River. It only occurs on rivershores that experience infrequent high-velocity flooding, sufficient to create large driftwood piles, unstable and ephemeral in nature. The size and location can shift with each major flood event. The piles are mainly composed of stacked driftwood without any interstitial soil, but small soil deposits may occur where alluvial soil has settled following a flooding event.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historic Park Vegetation: This association is dominated by the forb *Impatiens capensis.* Other herbaceous plants are typical of open wetlands, including *Boehmeria cylindrica, Leersia virginica, Lycopus virginicus, Polygonum punctatum, Phytolacca americana,* and *Sicyos angulatus.* Some woody plants also may occur in the field stratum as seedlings or saplings, including *Acer saccharinum, Betula nigra, Liriodendron tulipifera* and *Robinia pseudoacacia.* Some exotic plants include *Artemisia annua, Microstegium vimineum,* and *Sedum acre.*
Harpers Ferry National Historical Park Vegetation: This herbaceous association has low species richness and is strongly dominated by the fast-growing annuals *Impatiens capensis* and, less frequently, *Impatiens pallida*. Mostly herbaceous vegetation is rooted in small soil pockets scattered throughout the flotsam piles. Species are primarily introduced via floodwaters and therefore associated species are highly variable. Other species documented on the flotsam piles in the park include *Gaura biennis, Laportea canadensis, Mimulus ringens*, and the exotic *Microstegium vimineum*.

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historic Park: *Impatiens capensis*
Harpers Ferry National Historical Park: *Impatiens capensis*, *Impatiens pallida*

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historic Park: Exotic/Invasive: *Artemisia annua, Microstegium vimineum, Sedum acre* **Harpers Ferry National Historical Park: Invasive/Exotic Plants**: *Microstegium vimineum* (High/Medium)

CLASSIFICATION

Chesapeake & Ohio Canal National Historic Park Classification Comments: This association is mapped as part of the NCR Herbaceous Depositional Bar Map Class (COMP_HDEP) which includes seven associations at this park: Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103), Water-willow Rocky Bar and Shore (CEGL004286), Ridge and Valley Gravel Riverscour Prairie (CEGL006477), Piedmont-Central Appalachian

Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).

Harpers Ferry National Historical Park Classification Comments: Orange Jewelweed Herbaceous Vegetation is distinct and can be easily distinguished from other vegetation types in the park. It is the only type with a habitat of flotsam piles composed of flood-deposited driftwood. In addition, no other type is dominated by *Impatiens capensis* and/or *Impatiens pallida*. Because of its ephemeral nature, this association is mapped as part of NCR's Herbaceous Depositional Bar Map Class (COMP_HDEP) which includes five associations at this park: Water-willow Rocky Bar and Shore (CEGL004286), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), and Orange Jewelweed Herbaceous Vegetation (CEPS006675).

DISTRIBUTION

Chesapeake & Ohio Canal National Historic Park Range: Orange Jewelweed Herbaceous Vegetation is documented from one plot at Fifteenmile Creek (Canal mile 141).

Harpers Ferry National Historical Park Range: Orange Jewelweed Herbaceous Vegetation occurs along the shoreline of the Potomac River, in areas where large piles of driftwood have accumulated following major flood events. It is an ephemeral type, and the location of stands can shift spatially following major disturbances. In the late 1990s, a very large stand of this vegetation occupied the Virginia shore of the Potomac River just north of the U.S. 340 bridge below Loudoun Heights.

NCR Parks: NPS (C&O Canal, Harpers Ferry)

COMPOSITE AND OTHER MAP CLASSES

The following project-specific map classes (or map units) sometimes include several possible USNVC associations and/or as yet unclassified vegetation that either could not be reliably mapped as separate units, or that were mapped as a group for convenience and consistency across the region. Also included here are cultural map classes that are not included in natural and semi-natural vegetation. These are typically maintained and managed vegetation types.

[COMP_HDEP] Herbaceous Depositional Bar

CONCEPT

Summary: The Herbaceous Depositional Bar Map Class (COMP_HDEP) includes various predominantly herbaceous (and often ephemeral) communities subject to frequent high-energy floods, occurring on scoured shorelines or on sand, gravel, and cobble bars within the channels of rivers and streams. These communities typically occur in patches much smaller than the 0.5-ha minimum map unit established for the NCR project, frequently co-occur in fine-scale patch-mosaics and are difficult to distinguish on aerial photographs. Hence any predominantly herbaceous vegetation in these settings in NCR is represented by a single map class. The following seven vegetation communities are included in this map class in NCR: Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103), Water-willow Rocky Bar and Shore (CEGL004286), Ridge and Valley Gravel Riverscour Prairie (CEGL006477), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), and Orange Jewelweed Herbaceous Vegetation (CEPS006675). Some NCR parks have only one of these associations, while Chesapeake & Ohio Canal National Historic Park has all seven associations. The Herbaceous Depositional Bar Map Class is mapped at the following NCR parks: Catoctin Mountain Park, Chesapeake & Ohio Canal National Historic Park, George Washington Memorial Parkway, Harpers Ferry National Historical Park, Manassas National Battlefield Park, Monocacy National Battlefield, and Prince William Forest Park. Although found at Antietam National Battlefield, Herbaceous Depositional Bar Map Class occurs in patches too small to be mapped in that park's vegetation map.

ENVIRONMENTAL DESCRIPTION

Antietam National Battlefield Environment: Vegetation in this map class is found on riverbanks, riverine cobble bars, and floodplains.

Catoctin Mountain Park Environment: Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103)—mapped as Herbaceous Depositional Bar Map Class—occurs as small patches on sand and gravel bars along major creeks where some flood scour occurs.
Chesapeake & Ohio Canal National Historic Park Environment: Herbaceous Depositional Bar Map Class (COMP_HDEP) includes various predominantly herbaceous (and often ephemeral) communities subject to frequent high-energy floods, occurring on scoured shorelines or on sand, gravel, and cobble bars within the channels of rivers and streams. It is mapped at many locations, the length of the Chesapeake & Ohio Canal.
George Washington Memorial Parkway Environment: This map class represents sand, silt, cobble, and boulder bars and banks along the Potomac River shoreline that are frequently flooded and/or inundated for extended periods of the year. Soils consist of highly fertile, recent alluvium that is extremely rocky or sandy, lacks any profile development, and is frequently heterogeneous at small spatial scales. Length of inundation and frequency of scouring vary widely. Some habitats may be inundated year-round, while higher bars and banks may be exposed for most of the growing season.
Harpers Ferry National Historical Park Environment: This map class represents sand, silt, cobble, and boulder bars and banks along the Potomac River shoreline that are frequently flooded and/or inundated for extended periods of the year. Soils consist of highly fertile, recent alluvium that is extremely rocky or sandy, lacks any profile development, and is frequently heterogeneous at small spatial scales. Length of inundation and frequency of scouring vary widely. Some habitats may be inundated year-round, while higher bars and banks may be exposed for most of the growing season.
Manassas National Battlefield Park Environment: Water-Willow Rocky Bar and Shore (CEGL004286)—mapped as Herbaceous Depositional Bar Map Class—is a rivershore and depositional bar community, occurring in scattered patches in the stream channel of Bull Run. It develops only on low gravel, cobble, or boulder bars (mean rock cover = 60%) that are often inundated for much of the growing season. Soils consist of heterogeneous accumulations of base-rich sand, silt, and mud packed between cobbles or embedded in a matrix of coarse gravel.
Monocacy National Battlefield Environment: Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483)—mapped as Herbaceous Depositional Bar Map Class—occurs immediately above the waterline along the lowest parts of riverbanks or rivershore depositional bars. This association is well-developed in mid- to late summer, when river water levels are lowest. Due to the frequent floods and ice-scour that these areas experience, the location and extent of this vegetation type may change from year to year. It is characterized by short-statured annual herbs growing on semi-permanently flooded, flat, muddy alluvial plains. The soil is typically a sub-hygric, somewhat poorly drained mucky clayey silt over coarse sand and gravel.
Prince William Forest Park Environment: Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103)—mapped as Herbaceous Depositional Bar Map Class—occupies coarse-textured depositional bars in the stream channels of Quantico Creek and South Fork Quantico Creek, in high-gradient reaches that are frequently flooded and/or inundated for extended periods of the year. These habitats occur most commonly in the "gorge" sections of these valleys, where the streams cut through strata of resistant bedrock, and relatively steep slopes subtend the streams. Soils consist of recent alluvium that is rocky, cobbly, or gravelly, lacks any profile development, and is frequently heterogeneous at small spatial scales. Habitats are partly exposed for much of the growing season, becoming more extensive in mid to late summer as water levels drop. Vegetation composition is generally controlled by hydrologic stresses, ice-scouring, and the impacts of high-velocity floodwaters and flood debris.

VEGETATION DESCRIPTION

Antietam National Battlefield Vegetation: Vegetation is herbaceous, dominated by tall perennial forbs such as *Verbesina alternifolia, Teucrium canadense, Solidago gigantea*, and *Eupatorium* spp.
Catoctin Mountain Park Vegetation: Although occupying open areas, some shade is cast by overhanging trees. A dominant species is *Carex torta*. Other frequent associates include *Dichanthelium clandestinum, Glyceria striata, Hydrocotyle americana, Leersia oryzoides, Polygonum sagittatum, Amphicarpaea bracteata, Boehmeria cylindrica*, and *Pilea pumila*. A number of other wetland herbaceous species also occur at individual stands; a partial list includes *Symplocarpus foetidus, Arisaema triphyllum, Circaea lutetiana, Thelypteris palustris, Tiarella cordifolia, Equisetum hyemale, Onoclea sensibilis, Cyperus strigosus, Scutellaria lateriflora*, and others.
Chesapeake & Ohio Canal National Historic Park Vegetation: The Herbaceous Depositional Bar Map Class (COMP_HDEP) includes seven predominantly herbaceous (and often ephemeral) communities subject to frequent high-energy floods. The moderate to dense vegetation is variable. Wetland sedges and grasses such as *Carex torta* or *Andropogon gerardii* and *Panicum virgatum* dominate some communities, while wetland forbs such as *Justicia americana* or a combination of sedges, grasses, and wetland forbs dominate others. Scattered, ephemeral tree seedlings and saplings are common, as are exotic species. There may be a sparse emergent tree layer (20-35 m tall).

These communities also support Maryland state-vulnerable, imperiled, and critically imperiled species including *Carex emoryi, Carex hystericina, Cinna latifolia, Hibiscus laevis, Paspalum fluitans, Ptilimnium nodosum, Rhynchospora globularis,* and *Rumex latissimus,* and *Salix exigua*.

George Washington Memorial Parkway Vegetation: Excepting scattered, ephemeral tree seedlings and saplings, vegetation is strictly herbaceous, although it may be shaded by trees rooted in the adjacent floodplain forest. Composition varies with habitat. Most extensive are nearly monospecific stands of *Justicia americana* occurring on shallowly submersed boulder/cobble bars. On low, seasonally exposed silty, sandy, or gravelly shores, assemblages of short-statured annuals and perennials predominate, including *Eragrostis hypnoides, Lindernia dubia var. dubia, Ludwigia palustris, Cyperus squarrosus, Cyperus odoratus*, and *Artemisia annua*. Higher, sandy bars and riverbanks support tall, weedy perennials, including *Eupatorium serotinum, Boehmeria cylindrica, Solanum carolinense, Polygonum punctatum, Verbena urticifolia, Conoclinium coelestinum, Verbesina alternifolia, Cynanchum laeve, Teucrium canadense*, and *Rumex altissimus*. Additional species occurring frequently in these habitats are *Eclipta prostrata, Rorippa palustris ssp. fernaldiana, Acalypha rhomboidea, Ranunculus sceleratus var. sceleratus, Ammannia coccinea, Eleocharis obtusa, Hypericum mutilum, Lipocarpha micrantha (= Hemicarpha micrantha), Paspalum fluitans, Rotala ramosior, Bidens cernua, Chamaesyce humistrata, Lindernia dubia var. anagallidea, Cyperus bipartitus, Eragrostis frankii, Boehmeria cylindrica, Mimulus alatus, Penthorum sedoides, Samolus valerandi ssp. parviflorus, Lycopus americanus, Hibiscus laevis, Phyla lanceolata, Amaranthus spinosus, Datura stramonium, Verbena hastata, Polygonum lapathifolium, Polygonum pensylvanicum, Apocynum cannabinum (= Apocynum sibiricum), Schoenoplectus pungens var. pungens, Xanthium strumarium, Echinochloa muricata, Impatiens capensis, Solidago gigantea*, and *Eupatorium perfoliatum var. perfoliatum*.

Harpers Ferry National Historical Park Vegetation: Excepting scattered, ephemeral tree seedlings and saplings, vegetation is strictly herbaceous, although it may be shaded by trees rooted in the adjacent floodplain forest. Composition varies with habitat. Most extensive are nearly monospecific stands of *Justicia americana* occurring on shallowly submersed boulder/cobble bars. Another nearly monospecific community that occupies ephemeral flotsam piles of flood-deposited driftwood is dominated by *Impatiens capensis* or sometimes *Impatiens pallida*. On low, seasonally exposed silty, sandy or gravelly shores, assemblages of short-statured annuals and perennials predominate, including *Ludwigia palustris, Rotala ramosior, Cyperus squarrosus*, and *Cyperus strigosus*. Higher, unstable sandy bars and riverbanks support tall, weedy perennials, including *Eupatorium serotinum, Polygonum punctatum, Verbena urticifolia, Conoclinium coelestinum, Polygonum pensylvanicum*, and many exotics. Stabilized riverbanks support mostly native perennials, including *Eutrochium fistulosum (= Eupatorium fistulosum), Verbesina alternifolia, Solidago gigantea, Asclepias syriaca, Dichanthelium clandestinum*, and *Elymus riparius*. Differing from all the preceding are riverside "prairies" dominated by the warm-season grasses *Andropogon gerardii* and *Panicum virgatum*.

Manassas National Battlefield Park Vegetation: Examples of Water-Willow Rocky Bar and Shore in the park—mapped as Herbaceous Depositional Bar Map Class—consist of nearly monospecific stands of *Justicia americana* covering about 50-95% of a given area. *Leersia virginica* is a common associate in stands not totally dominated by *Justicia americana*. Additional species typically occur with very low cover (<2%), and the most frequent include *Polygonum punctatum, Saururus cernuus, Boehmeria cylindrica, Pontederia cordata*, and the exotic species *Rorippa sylvestris, Murdannia keisak, Polygonum cespitosum var. longisetum*, and *Arthraxon hispidus*.

Monocacy National Battlefield Vegetation: Short-statured annual herbs such as *Lindernia dubia var. dubia* and *Ludwigia palustris* typically cover 25-50% of the area. Various species of *Polygonum* spp., such as *Polygonum cespitosum var. longisetum, Polygonum hydropiperoides*, and *Polygonum pensylvanicum*, can be common. Other typical species include *Eclipta prostrata, Eragrostis hypnoides, Cyperus squarrosus, Echinochloa* spp., *Eleocharis* spp., and *Leersia virginica*. Due to the frequent disturbances that this vegetation type experiences, the species composition can be variable. Seedlings of several tree species, such as *Acer saccharinum, Salix nigra, Betula nigra*, and *Populus tremuloides*, can also be present.

Prince William Forest Park Vegetation: Rocky Bar and Shore (Twisted Sedge Type)—mapped as Herbaceous Depositional Bar Map Class—is dominated by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. However, its physiognomy varies from strictly herbaceous to shrubby. Coppice sprouts of *Platanus occidentalis* and/or *Betula nigra* are the most common woody plants, but rarely cover more than 50% of a given area. At Prince William Forest Park, *Carex torta* is usually one of several patch-dominant herbs that form highly variable stands. Where *Carex torta* dominates, it typically forms dense, extensive colonies. Characteristic associates that can achieve patch-dominance in some areas include *Polygonum sagittatum, Dichanthelium clandestinum, Boehmeria cylindrica, Amphicarpaea bracteata, Equisetum arvense, Dichanthelium dichotomum, Symphyotrichum lateriflorum, Lycopus virginicus*, and *Cyperus odoratus*. Many other annual and

perennial herbs occur at lower cover and constancy. Stands in the park are often heavily invaded by the exotic grass *Microstegium vimineum*.

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Verbesina alternifolia, Teucrium canadense, Solidago gigantea*, and *Eupatorium* spp.
Catoctin Mountain Park: *Boehmeria cylindrica*, *Carex torta*, *Dichanthelium clandestinum*, *Glyceria striata*, *Hydrocotyle americana*, *Leersia oryzoides*, *Pilea pumila*, *Polygonum sagittatum*
Chesapeake & Ohio Canal National Historic Park: Wetland grasses, sedges, and forbs. May include one or more of the following: *Carex torta, Cyperus squarrosus, Andropogon gerardii, Eragrostis hypnoides, Panicum virgatum, Elymus riparius, Eupatorium serotinum, Impatiens capensis, Justicia americana, Lindernia dubia* var. *dubia, Ludwigia palustris, Polygonum lapathifolium, Teucrium canadense*, or *Verbesina alternifolia*
George Washington Memorial Parkway: Wetland forbs, with some sedges or grasses. May include one or more of the following: *Boehmeria cylindrica*, *Conoclinium coelestinum, Cynanchum leave, Eupatorium perfoliatum var. perfoliatum, Eupatorium serotinum*, *Hibiscus laevis, Impatiens capensis, Justicia Americana, Lindernia dubia* var. *dubia*, *Ludwigia palustris, Polygonum lapathifolium, Polygonum pensylvanicum, Polygonum punctatum*, *Rumex altissimus, Solanum carolinense, Solidago gigantea*, *Teucrium canadense, Verbena hastata, Verbena urticifolia,* or *Verbesina alternifolia*
Harpers Ferry National Historical Park: Wetland forbs and/or sedges and grasses. May include one or more of the following: *Andropogon gerardii*, *Apios americana*, *Artemisia annua*, *Baptisia australis*, *Conoclinium coelestinum*, *Cyperus squarrosus*, *Cyperus strigosus*, *Eutrochium fistulosum*, *Hibiscus laevis*, *Impatiens capensis*, *Impatiens pallida, Justicia americana*, *Ludwigia palustris*, *Panicum virgatum, Polygonum lapathifolium*, *Rotala ramosior, Solanum ptycanthum, Solidago gigantea*, *Sorghastrum nutans,* or *Verbesina alternifolia*
Manassas National Battlefield Park: *Justicia americana*, *Leersia virginica*
Monocacy National Battlefield: *Eragrostis hypnoides*, *Lindernia dubia* var. *dubia*, *Ludwigia palustris*
Prince William Forest Park: *Betula nigra*, *Boehmeria cylindrica*, *Carex torta*, *Dichanthelium clandestinum*, *Platanus occidentalis*, *Polygonum sagittatum*, *Symphyotrichum lateriflorum*

OTHER NOTEWORTHY SPECIES

Antietam National Battlefield: (none)
Catoctin Mountain Park: (none)
Chesapeake & Ohio Canal National Historic Park: Vulnerable Plants: *Carex emoryi* (G5, MD-imperiled), *Carex hystericina* (G5, MD-critically imperiled), *Cinna latifolia* (G5, MD-imperiled), *Doellingeria infirma* (G5, MD-vulnerable), *Eupatorium altissimum* (G5, MD-vulnerable), *Geum laciniatum* (G5, MD-vulnerable), *Hibiscus laevis* (G5, MD-vulnerable), *Juglans cinerea* (G4, MD-vulnerable), *Monarda clinopodia* (G5, MD-vulnerable); *Paspalum fluitans* (G5, MD-critically imperiled), *Ptilimnium nodosum* (G2, globally imperiled, MD-critically imperiled), *Rhynchospora globularis* (G5?, MD-critically imperiled), *Rumex altissimus* (G5, MD-critically imperiled), *Salix caroliniana* (G5, MD-vulnerable), *Salix exigua* (G5, MD-critically imperiled), *Zizia aurea* (G5, MD-vulnerable); **Invasive/Exotic Plants**: *Abutilon theophrasti* (Medium/Low), *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Allium vineale* (Medium/Insignificant), *Artemisia annua* (Medium/Insignificant), *Arthraxon hispidus* (Medium/Low), *Brassica nigra* (High/Low), *Calystegia sepium*, *Chenopodium album*, *Cichorium intybus* (Medium/Insignificant), *Cirsium vulgare* (Medium/Low), *Cleome hassleriana*, *Commelina communis*, *Dactylis glomerata* (Medium/Insignificant), *Datura stramonium* (High/Low), *Daucus carota* (Low), *Dianthus armeria* (Low/Insignificant), *Digitaria ischaemum*, *Duchesnea indica* (Low/Insignificant), *Echinochloa crus-galli* (Medium/Insignificant), *Eragrostis cilianensis* (Medium/Insignificant), *Galinsoga quadriradiata*, *Glechoma hederacea* (Low), *Hesperis matronalis* (Medium/Low), *Humulus japonicus* (Medium/Low), *Hypericum perforatum* (High/Medium), *Kickxia elatine*, *Kummerowia striata* (Low), *Lespedeza cuneata* (Medium), *Linaria vulgaris* (High/Low), *Lonicera japonica* (High/Medium), *Lonicera morrowii* (High/Medium), *Lysimachia nummularia* (Medium/Low), *Lythrum salicaria* (High), *Melilotus officinalis* (Medium/Low), *Mentha spicata*, *Microstegium vimineum* (High/Medium), *Morus alba* (High/Medium), *Paulownia tomentosa* (Medium/Low), *Perilla frutescens* (Low), *Plantago lanceolata* (High/Low), *Polygonum cuspidatum* (High/Medium), *Polygonum hydropiper*, *Polygonum perfoliatum* (Medium), *Polygonum persicaria*, *Rorippa indica*, *Rorippa sylvestris* (Medium/Low), *Rosa multiflora* (Medium/Low), *Rumex crispus* (Low/Insignificant), *Rumex obtusifolius*, *Sedum acre, Setaria faberi*, *Setaria pumila* (Low/Insignificant), *Silene latifolia* ssp. *alba*, *Silene noctiflora*, *Solanum dulcamara* var. *dulcamara*, *Sorghum halepense* (High/Medium), *Taraxacum officinale*, *Trifolium arvense* (Low), *Trifolium pratense* (Low/Insignificant), *Tussilago farfara* (Insignificant), *Urtica dioica* ssp. *dioica*, *Verbascum*

thapsus (Medium); **Other Plants**: *Amaranthus retroflexus* (G5), *Artemisia vulgaris* var. *vulgaris* (GUTU), *Dysphania ambrosioides* (= *Chenopodium ambrosioides var. ambrosioides*) (GNRTNR)
George Washington Memorial Parkway: Vulnerable Plants: *Acalypha deamii* (G4?, VA state-vulnerable), *Lipocarpha micrantha* (G5, VA state-critically imperiled); **Invasive/Exotic Plants**: *Artemisia annua* (Medium/Insignificant), *Datura stramonium* (High/Low), *Glechoma hederacea* (Low), *Perilla frutescens* (Low), *Polygonum cespitosum* var. *longisetum*; **Other Plants**: *Amaranthus spinosus* (G5), *Dysphania ambrosioides (= Chenopodium ambrosioides var. ambrosioides)* (GNRTNR)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Artemisia annua* (Medium/Insignificant), *Datura stramonium* (High/Low), *Perilla frutescens* (Low), *Polygonum cespitosum* var. *longisetum*; **Other Plants**: *Amaranthus spinosus* (G5), *Dysphania ambrosioides (= Chenopodium ambrosioides var. ambrosioides)* (GNRTNR)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Arthraxon hispidus* (Medium/Low), *Murdannia keisak* (Medium/Low), *Polygonum cespitosum* var. *longisetum*, *Rorippa sylvestris* (Medium/Low)
Monocacy National Battlefield: Invasive/Exotic Plants: *Albizia julibrissin* (High/Low), *Echinochloa crus-galli* (Medium/Insignificant), *Rorippa sylvestris* (Medium/Low); **Other Plants**: *Cyperus squarrosus* (G5)
Prince William Forest Park: Invasive/Exotic Plants: *Microstegium vimineum* (High/Medium)

CLASSIFICATION

Antietam National Battlefield Classification Comments: The Herbaceous Depositional Bar Map Class (COMP_HDEP) includes only one defined association at this park—Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480). Even combined with other undefined bar or shoreline communities with which it may co-occur in fine-scale patch-mosaics, there were no patches large enough to meet the 0.5-ha minimum map unit established for the NCR project, and so COMP_HDEP was not mapped at Antietam National Battlefield.
Catoctin Mountain Park Classification Comments: The Herbaceous Depositional Bar Map Class (COMP_HDEP) includes only one defined association at this park: Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103). It may include other undefined bar or shoreline communities that occur in patches much smaller than the 0.5-ha minimum map unit established for the NCR project, may co-occur in fine-scale patch-mosaics, and are difficult to distinguish on aerial photographs.
Chesapeake & Ohio Canal National Historic Park Classification Comments: In NCR, seven associations are mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP). This park has representatives of all seven associations: Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103), Water-willow Rocky Bar and Shore (CEGL004286), Ridge and Valley Gravel Riverscour Prairie (CEGL006477), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), and Orange Jewelweed Herbaceous Vegetation (CEPS006675). These communities typically occur in patches much smaller than the 0.5-ha minimum map unit established for the NCR project, frequently co-occur in fine-scale patch-mosaics and are difficult to distinguish on aerial photographs.
George Washington Memorial Parkway Classification Comments: The Herbaceous Depositional Bar Map Class (COMP_HDEP) consists of three associations at this park: Water-Willow Rocky Bar and Shore (CEGL004286), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), and Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483). These communities typically occur in patches much smaller than the 0.5-ha minimum map unit established for the NCR project, frequently co-occur in fine-scale patch-mosaics and are difficult to distinguish on aerial photographs.
Harpers Ferry National Historical Park Classification Comments: The Herbaceous Depositional Bar Map Class (COMP_HDEP) consists of five associations at this park: Water-willow Rocky Bar and Shore (CEGL004286), Piedmont-Central Appalachian Riverbar Tall Wet Meadow (CEGL006480), Piedmont-Central Appalachian Scour Bar Wet Meadow (CEGL006481), Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), and Orange Jewelweed Herbaceous Vegetation (CEPS006675). These associations typically occur in patches much smaller than the 0.5-ha minimum map unit established for the NCR project, frequently co-occur in fine-scale patch-mosaics and are difficult to distinguish on aerial photographs.
Manassas National Battlefield Park Classification Comments: The Herbaceous Depositional Bar Map Class (COMP_HDEP) includes only one defined association at this park: Water-willow Rocky Bar and Shore (CEGL004286). This community is clearly distinguished by its occurrence on bouldery / cobbly bars that are inundated most of the year, and by the nearly monospecific dominance by *Justicia americana*. However, on larger, rocky bar complexes in this park, this vegetation may co-occur in very small-scale patch-mosaics with other shoreline communities.

Monocacy National Battlefield Classification Comments: The Herbaceous Depositional Bar Map Class (COMP_HDEP) may include Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483) and other undefined shoreline communities at this park that occur in patches much smaller than the 0.5-ha minimum map unit established for the NCR project, co-occur in fine-scale patch-mosaics, and are difficult to distinguish on aerial photographs.
Prince William Forest Park Classification Comments: In this park, Rocky Bar and Shore (Twisted Sedge Type) (CEGL004103) is distinguished from other disturbed herbaceous vegetation on depositional bars by its association with rocky bars in high-gradient stream reaches (versus sandy/silty bars in lower-gradient reaches), and by the dominance of perennial (versus annual) herbs. Both kinds of vegetated bars are included in the Herbaceous Depositional Bar Map Class (COMP_HDEP) at this park because they occur in patches much smaller than the 0.5-ha minimum map unit established for the NCR project, and are difficult to distinguish on aerial photographs.

DISTRIBUTION

Antietam National Battlefield Range: This vegetation occurs along Antietam Creek in small patches that were too small to map in the ANTI vegetation map.
Catoctin Mountain Park Range: The Herbaceous Depositional Bar Map Class (COMP_HDEP) is confined to larger watercourses in the park. This map class is documented in one location along Owens Creek near where it is crossed by the Catoctin National Recreational Trail and the road to Owens Creek Campground.
Chesapeake & Ohio Canal National Historic Park Range: The Herbaceous Depositional Bar Map Class (COMP_HDEP) includes various predominantly herbaceous (and often ephemeral) communities subject to frequent high-energy floods, occurring on scoured shorelines or on sand, gravel, and cobble bars within the channels of rivers and streams. It is mapped at many locations, the length of the Chesapeake & Ohio Canal.
George Washington Memorial Parkway Range: The Herbaceous Depositional Bar Map Class (COMP_HDEP) occurs in scattered patches along the Potomac River shoreline through most of the Potomac Gorge, but is most frequent and best developed in higher-gradient river reaches in the western half of the area. Occurrences below the mouth of Gulf Branch in the Arlington section of the gorge are rare.
Harpers Ferry National Historical Park Range: The Herbaceous Depositional Bar Map Class (COMP_HDEP) occurs in small, scattered patches along the Shenandoah and Potomac river shorelines.
Manassas National Battlefield Park Range: Water-Willow Rocky Bar and Shore, mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP), occurs as small patches in the stream channel of Bull Run.
Monocacy National Battlefield Range: Appalachian-Atlantic Riverbar Drawdown Shore (CEGL006483), mapped as Herbaceous Depositional Bar Map Class (COMP_HDEP), occurs occasionally along the shoreline and depositional bars of the Monocacy River.
Prince William Forest Park: The Herbaceous Depositional Bar Map Class (COMP_HDEP) is scattered in small linear patches along the lengths of Quantico Creek and South Fork Quantico Creek in Prince William Forest Park.
NCR Parks: NPS (Antietam, C&O Canal, Catoctin Mountain, George Washington Parkway, Harpers Ferry, Manassas, Monocacy, Prince William)

[COMP_HEWE] Successional Herbaceous Wetland

CONCEPT

Summary: For the NPS National Capital Region, the Successional Herbaceous Wetland Map Class (COMP_HEWE) represents all successional herbaceous vegetation of non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity. This map class was created to facilitate regularized local land unit mapping of a managed area and to provide a standard label for polygons in a vegetation map. Known associations included in this map class are Eastern Ruderal Reed Canarygrass Marsh (CEGL006044), Bulrush – Cattail – Bur-reed Shallow Marsh (CEGL002026), Eastern Cattail Marsh (CEGL006153), Eastern Ruderal Common Reed Marsh (CEGL004141), and Northeastern Woolgrass Marsh (CEGL006349). It may also include other undefined successional herbaceous wetlands. The Successional Herbaceous Wetland Map Class is mapped at the following NCR parks: Antietam National Battlefield, Catoctin Mountain Park, Chesapeake & Ohio Canal National Historical Park, George Washington Memorial Parkway, Harpers Ferry National Historical Park, Manassas National Battlefield Park, National Capital Parks-East, Prince William Forest Park, and Wolf Trap National Park for the Performing Arts.

ENVIRONMENTAL DESCRIPTION

Antietam National Battlefield Environment: Successional Herbaceous Wetland Map Class (COMP_HEWE) is found on riverbanks, riverine cobble bars, and floodplains.

Catoctin Mountain Park Environment: Successional Herbaceous Wetland Map Class (COMP_HEWE) occurs in non-tidal stream and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.
Chesapeake & Ohio Canal National Historic Park Environment: Successional Herbaceous Wetland Map Class (COMP_HEWE) includes successional herbaceous vegetation of non-tidal stream-and riverside habitats (not depositional bars) periodically inundated by overbank flooding and/or influenced by groundwater seepage, as well as impounded wetlands disturbed or created by human or beaver activity.
George Washington Memorial Parkway Environment: Successional Herbaceous Wetland Map Class (COMP_HEWE) represents vegetation dominated by herbaceous species found in ponds, low wet fields, and other artificial clearings and fields in the park, such as where powerline rights-of-way intersect stream bottoms. These habitats are ecologically dynamic and, in many cases, are held in a state of successional flux by periodic disturbance. Hydrology varies from saturated to seasonally flooded. Soils may be sandy, silty, or mucky.
Harpers Ferry National Historical Park Environment: This vegetation is dominated by herbaceous species and found in wet meadows and fields in the park. Successional Herbaceous Wetland Map Class (COMP_HEWE) is found at two sites, as an isolated patch in a disturbed area with saturated soils, and as a linear patch in a former canal adjacent to a floodplain.
Manassas National Battlefield Park Environment: Successional Herbaceous Wetland Map Class (COMP_HEWE) includes vegetation dominated by herbaceous species found in wet meadows and fields located throughout the park. Successional Herbaceous Wetlands are found as isolated patches in areas with saturated soils, and as linear areas along floodplains with snags of beaver-killed trees.
National Capital Parks-East Environment: This generic map class consisting of disturbed, predominantly herbaceous wetland could occur in any wetland area that has been disturbed.
Prince William Park Environment: Successional Herbaceous Wetland Map Class (COMP_HEWE) occurs on disturbed riverbanks and depositional bars in floodplains scattered throughout the park.
Wolf Trap National Park for the Performing Arts Environment: Successional Herbaceous Wetland Map Class (COMP_HEWE) is documented in one location along a disturbed wetland area just outside the southeast corner of the park boundary near the intersection of Wolftrap Creek and the Dulles Toll Road. Vegetation Description

VEGETATION DESCRIPTION

Antietam National Battlefield Vegetation: Weedy herbaceous vegetation dominated by medium-statured annual grasses and forbs. Species composition can be variable; however, the most common species are *Microstegium vimineum* and *Polygonum cespitosum*. Other typical species include *Polygonum* spp., *Impatiens* spp., *Medicago lupulina, Ambrosia artemisiifolia, Dichanthelium clandestinum*, and *Leersia* spp.
Catoctin Mountain Park Vegetation: This vegetation is dominated by *Phalaris arundinacea* (reed canarygrass).
Chesapeake & Ohio Canal National Historic Park Vegetation: This map class may include a variety of native and non-native successional herbaceous species found in disturbed wetlands.
George Washington Memorial Parkway Vegetation: Herbaceous vegetation predominates and woody plants contribute less than 30% cover to the stand. Most of the woody component consists of scattered floodplain tree saplings and wetland shrubs such as *Alnus serrulata*. The herbaceous vegetation is generally dense and consists of weedy, light-demanding native and exotic species, commonly including (but not limited to) *Arthraxon hispidus, Carex lurida, Carex normalis, Carex scoparia, Carex stricta, Carex vulpinoidea, Eleocharis tenuis, Glyceria striata, Holcus lanatus, Juncus acuminatus, Juncus effusus, Leersia oryzoides, Polygonum punctatum, Polygonum sagittatum, Saururus cernuus, Scirpus cyperinus, Scirpus georgianus, Typha latifolia*, and many others.
Harpers Ferry National Historical Park Vegetation: This map class represents mixed herbaceous vegetation of wet meadows, fields, and former canals. Trees are typically absent or sparse. Snags of dead trees are common in wetlands along beaver-impacted floodplains due to permanent flooding from beaver dams. The wetlands are typically dominated by native and exotic, light-demanding hydrophytic graminoids. Common herbaceous species include *Phalaris arundinacea, Typha latifolia, Leersia virginica, Echinochloa crus-galli*, and *Impatiens capensis*. Woody species can include scattered, small *Acer negundo* and *Salix nigra*.
Manassas National Battlefield Park Vegetation: This map class is comprised of mixed herbaceous vegetation of wet meadows and fields and beaver-impacted floodplains. Canopy and subcanopy trees are typically absent or sparse. Snags of dead trees are common in wetlands along beaver-impacted floodplains due to permanent flooding from beaver dams. The wetlands are typically dominated by native and exotic, light-demanding hydrophytic graminoids. Common native species include *Carex lurida, Carex normalis, Carex scoparia, Carex stricta, Carex vulpinoidea, Eleocharis tenuis, Juncus acuminatus, Juncus effusus, Leersia oryzoides, Panicum rigidulum var.*

elongatum, Phalaris arundinacea, Scirpus cyperinus, Scirpus georgianus, and *Typha latifolia*. Exotic hydrophytic graminoid species include *Arthraxon hispidus* and *Holcus lanatus*.
National Capital Parks-East Vegetation: These are predominantly herbaceous-dominated stands. Some herbs include *Boehmeria cylindrica, Hibiscus moscheutos (= ssp. moscheutos), Juncus effusus, Polygonum hydropiperoides, Nuphar advena (= Nuphar lutea ssp. advena), Peltandra virginica, Pontederia cordata, Sagittaria* sp., *Typha angustifolia, Typha latifolia, Vernonia noveboracensis*, and various graminoids. Some stands may contain, or be partly dominated by, *Phragmites australis*. Some woody plants may be present at low cover, including *Acer saccharinum, Betula nigra, Cephalanthus occidentalis, Fraxinus profunda, Liquidambar styraciflua, Platanus occidentalis*, and *Salix nigra*.
Prince William Park Vegetation: The Herbaceous Wetland (COMP_HEWE) map class may include a variety of native and non-native successional herbaceous species found in disturbed wetlands.
Wolf Trap National Park for the Performing Arts Vegetation: The Herbaceous Wetland (COMP_HEWE) map class may include a variety of native and non-native successional herbaceous species found in disturbed wetlands.

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Microstegium vimineum*, *Polygonum cespitosum*
Catoctin Mountain Park: *Phalaris arundinacea* (reed canarygrass)
George Washington Memorial Parkway: *Carex lurida*, *Carex scoparia*, *Juncus effusus*, *Leersia oryzoides*, *Polygonum sagittatum*, *Scirpus cyperinus*, *Typha latifolia*
Harpers Ferry National Historical Park: *Leersia virginica*, *Phalaris arundinacea*, *Typha latifolia*
Manassas National Battlefield Park: *Carex lurida*, *Juncus effusus*, *Leersia oryzoides*, *Scirpus cyperinus*
:

OTHER NOTEWORTHY SPECIES

Antietam National Battlefield: Invasive/Exotic Plants: *Medicago lupulina* (Medium/Insignificant), *Microstegium vimineum* (High/Medium), *Polygonum cespitosum*
Manassas National Battlefield Park: Invasive/Exotic Plants: *Arthraxon hispidus* (Medium/Low), *Holcus lanatus* (High/Medium)

CLASSIFICATION

Antietam National Battlefield Classification Comments: Successional Herbaceous Wetland Map Class (COMP_HEWE) is distinguished from other meadow vegetation by its development in saturated or flooded soils and high cover of hydrophytic graminoids. At this park, it consists of unclassified successional herbaceous wetlands.
Catoctin Mountain Park Classification Comments: Successional Herbaceous Wetland Map Class (COMP_HEWE) is distinguished from other meadow vegetation by its development in saturated or flooded soils and high cover of hydrophytic graminoids. At this park, it includes one described association, Eastern Ruderal Reed Canarygrass Marsh (CEGL006044), as well as unclassified successional herbaceous wetlands. These typically occur in patches smaller than the 0.5-ha minimum map unit established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs.
Chesapeake & Ohio Canal National Historical Park Classification Comments: Successional Herbaceous Wetland Map Class (COMP_HEWE) is distinguished from other meadow vegetation by its development in saturated or flooded soils and high cover of hydrophytic graminoids. At this park, it includes four associations, Eastern Ruderal Reed Canarygrass Marsh (CEGL006044), Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026), Eastern Cattail Marsh (CEGL006153), and Northeastern Woolgrass Marsh (CEGL006349), as well as unclassified successional herbaceous wetlands. These typically occur in patches smaller than the 0.5-ha minimum map unit established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs.
George Washington Memorial Parkway Classification Comments: Successional Herbaceous Wetland Map Class (COMP_HEWE) is distinguished from other meadow vegetation by its development in saturated or flooded soils and high cover of hydrophytic graminoids. At this park, it consists of unclassified successional herbaceous wetlands.
Harpers Ferry National Historical Park Classification Comments: Successional Herbaceous Wetland Map Class (COMP_HEWE) is distinguished from other meadow vegetation by its development in saturated or flooded soils and high cover of hydrophytic graminoids. At this park, this map class consists of two associations, Eastern Ruderal Reed Canarygrass Marsh (CEGL006044) and Eastern Cattail Marsh (CEGL006153), as well as unclassified successional herbaceous wetlands. These typically occur in patches smaller than the 0.5-ha minimum map unit

established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs.

Manassas National Battlefield Park Classification Comments: Successional Herbaceous Wetland Map Class (COMP_HEWE) is distinguished from other meadow vegetation, Pasture / Hay (NLCD81) and Successional Meadow / Grassland (COMP_SUME), by its development in saturated or flooded soils and high cover of hydrophytic graminoids. At this park, this map class includes two associations, Eastern Cattail Marsh (CEGL006153) and Northeastern Woolgrass Marsh (CEGL006349), as well as unclassified successional herbaceous wetlands. These typically occur in patches smaller than the 0.5-ha minimum map unit established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs.

National Capital Parks-East Classification Comments: Successional Herbaceous Wetland Map Class (COMP_HEWE) consists of any disturbed, predominantly herbaceous wetland with less than 30% woody cover. At this park it includes three associations, Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026), Eastern Cattail Marsh (CEGL006153), and Northeastern Woolgrass Marsh (CEGL006349), as well as unclassified successional herbaceous wetlands. These typically occur in patches smaller than the 0.5-ha minimum map unit established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs.

Prince William Forest Park Classification Comments: Successional Herbaceous Wetland Map Class (COMP_HEWE) consists of any disturbed, predominantly herbaceous wetland with less than 30% woody cover. At this park it includes two associations, Bulrush - Cattail - Bur-reed Shallow Marsh (CEGL002026) and Northeastern Woolgrass Marsh (CEGL006349), as well as unclassified successional herbaceous wetlands.

Wolf Trap National Park for the Performing Arts Classification Comments: Successional Herbaceous Wetland Map Class (COMP_HEWE) consists of any disturbed, predominantly herbaceous wetland with less than 30% woody cover. At this park, it consists of unclassified successional herbaceous wetlands that are too small to map (smaller than the 0.5-ha minimum map unit established for the NCR project).

DISTRIBUTION

Antietam National Battlefield Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) has been mapped at ANTI near the Sherrick Farmhouse along a tributary, and in association with two small ponds located in the center and east side of the park not far from Antietam Creek or a tributary. Other isolated patches may occur in patches too small to map.

Catoctin Mountain Park Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) is mapped at Catoctin Mountain Park flanking opposite sides of Owen Creek where an unnamed tributary enters it near the eastern boundary of the park and Sabillasville Road.

Chesapeake & Ohio Canal National Historical Park Range: This map class is mapped at many locations, the length of the Chesapeake & Ohio Canal.

George Washington Memorial Parkway Range: This vegetation is uncommon in the Potomac Gorge section of George Washington Memorial Parkway. It is known only from two sites in the powerline south of the parkway in Turkey Run Park. South of Chain Bridge it occurs as three small linear stands near the parkway at Daingerfield Island and one small stand on the edge of the waterfowl sanctuary at Roaches Run.

Harpers Ferry National Historical Park Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) occurs in disturbed areas adjacent to the Potomac and Shenandoah rivers and their tributaries. One stand is in the abandoned basin of the Shenandoah Canal, located between the railroad and the road along the trail from the lower town to the Visitors' Center.

Manassas National Battlefield Park Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) occurs as isolated patches scattered throughout the park in wet meadows and beaver-impacted floodplains.

National Capital Parks-East Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) has been documented or mapped at NACE in the central area and at Oxon Hill Farm, Oxon Run Parkway, Patuxent North, Piscataway, and Shepherd Parkway.

Prince William Forest Park Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) has been documented or mapped at PRWI throughout the park along Quantico Creek and South Fork Quantico Creek or its tributaries, including Mary Bird Branch.

Wolf Trap National Park for the Performing Arts Range: Successional Herbaceous Wetland Map Class (COMP_HEWE) has been documented along Wolf Trap Creek, but in patches too small to map.

NCR Parks: NPS (Antietam, C&O Canal, Catoctin Mountain, George Washington Parkway, Harpers Ferry, Manassas, National Capital-East, Prince William, Wolf Trap)

[COMP_PLDE] Planted Deciduous Forest

CONCEPT

Summary: Planted Deciduous Forest Map Class (COMP_PLDE) is a conceptual placeholder, designed only to act as a provisional type for vegetation complexes, ruderal or early-successional vegetation, and other types that cannot be reliably classified. It is created to facilitate regularized local land unit mapping of a managed area and to provide a standard label for polygons in a vegetation map. It includes any planted deciduous forest, except fruit orchards. Plantations may be monocultural or mixed species. It can also include decadent plantations that are no longer actively maintained. Planted Deciduous Forest Map Class is mapped at the following NCR parks: Chesapeake & Ohio Canal National Historical Park, Monocacy National Battlefield, and National Capital Parks-East.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Environment: The Planted Deciduous Forest map class was mapped in only two locations along the park based on the observance of recently disturbed areas dominated by deciduous trees.
Monocacy National Battlefield Environment: This forest occurs on the borders of fields or as hedgerows.
National Capital Parks-East Environment: The Planted Deciduous Forest map class was mapped in six locations in NACE based on the observance of recently disturbed areas dominated by deciduous trees.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historical Park Vegetation: Vegetation may include plantings of native or non-native trees.
Monocacy National Battlefield Vegetation: *Maclura pomifera* is the dominant species.
National Capital Parks-East Vegetation: This is a generic map class consisting of a deciduous forest of any species composition, which has been planted rather than regenerated naturally. Documented areas at National Capital Parks-East include what appears to be a planted *Liquidambar styraciflua* forest. It also would include stands of ~Bald-cypress Plantation (CST007452)$$.

CHARACTERISTIC SPECIES

Monocacy National Battlefield: *Maclura pomifera*

DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: The Planted Deciduous Forest map class was mapped in only two locations along the canal.
Monocacy National Battlefield Range: This forest occurs on the borders of fields or as hedgerows.
National Capital Parks-East Range: This Planted Deciduous Forest Map Class has been documented or mapped at NACE at Harmony Hall and Oxon Hill Farm.
NCR Parks: NPS (C&O Canal, Monocacy, National Capital-East)

[COMP_PLEV] Planted Evergreen Forest

CONCEPT

Summary: The Planted Evergreen Forest Map Class (COMP_PLEV) is a conceptual placeholder, designed only to act as a provisional type for vegetation complexes, ruderal or early-successional vegetation, and other types that cannot be reliably classified. It is created to facilitate regularized local land unit mapping of a managed area and to provide a standard label for polygons in a vegetation map. It includes any planted evergreen forest, typically occurring as an even-aged monoculture or nearly so. It can also include decadent plantations that are no longer actively maintained. Within the NPS National Capital Region, planted areas of *Picea abies* (Norway Spruce Plantation - CST007167), *Pinus strobus* (Eastern White Pine Plantation - CST007178) and *Pinus taeda* (Loblolly Pine Plantation - CST007179) have been documented. The Planted Evergreen Forest Map Class is mapped at the following NCR parks: Antietam National Battlefield, Catoctin Mountain Park, Chesapeake & Ohio Canal National Historic Park, Manassas National Battlefield Park, Monocacy National Battlefield, National Capital Parks-East, and Rock Creek Park.

VEGETATION DESCRIPTION

Antietam National Battlefield Vegetation: This is a generic map class consisting of an evergreen forest of any species composition, which has been planted rather than regenerated naturally. Planted areas of *Pinus strobus*

(Eastern White Pine) have been documented at the park, but other evergreen plantations may also be included in this map class at the park.

Catoctin Mountain Park Vegetation: This is a generic map class consisting of an evergreen forest of any species composition, which has been planted rather than regenerated naturally. Planted areas of *Pinus strobus* (Eastern White Pine) have been documented at the park, but other evergreen plantations may also be included in this map class at the park.

Chesapeake & Ohio Canal National Historic Park Vegetation: This is a generic map class consisting of an evergreen forest of any species composition, which has been planted rather than regenerated naturally. Planted areas of *Pinus strobus* (Eastern White Pine), *Picea abies* (Norway Spruce), and *Pinus taeda* (Loblolly Pine) have been documented at the park, but other evergreen plantations may also be included in this map class at the park.

George Washington Memorial Parkway Vegetation: This is a generic map class consisting of an evergreen forest of any species composition, which has been planted rather than regenerated naturally. Planted areas of *Picea abies* (Norway Spruce) have been documented at the park, but other evergreen plantations may also be included in this map class at the park.

Manassas National Battlefield Park Vegetation: This is a generic map class consisting of an evergreen forest of any species composition, which has been planted rather than regenerated naturally. Planted areas of *Pinus taeda* (Loblolly Pine) have been documented at the park, but other evergreen plantations may also be included in this map class at the park.

Monocacy National Battlefield Vegetation: This is a generic map class consisting of an evergreen forest of any species composition, which has been planted rather than regenerated naturally. Planted areas of *Pinus strobus* (Eastern White Pine) have been documented at the park, but other evergreen plantations may also be included in this map class at the park.

National Capital Parks-East Vegetation: This is a generic map class consisting of an evergreen forest of any species composition, which has been planted rather than regenerated naturally. Documented areas at National Capital Parks-East include what appears to be planted *Pinus taeda* forests (CST007179), but other evergreen plantations may also be included.

Rock Creek Park Vegetation: This is a generic map class consisting of an evergreen forest of any species composition, which has been planted rather than regenerated naturally. The Planted Evergreen Forest Map Class (COMP_PLEV) includes one association at this park, Loblolly Pine Plantation (CST007179), but other evergreen plantations may also be included in this map class at the park.

CLASSIFICATION

Antietam National Battlefield Classification Comments: The Planted Evergreen Forest Map Class (COMP_PLEV) is only known to include one association at this park, Eastern White Pine Plantation (CST007178).

Catoctin Mountain Park Classification Comments: The Planted Evergreen Forest Map Class (COMP_PLEV) is only known to include one association at this park, Eastern White Pine Plantation (CST007178).

Chesapeake & Ohio Canal National Historic Park Classification Comments: The Planted Evergreen Forest Map Class (COMP_PLEV) is known to include three associations at this park, Norway Spruce Plantation (CST007167), Eastern White Pine Plantation (CST007178), and Loblolly Pine Plantation (CST007179).

George Washington Memorial Parkway Classification Comments: The Planted Evergreen Forest Map Class (COMP_PLEV) is only known to include one association at this park, Norway Spruce Plantation (CST007167).

Manassas National Battlefield Park Classification Comments: The Planted Evergreen Forest Map Class (COMP_PLEV) is only known to include one association at this park, Loblolly Pine Plantation (CST007179).

Monocacy National Battlefield Classification Comments: The Planted Evergreen Forest Map Class (COMP_PLEV) is only known to include one association at this park, Eastern White Pine Plantation (CST007178).

National Capital Parks-East Classification Comments: The Planted Evergreen Forest Map Class (COMP_PLEV) is only known to include one association at this park, Loblolly Pine Plantation (CST007179).

Rock Creek Park Classification Comments: The Planted Evergreen Forest Map Class (COMP_PLEV) is only known to include one association at this park, Loblolly Pine Plantation (CST007179).

DISTRIBUTION

Antietam National Battlefield Range: The Planted Evergreen Forest Map Class has been mapped in the eastern side of the park at the edges of fields.

Catoctin Mountain Park Range: The Planted Evergreen Forest has been documented in two locations at Catoctin Mountain Park. One location is along the Brown's Farm Nature Trail Loop.

Chesapeake & Ohio Canal National Historic Park: The Planted Evergreen Forest Map Class has been mapped at 26 areas scattered along the park.

Manassas National Battlefield Park Range: The Planted Evergreen Forest Map Class has been mapped at MANA beside parking lots and fields.
Monocacy National Battlefield Range: The Planted Evergreen Forest Map Class has been mapped at MONO beside parking lots and fields.
National Capital Parks-East Range: The Planted Evergreen Forest Map Class has been documented or mapped at NACE at Harmony Hall and Piscataway.
Rock Creek Park Range: The Planted Evergreen Forest Map Class has been mapped at ROCR beside the Meadowlink Trail.
NCR Parks: NPS (Antietam, C&O Canal, Catoctin Mountain, George Washington Parkway, Manassas, Monocacy, National Capital-East, Rock Creek)

[COMP_RROP] Riverside Rock Outcrop and Prairie

CONCEPT

Summary: The Riverside Rock Outcrop and Prairie Map Class (COMP_RROP) includes any combination of shrublands, prairies, and barrens occurring on riverside rock outcrops and eroded bedrock terraces in association with high-gradient stretches of major rivers. All communities in this map class are influenced and shaped by major flood scouring events, although flood return intervals vary widely. Communities typically occur in a mosaic of patches too small to map separately. In NCR, this map class is restricted primarily to the Potomac Gorge, with a few outliers at Harpers Ferry National Historical Park. It may include any of four associations: Fall-line Riverwash Bedrock Prairie (CEGL006283), Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478), Piedmont Riverscour Shrubland (CEGL006484), and Potomac Gorge Riverside Outcrop Barrens (CEGL006491). It is mapped at the following NCR parks: Chesapeake & Ohio Canal National Historic Park, George Washington Memorial Parkway, and Harpers Ferry National Historical Park.

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historic Park Environment: The Riverside Rock Outcrop and Prairie Map Class occurs on riverside rock outcrops and eroded bedrock terraces in association with high-gradient stretches of major rivers. All communities in this map class are influenced and shaped by major flood scouring events, although flood return intervals vary widely. Communities typically occur in a mosaic of patches too small to map separately.
George Washington Memorial Parkway Environment: This map class represents exposed cliffs and outcrops bordering the Potomac River and elevated above it, but subject to inundation in large flood events. Stands occur between approximately 2 to 17 m (7-56 feet) relative elevation above mean river level, and thus have variable flood regimes. The average flood-return interval probably varies from 0.5 year to more than 15 years (Lea 2000). Habitats typically have >80% surface cover of exposed bedrock and boulders. On convex sites, mineral soil is absent. However, more concave sites often have relatively great, fine-scale microtopographic diversity, with many small depressions and ledges where soils or water can accumulate. Soils are probably all flood-deposited or colluvial, consisting mostly of coarse sand. However, some deposits of deeper, loamy material are found at a few sites. Samples collected from plots are all 100% base-saturated, with high pH (mean = 6.5), calcium, and magnesium levels.
Harpers Ferry National Historical Park Environment: This map class develops on bedrock outcrops along the Shenandoah and Potomac rivers. It occupies frequently flooded rocky areas on the active channel shelf. Potomac drainage stands are associated with stable outcrop / boulder habitats versus more ephemeral cobble bars. Soil material is often restricted to the narrow interstices of tightly packed boulders, or to small crevices in bedrock exposures.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historic Park Vegetation: In the Riverside Rock Outcrop and Prairie Map Class, vegetation may be any combination of shrublands, prairies, and barrens occurring on riverside rock outcrops and eroded bedrock terraces in association with high-gradient stretches of major rivers.
George Washington Memorial Parkway Vegetation: In this map class, vegetation typically varies from sparse to mostly herbaceous with scattered shrubs and trees. More rarely, it may be densely dominated by shrubs. The sparse variants, associated with the most exposed, usually convex cliffs and outcrops, typically have <12% low shrub cover and <10% herb cover. The most frequent and characteristic species are *Schizachyrium scoparium, Solidago simplex var. racemosa, Dichanthelium acuminatum var. acuminatum, Ionactis linariifolius*, and the shrubs *Eubotrys racemosa (= Leucothoe racemosa)* and *Hypericum prolificum*, which are usually dwarfed. On ledges and outcrops with better soil development, prairie-like vegetation dominated by the warm-season grasses *Andropogon gerardii*

(usually most abundant), *Sorghastrum nutans*, and *Panicum virgatum var. virgatum* is characteristic. Other constant species of these prairies include the forbs *Pycnanthemum tenuifolium, Veronicastrum virginicum, Coreopsis tripteris, Packera paupercula, Allium cernuum, Symphyotrichum patens var. patens (= Aster patens var. patens)*, and *Phlox subulata*. The shrubland variant, which is dominated by *Carpinus caroliniana* and one or both of the deciduous hollies *Ilex decidua* and *Ilex verticillata*, is rare but distinctive.

Additional species that are characteristic of this map class include *Hypericum gentianoides, Aquilegia canadensis, Gaylussacia baccata, Vaccinium pallidum, Amelanchier stolonifera, Amelanchier nantucketensis, Physocarpus opulifolius, Baptisia australis var. australis, Cerastium arvense ssp. arvense, Lathyrus venosus, Lespedeza violacea, Helianthus occidentalis ssp. occidentalis, Lespedeza virginica, Sporobolus clandestinus, Lespedeza capitata, Solidago nemoralis*, and *Tripsacum dactyloides*. *Juncus dichotomus, Ludwigia palustris, Ludwigia alternifolia, Scirpus cyperinus,* and *Rhynchospora capitellata*. Other wetland herbs occur irregularly in and around periodically flooded potholes and depressions. Lichens are the predominant biota on the exposed rock surfaces, with *Xanthoparmelia conspersa, Dimelaena oreina, Candelariella* cf. *vitellina, Xanthoria* sp., and numerous unidentified crustose species all abundant.

Harpers Ferry National Historical Park Vegetation: In this map class, vegetation may be any combination of shrublands, prairies, and barrens occurring on riverside rock outcrops and eroded bedrock terraces in association with high-gradient stretches of major rivers.

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: *Andropogon gerardii*, *Panicum virgatum*

George Washington Memorial Parkway: *Andropogon gerardii*, *Coreopsis tripteris*, *Eubotrys racemosa*, *Hypericum prolificum*, *Ionactis linariifolius*, *Panicum virgatum*, *Phlox subulata*, *Pycnanthemum tenuifolium*, *Schizachyrium scoparium*, *Sorghastrum nutans*, *Veronicastrum virginicum*

Harpers Ferry National Historical Park: *Andropogon gerardii*, *Baptisia australis*, *Panicum virgatum*

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: **Vulnerable**: *Carex emoryi* (MD-imperiled, G5), *Quercus macrocarpa* (MD-critically imperiled, G5), *Zizia aurea* (MD-vulnerable, G5); **Exotic/Invasive**: *Ailanthus altissima* (Medium), *Allium vineale* (Medium/Insignificant), *Ampelopsis brevipedunculata, Arabidopsis thaliana, Artemisia annua* (Medium/Insignificant), *Arthraxon hispidus* (Medium/Low), *Calystegia sepium*, *Commelina communis, Daucus carota, Dianthus armeria, Digitaria ischaemum*, *Elaeagnus umbellata* var. *parvifolia*, *Glechoma hederacea, Hemerocallis fulva, Ipomoea hederacea*, *Lespedeza cuneata, Leucojum aestivum, Lonicera japonica* (High/Medium), *Lysimachia nummularia, Melilotus albus, Microstegium vimineum* (High/Medium), *Perilla frutescens* (Low), *Phleum pretense, Plantago major, Poa pratensis, Polygonum caespitosum var. longisetum, Ranunculus bulbosus, Ranunculus ficaria, Rorippa sylvestris, Rumex crispus* (Low/Insignificant), *Stellaria media, Trifolium pretense, Vicia sativa ssp. nigra*

George Washington Memorial Parkway: **Vulnerable Plants**: *Amelanchier nantucketensis* (G3Q, VA state-critically imperiled), *Baptisia australis* var. *australis* (G5T3T4, VA state-vulnerable), *Carex straminea* (G5, VA state-critically imperiled), *Cerastium arvense* var. *velutinum* (G5T4?, VA state-imperiled), *Cornus obliqua* (G5, VA state-imperiled), *Eleocharis compressa* (G4, VA state-imperiled), *Helianthus occidentalis* ssp. *occidentalis* (G5T5, VA state-critically imperiled), *Onosmodium virginianum* (G4, VA state-imperiled), *Packera paupercula* (G5, VA state-vulnerable), *Rhododendron arborescens* (G4G5, VA state-imperiled), *Solidago rupestris* (G4?, VA state-critically imperiled), *Solidago simplex* var. *racemosa* (G5T3?, VA state-critically imperiled), *Spartina pectinata* (G5, VA state-imperiled); **Invasive/Exotic Plants**: *Celastrus orbiculatus* (High/Medium), *Lespedeza cuneata* (Medium), *Lonicera japonica* (High/Medium)

Harpers Ferry National Historical Park: Vulnerable Plants: *Baptisia australis* var. *australis* (blue wild indigo, G5T3T4),

CLASSIFICATION

Chesapeake & Ohio Canal National Historical Park Classification Comments: The Riverside Rock Outcrop and Prairie Map Class (COMP_RROP) includes four associations at this park: Fall-line Riverwash Bedrock Prairie (CEGL006283), Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478), Piedmont Riverscour Shrubland (CEGL006484), and Potomac Gorge Riverside Outcrop Barrens (CEGL006491). Communities typically occur in a mosaic of patches too small to map separately.

George Washington Memorial Parkway Classification Comments: The Riverside Rock Outcrop and Prairie Map Class (COMP_RROP) includes four associations at this park: Fall-line Riverwash Bedrock Prairie (CEGL006283), Piedmont-Central Appalachian Riverside Outcrop Prairie (CEGL006478), Piedmont Riverscour

Shrubland (CEGL006484), and Potomac Gorge Riverside Outcrop Barrens (CEGL006491). These community types often occur in patches much smaller than the 0.5-ha minimum map unit established for the NCR project, frequently co-occur in fine-scale patch-mosaics and are difficult to distinguish on aerial photographs.

Harpers Ferry National Historical Park Classification Comments: The Riverside Rock Outcrop and Prairie Map Class (COMP_RROP) consists predominantly of the Fall-line Riverwash Bedrock Prairie (CEGL006283). These community types typically occur in patches smaller than the 0.5-ha minimum map unit established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs.

DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: The Riverside Rock Outcrop and Prairie Map Class is restricted primarily to the Outer Piedmont in the Potomac Gorge (Canal mile 11 – 14) and below High Island (Canal mile 4 – 5).

George Washington Memorial Parkway Range: This map class occupies the exposed cliffs and outcrops that flank the Potomac River from Great Falls through Mather Gorge to Madeira School, and occasionally further downstream. In George Washington Memorial Parkway, it is confined to Great Falls Park.

Harpers Ferry National Historical Park Range: This map class occurs in small isolated patches on channel shelf bedrock outcrops in high-gradient stretches of the Shenandoah river.

NCR Parks: NPS (C&O Canal, George Washington Parkway, Harpers Ferry)

[COMP_RSWO] River-scour Woodland

CONCEPT

Summary: The River-scour Woodland Map Class (COMP_RSWO), includes various wooded communities (where shrubs and/or stunted trees comprise at least 25% of cover) that are subject to frequent high-energy floods. It is found on scoured shorelines or on sand, gravel, and cobble bars within the channels of rivers and streams. In the NPS National Capital Region, it includes as many as three associations, Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), and Piedmont-Central Appalachian Riverscour Forest (CEGL006218), and is mapped at the following NCR parks: Chesapeake & Ohio Canal National Historic Park, George Washington Memorial Parkway, Harpers Ferry National Historical Park, Manassas National Battlefield Park, Monocacy National Battlefield, and Prince William Forest Park. Although found at Antietam National Battlefield, the River-scour Woodland Map Class occurs in patches too small to be mapped in that park's vegetation map.

ENVIRONMENTAL DESCRIPTION

Antietam National Battlefield Environment: This map class occurs on low cobbly or sandy depositional bars and vegetation is strongly influenced by flooding.

Chesapeake & Ohio Canal National Historical Park Environment: This map class represents various wooded communities (where shrubs and/or stunted trees comprise at least 25% of cover) subject to frequent high-energy floods, occurring on scoured shorelines or on sand, gravel, and cobble bars within the channels of rivers and streams.

George Washington Memorial Parkway Environment: This map class represents channel-shelf bedrock exposures and coarse-textured depositional bars along the higher-gradient sections of the Potomac River and Difficult Run. Most plots had >50% surface cover of bedrock, boulders, cobbles, and gravel in variable proportions, with the remainder covered by thin veneers of alluvium. Soils are predominantly coarse sands with very high fertility. However, low areas and areas around tree roots may contain silty or mucky deposits. At some sites, sandy soils are densely packed in the interstitial areas between cobbles. Other sites have very diverse fine-scale microtopography that includes cobble-filled channels, mucky pools, soil-covered berms, and rock outcrops. Sites for this vegetation complex are flooded annually and inundated 3 to 40% of the year, mostly during the dormant season (Lea 2000). Large floods during periods of exposure can have powerful scouring effects and alter or remove parts of the substrate.

Harpers Ferry National Historical Park Environment: This map class represents channel-shelf bedrock exposures and coarse-textured depositional bars along the higher-gradient sections of the Shenandoah and Potomac rivers. Most sites have >50% surface cover of bedrock, boulders, cobbles, and gravel in variable proportions, with the remainder covered by thin veneers of alluvium. Soils are predominantly coarse sands with very high fertility. However, low areas and areas around tree roots may contain silty or mucky deposits. At some sites, sandy soils are densely packed in the interstitial areas between cobbles. Other sites have very diverse fine-scale microtopography that includes cobble-filled channels, mucky pools, soil-covered berms, and rock outcrops. Sites for this vegetation

complex are flooded annually and inundated 3 to 40% of the year, mostly during the dormant season (Lea 2000). Large floods during periods of exposure can have powerful scouring effects and alter or remove parts of the substrate.

Manassas National Battlefield Park Environment: This map class on coarse-textured depositional bars within the stream channel of Bull Run. Most stands have sand and silt substrates, interspersed with cobbles and gravel in variable proportions, and occasionally some exposed bedrock. Habitats supporting this community flood an average of 5-8 times a year. Although these stony bars are relatively stable, large and powerful floods can remove or alter large portions of the substrate. Soils are predominantly coarse sands with very high fertility. However, low areas and areas around tree roots may contain silty or mucky deposits.

Monocacy National Battlefield Environment: This map class represents riparian vegetation occurring on low cobbly or sandy depositional bars along riverbanks or the edges of islands. Typical soil is a hygric, well-drained coarse sand and gravel with occasional pockets of silty clay loam in the depressions. This vegetation is strongly influenced by frequent flooding and ice-scouring that prevents the woody species from developing into full-statured canopy trees.

Prince William Forest Park: This map class represents vegetation that occurs on coarse-textured depositional bars within stream channels.

VEGETATION DESCRIPTION

Antietam National Battlefield Vegetation: Tall shrubs or flood-battered stunted trees less than 6 m in height are dominant. *Platanus occidentalis, Betula nigra*, and/or *Salix* spp. are the dominant species.

Chesapeake & Ohio Canal National Historic Park Vegetation: Various wooded communities (where shrubs and/or stunted trees comprise at least 25% of cover) subject to frequent high-energy floods.

George Washington Memorial Parkway Vegetation: Stand physiognomy is highly variable, depending on the stability of the substrate and the impacts of past flooding. Stands exposed to frequent high-velocity scouring usually have a shrubland stature, while those that are somewhat more protected are open woodlands. In most stands, at least some trees are heavily flood-trained, with leaning or horizontal trunks and numerous vertical, adventitious sprouts. Woody composition is also variable. Most common are stands on boulder and cobble bars dominated by *Platanus occidentalis*, with or without *Betula nigra*. Areas where bedrock is exposed on the channel shelf tend to support more mixed woodlands of *Fraxinus pennsylvanica* (usually most important), *Ulmus americana, Diospyros virginiana, Platanus occidentalis*, and *Acer saccharinum*. Additional trees that occur less constantly are *Acer negundo, Quercus bicolor, Quercus shumardii, Salix nigra, Salix caroliniana*, and *Carya cordiformis*. Climbing and scrambling vines of *Toxicodendron radicans, Campsis radicans, Parthenocissus quinquefolia, Vitis riparia*, and *Vitis vulpina* are common in some stands. *Carpinus caroliniana, Cornus obliqua*, and *Cornus amomum* are the most frequent true shrubs, but none are particularly characteristic. The herbaceous flora varies from sparse to moderately dense but tends to be species-rich. Some of the more characteristic herbs of this complex include *Apocynum cannabinum (= Apocynum sibiricum), Bidens frondosa, Carex emoryi, Eupatorium serotinum, Acalypha rhomboidea, Solanum carolinense, Phyla lanceolata, Polygonum lapathifolium, Xanthium strumarium, Cyperus odoratus, Polygonum punctatum, Eclipta prostrata, Leersia virginica, Ipomoea lacunosa, Artemisia annua, Chamaesyce humistrata, Cyperus strigosus, Teucrium canadense, Boehmeria cylindrica, Pilea pumila, Polygonum virginianum, Symphyotrichum lateriflorum (= Aster lateriflorus)*, and *Verbesina alternifolia*.

Harpers Ferry National Historical Park Vegetation: Stand physiognomy is highly variable, depending on the stability of the substrate and the impacts of past flooding. Stands exposed to frequent high-velocity scouring usually have a shrubland stature, while those that are somewhat more protected are open woodlands. In most stands, at least some trees are heavily flood-trained, with leaning or horizontal trunks and numerous vertical, adventitious sprouts. Woody composition is also variable. Most common are stands on boulder and cobble bars dominated by *Platanus occidentalis*, with or without *Betula nigra*. Areas where bedrock is exposed on the channel shelf tend to support more mixed woodlands of *Fraxinus pennsylvanica* (usually most important), *Ulmus americana, Platanus occidentalis, Betula nigra*, and *Acer saccharinum*. Climbing and scrambling vines of *Toxicodendron radicans, Campsis radicans, Parthenocissus quinquefolia, Vitis riparia*, and *Vitis vulpina* are common in some stands. *Carpinus caroliniana* and *Cornus amomum* are the most frequent true shrubs, but none are particularly characteristic. The herbaceous flora varies from sparse to moderately dense but tends to be species-rich. Some of the more characteristic herbs of this complex include *Apocynum cannabinum, Boehmeria cylindrica, Carex emoryi, Eutrochium fistulosum (= Eupatorium fistulosum), Eupatorium serotinum, Acalypha rhomboidea, Polygonum lapathifolium, Xanthium strumarium, Cyperus odoratus, Polygonum punctatum, Leersia virginica, Ipomoea*

lacunosa, Artemisia annua, Chamaesyce humistrata, Cyperus strigosus, Teucrium canadense, and *Verbesina alternifolia*.

Manassas National Battlefield Park Vegetation: Stand physiognomy is highly variable, depending on the stability of the substrate and the impacts of past flooding. Stands exposed to frequent scouring usually have a shrubland stature, while those that are somewhat more protected are open woodlands; mean cover of all woody plants is about 60%. Maximum canopy height (usually achieved by just one or two trees in a stand) ranges from 5 to 20 m (16-65 feet). In all stands, at least some trees are heavily flood-trained, with leaning or horizontal trunks and numerous vertical, adventitious sprouts. *Platanus occidentalis* and/or *Betula nigra* are typically the most abundant trees, while *Acer negundo* and *Celtis occidentalis* are common associates. The herb layer is rather sparse but moderately diverse with a number of typical riparian and ruderal herbs. Rock cover and densely packed, seasonally dry soils keep herbaceous cover down, but many of the species typical of the type are both flood- and drought-tolerant. Exotics species, such as *Lonicera japonica, Microstegium vimineum*, and *Polygonum cespitosum var. longisetum*, are often prevalent. Characteristic native herbs are *Verbesina alternifolia, Elymus virginicus, Dichanthelium clandestinum, Carex laxiflora var. laxiflora, Boehmeria cylindrica, Polygonum punctatum, Agrostis perennans*, and *Leersia virginica*. *Toxicodendron radicans* can also have high cover as a low shrub (25-50% in one stand).

Monocacy National Battlefield Vegetation: Tall shrubs or flood-battered stunted trees less than 6 m in height are characteristic of this association. *Platanus occidentalis* is often the dominant species, though *Betula nigra* and/or *Salix* spp. can be common as well. This tall-shrub layer is typically moderately dense (50-75% cover). Due to the frequent disturbances, the herbaceous layer can be highly variable. *Polygonum* spp. such as *Polygonum cespitosum var. longisetum, Polygonum hydropiperoides, Polygonum persicaria, Polygonum perfoliatum, Polygonum pensylvanicum*, and *Polygonum sagittatum* can be common. Other typical species include *Leersia virginica, Mimulus ringens, Acalypha rhomboidea, Pilea pumila, Setaria* spp., *Echinochloa* spp., and *Brassica nigra*.

Prince William Forest Park: Where documented, this vegetation occurs in patches too small and diverse to classify to a single vegetation type.

CHARACTERISTIC SPECIES

Antietam National Battlefield: *Platanus occidentalis, Betula nigra*, and/or *Salix* spp.

George Washington Memorial Parkway: *Apocynum cannabinum*, *Betula nigra*, *Diospyros virginiana*, *Eupatorium serotinum*, *Fraxinus pennsylvanica*, *Platanus occidentalis*, *Teucrium canadense*

Harpers Ferry National Historical Park: *Acalypha rhomboidea*, *Acer saccharinum*, *Apocynum cannabinum*, *Betula nigra*, *Boehmeria cylindrica*, *Carex emoryi*, *Eupatorium serotinum*, *Eutrochium fistulosum*, *Fraxinus pennsylvanica*, *Platanus occidentalis*, *Teucrium canadense*, *Ulmus americana*

Manassas National Battlefield Park: *Betula nigra*, *Celtis occidentalis*, *Dichanthelium clandestinum*, *Platanus occidentalis*, *Verbesina alternifolia*

OTHER NOTEWORTHY SPECIES

George Washington Memorial Parkway: **Vulnerable Plants**: *Baptisia australis* var. *australis* (G5T3T4, state-vulnerable), *Cornus obliqua* (G5, state-imperiled), *Desmodium cuspidatum* var. *cuspidatum* (G5T5?, state-imperiled), *Eleocharis compressa* (G4, state-imperiled), *Hasteola suaveolens* (G4, state-imperiled), *Lipocarpha micrantha* (G5, state-critically imperiled), *Solidago simplex* var. *racemosa* (G5T3?, state-critically imperiled), *Spartina pectinata* (G5, state-imperiled); **Invasive/Exotic Plants**: *Artemisia annua* (Medium/Insignificant), *Arthraxon hispidus* (Medium/Low), *Glechoma hederacea* (Low), *Lysimachia nummularia* (Medium/Low), *Lysimachia vulgaris*, *Microstegium vimineum* (High/Medium), *Perilla frutescens* (Low), *Polygonum cespitosum* var. *longisetum*; **Other Plants**: *Carex emoryi* (G5), *Ulmus americana* (G5)

Harpers Ferry National Historical Park: **Vulnerable Plants**: *Hasteola suaveolens* (G4, State rare); **Invasive/Exotic Plants**: *Ailanthus altissima* (Medium), *Artemisia annua* (Medium/Insignificant), *Lysimachia nummularia* (Medium/Low), *Microstegium vimineum* (High/Medium), *Perilla frutescens* (Low), *Polygonum cespitosum* var. *longisetum*

Manassas National Battlefield Park: **Invasive/Exotic Plants**: *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Murdannia keisak* (Medium/Low), *Perilla frutescens* (Low), *Polygonum cespitosum* var. *longisetum*, *Rorippa sylvestris* (Medium/Low)

Monocacy National Battlefield: *Betula nigra*, *Platanus occidentalis*, *Salix* spp.

Classification

Antietam National Battlefield Classification Comments: The River-scour Woodland Map Class (COMP_RSWO) includes only the Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896) in this park, along with other undescribed woody vegetation in the same environment. This map class occurs in patches too

small to be captured in the vegetation map (smaller than the 0.5-ha minimum map unit established for the NCR project).

Chesapeake & Ohio Canal National Historical Park Classification Comments: The River-scour Woodland Map Class (COMP_RSWO) includes three associations at this park, Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), Piedmont-Central Appalachian Riverscour Forest (CEGL006218), and Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), along with any other undescribed woody vegetation in the same environment. These communities typically occur in patches smaller than the 0.5-ha minimum map unit established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs.

George Washington Memorial Parkway Classification Comments: The River-scour Woodland Map Class (COMP_RSWO) consists of three associations at this park, Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896), Piedmont-Central Appalachian Riverscour Forest (CEGL006218), and Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), along with any other undescribed woody vegetation in the same environment. These communities typically occur in patches smaller than the 0.5-ha minimum map unit established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs.

Harpers Ferry National Historical Park Classification Comments: The River-scour Woodland Map Class (COMP_RSWO) consists of two associations at this park, Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896) and Central Appalachian-Piedmont Bedrock Floodplain Forest (CEGL006476), along with any other undescribed woody vegetation in the same environment. These communities typically occur in patches smaller than the 0.5-ha minimum map unit established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs.

Manassas National Battlefield Park Classification Comments: The River-scour Woodland Map Class (COMP_RSWO) includes only the Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896) in this park, along with other undescribed woody vegetation in the same environment. These communities typically occur in patches smaller than the 0.5-ha minimum map unit established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs. This map class is distinguished by its rocky, depositional bar habitat; its scrubby or open woodland vegetation with leaning, flood-damaged trees; dominance by *Platanus occidentalis* and/or *Betula nigra*; and a rather sparse herbaceous flora.

Monocacy National Battlefield Classification Comments: The River-scour Woodland Map Class (COMP_RSWO) includes only the Piedmont-Central Appalachian Sycamore - River Birch Floodplain Forest (CEGL003896) in this park, along with other undescribed woody vegetation in the same environment. These communities typically occur in patches smaller than the 0.5-ha minimum map unit established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs. This map class is distinguished by its low cobbly or sandy depositional bar habitat along riverbanks or the edges of islands; its scrubby or open woodland vegetation with leaning, flood-damaged trees; and dominance by *Platanus occidentalis* or sometimes *Betula nigra* and/or *Salix* spp.

Prince William Forest Park Classification Comments: The River-scour Woodland Map Class consists of undescribed woody vegetation on coarse-textured depositional bars within stream channels. If distinct communities are identifiable, these communities typically occur in patches smaller than the 0.5-ha minimum map unit established for the NCR project, often co-occur in patch-mosaics, and are difficult to distinguish on aerial photographs.

DISTRIBUTION

Antietam National Battlefield Range: River-scour Woodland Map Class (COMP_RSWO) occurs in small patches along Antietam Creek. These were too small to map in the ANTI vegetation map.

Chesapeake & Ohio Canal National Historical Park Range: River-scour Woodland Map Class (COMP_RSWO) is mapped at 260 locations, the length of the Chesapeake & Ohio Canal.

George Washington Memorial Parkway Range: River-scour Woodland Map Class occurs in scattered patches along the higher-gradient sections of the Potomac River and Difficult Run. Known stands on George Washington Memorial Parkway lands are all in the river, reaching from just above Great Falls to the mouth of Turkey Run.

Harpers Ferry National Historical Park Range: River-scour Woodland Map Class occurs in scattered, sometimes large-linear patches along the higher-gradient sections of the Shenandoah and Potomac rivers.

Manassas National Battlefield Park Range: River-scour Woodland Map Class occurs as small patches within the stream channel of Bull Run.

Monocacy National Battlefield Range: This map class occurs on low cobbly or sandy depositional bars of the Monocacy River.

Prince William Forest Park: This map class occurs along the North Branch Chopawamsic Creek and South Fork Quantico Creek.
NCR Parks: Antietam, C&O Canal, George Washington Parkway, Harpers Ferry, Manassas, Monocacy, Prince William

[COMP_SBWO] Shale Barren Woodland

CONCEPT

Summary: The Shale Barren Woodland Map Class (COMP_SBWO) includes stunted, very open woodlands occurring on steep, unstable, exposed slopes with conspicuously abundant shale channery as the primary substrate. It includes four associations: Central Appalachian Circumneutral Barrens (CEGL006037), North-Central Appalachian Acidic Shale Woodland (CEGL006288), Central Appalachian Xeric Shale Woodland (Virginia Pine / Sparse Herbs Type) (CEGL008525), and Central Appalachian Xeric Shale Woodland (Chestnut Oak / Mixed Herbs Type) (CEGL008526). The Shale Barren Woodland Map Class (COMP_SBWO) occurs on dry slopes along the Chesapeake & Ohio Canal at many locations in the Ridge and Valley (Canal mile 137–173).

ENVIRONMENTAL DESCRIPTION

Chesapeake & Ohio Canal National Historic Park Environment: The Shale Barren Woodland Map Class (COMP_SBWO) includes stunted, very open woodlands occurring on dry, steep, shale slopes. Aspect ranges from southeast to west, to northwest but is mostly south and southwest facing. There may be large areas of exposed bedrock, and small rockslides are possible here.

VEGETATION DESCRIPTION

Chesapeake & Ohio Canal National Historic Park Vegetation: In the stunted, very open woodlands of the Shale Barren Woodland Map Class (COMP_SBWO), canopy dominants may include some combination of *Quercus montana (= Quercus prinus), Q. rubra, Pinus virginiana, Carya glabra, Juniperus virginiana*, and/or *Fraxinus Americana.* The shrub layer varies from non-existent or sparse to patchy or moderate, and may contain tree seedlings (sometimes *Quercus ilicifolia*) and in some cases *Vaccinium* spp. The herbaceous layer varies from very sparse to abundant, and generally includes grasses and sedges. Nonvascular species may also be present in amounts up to 30% of the ground surface.

CHARACTERISTIC SPECIES

Chesapeake & Ohio Canal National Historical Park: Trees tolerant of open, dry conditions, including oaks or evergreens such as *Quercus montana* or *Juniperus virginiana*.

OTHER NOTEWORTHY SPECIES

Chesapeake & Ohio Canal National Historical Park: Vulnerable Plants: *Solidago arguta* var. *harrisii* (Harris' goldenrod, G5T4, MD S3 state-vulnerable)

Vulnerable Plants: *Allium oxyphilum* (lillydale onion, G2), *Arabis serotina* (shale barren rockcress, G2), *Buckleya distichophylla* (piratebush, G3), *Clematis coactilis* (Virginia whitehair leather flower, G3), *Clematis viticaulis* (Millboro leather flower, G1), *Melica nitens* (threeflower melicgrass, G5, state-rare), *Monarda fistulosa* var. *brevis* (wild bergamot, G5T1T2), *Oligoneuron rigidum* var. *rigidum* (stiff goldenrod, G5T5, state-rare), *Solidago arguta* var. *harrisii* (Harris' goldenrod, G5T4, WV state rare), *Taenidia montana* (mountain pimpernel, G3), *Trifolium virginicum* (Kates Mountain clover, G3, endemic or near-endemic shale barren plant); **Invasive/Exotic Plants**: *Arenaria serpyllifolia* (thymeleaf sandwort);

CLASSIFICATION

Chesapeake & Ohio Canal National Historical Park: Shale Barren Woodland Map Class (COMP_SBWO) includes four associations at this park, Central Appalachian Circumneutral Barrens (CEGL006037), North-Central Appalachian Acidic Shale Woodland (CEGL006288), Central Appalachian Xeric Shale Woodland (Virginia Pine / Sparse Herbs Type) (CEGL008525), and Central Appalachian Xeric Shale Woodland (Chestnut Oak / Mixed Herbs Type) (CEGL008526).

DISTRIBUTION

Chesapeake & Ohio Canal National Historical Park Range: The Shale Barren Woodland (COMP_SBWO) is mapped on dry slopes along the Chesapeake & Ohio Canal at many locations in the Ridge and Valley (Canal mile 137–173).

NCR Parks: NPS (C&O Canal)

[COMP_SMDF] Successional Mixed Deciduous Forest

CONCEPT

Summary: This type, Successional Mixed Deciduous Forest Map Class (COMP_SMDF), is a conceptual placeholder, designed only to act as a provisional type for vegetation complexes, ruderal or early-successional vegetation, and other types that cannot be reliably classified. It is created to facilitate regularized local land unit mapping of a managed area and to provide a standard label for polygons in a vegetation map. It is a diverse map class representing upland early successional deciduous forests of highly variable composition, including stands dominated by invasive or weedy native species. In the National Capital Region, this may include some or all of these associations, Northeastern Ruderal Hardwood Forest (CEGL006599), Ruderal Tree-of-Heaven Forest (CEGL007191), Ruderal Black Locust Forest (CEGL007279), and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to undescribed ruderal vegetation. In special cases, one of the associations included here may have been mapped separately (see Element Distribution notes for Ruderal Tree-of-Heaven Forest (CEGL007191) at CHOH). The Successional Mixed Deciduous Forest Map Class is mapped at the following NCR parks: Antietam National Battlefield (ANTI), Catoctin Mountain Park (CATO), Chesapeake & Ohio Canal National Historical Park (CHOH), George Washington Memorial Parkway (GWMP), Harpers Ferry National Historical Park (HAFE), Manassas National Battlefield Park (MANA), Monocacy National Battlefield (MONO), National Capital Parks-East (NACE), Rock Creek Park (ROCR), and Wolf Trap National Park for the Performing Arts (WOTR).

VEGETATION DESCRIPTION

National Capital Parks-East Vegetation: This is a generic map class consisting of any disturbed, early-successional forest dominated by a mixture of deciduous and evergreen trees. The canopy is highly variable among stands and may include *Fraxinus americana* (which may dominate some examples), *Acer rubrum, Acer saccharinum, Fagus grandifolia, Fraxinus pennsylvanica, Quercus alba, Quercus coccinea, Quercus falcata, Quercus montana (= Quercus prinus), Quercus rubra, Robinia pseudoacacia*, and *Ulmus rubra*. The subcanopy and shrub strata may include *Asimina triloba* (which may dominate some examples), *Ailanthus altissima, Carya cordiformis, Cercis canadensis var. canadensis, Fraxinus pennsylvanica, Ilex opaca var. opaca, Liquidambar styraciflua, Liriodendron tulipifera, Morus rubra, Prunus serotina var. serotina, Quercus alba*, and *Ulmus americana*. Vines may include *Campsis radicans, Lonicera japonica, Parthenocissus quinquefolia, Smilax* sp., and *Toxicodendron radicans*. Some herbs that may occur in examples include *Bidens bipinnata, Carex* sp., *Danthonia spicata, Elymus hystrix var. hystrix, Elymus virginicus, Oxalis* sp., *Polystichum acrostichoides*, and the exotics *Microstegium vimineum* and *Polygonum cespitosum var. longisetum*.

CLASSIFICATION

Antietam National Battlefield Classification Comments: Mapped areas of Successional Mixed Deciduous Forest Map Class (COMP_SMDF) at ANTI include examples of three associations, Ruderal Tree-of-Heaven Forest (CEGL007191), Ruderal Black Locust Forest (CEGL007279), and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to undescribed ruderal vegetation.

Catoctin Mountain Park Classification Comments: Successional Mixed Deciduous Forest Map Class (COMP_SDMF) at CATO includes two associations, Northeastern Ruderal Hardwood Forest (CEGL006599) and Ruderal Black Locust Forest (CEGL007279), in addition to undescribed ruderal vegetation.

Chesapeake & Ohio Canal National Historic Park Classification Comments: Successional Mixed Deciduous Forest Map Class (COMP_SDMF) at CHOH includes four associations, Northeastern Ruderal Hardwood Forest (CEGL006599), Ruderal Tree-of-Heaven Forest (CEGL007191), Ruderal Black Locust Forest (CEGL007279), and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to undescribed ruderal vegetation.

George Washington Memorial Parkway Classification Comments: Successional Mixed Deciduous Forest Map Class (COMP_SDMF) at GWMP includes only one described association, Northeastern Ruderal Hardwood Forest (CEGL006599), in addition to undescribed ruderal vegetation.

Harpers Ferry National Historical Park Classification Comments: Successional Mixed Deciduous Forest Map Class (COMP_SMDF) at HAFE includes one described association, Northeastern Ruderal Hardwood Forest (CEGL006599), in addition to undescribed ruderal vegetation.

National Capital Parks-East Classification Comments: Mapped areas of Successional Mixed Deciduous Forest Map Class (COMP_SMDF) at NACE include examples of Northeastern Ruderal Hardwood Forest (CEGL006599) and Ruderal Black Locust Forest (CEGL007279), but other successional deciduous forests may also be included.

Manassas National Battlefield Park Classification Comments: Successional Mixed Deciduous Forest Map Class (COMP_SMDF) at MANA includes one described association, Northeastern Ruderal Hardwood Forest (CEGL006599), in addition to undescribed ruderal vegetation.
Monocacy National Battlefield Classification Comments: Successional Mixed Deciduous Forest Map Class (COMP_SDMF) at MONO includes two associations, Northeastern Ruderal Hardwood Forest (CEGL006599) and Ruderal Black Locust Calcareous Forest (CEGL007281), in addition to undescribed ruderal vegetation.
Rock Creek Park Classification Comments: The Successional Mixed Deciduous Forest Map Class (COMP_SMDF) at ROCR includes Northeastern Ruderal Hardwood Forest (CEGL006599), in addition to undescribed ruderal vegetation.
Wolf Trap National Park for the Performing Arts Classification Comments: Successional Mixed Deciduous Forest Map Class (COMP_SMDF) at WOTR includes one described association, Northeastern Ruderal Hardwood Forest (CEGL006599), in addition to undescribed ruderal vegetation.

DISTRIBUTION

Antietam National Battlefield Range: Successional Mixed Deciduous Forest Map Class (COMP_SMDF) is mapped across the park, occurring as narrow fenceline strips or small polygons throughout, and in a few scattered larger polygons, the largest being in the southern part.
Catoctin Mountain Park Range: Successional Mixed Deciduous Forest is documented in many locations scattered throughout Catoctin Mountain Park.
Chesapeake & Ohio Canal National Historic Park Range: Successional Mixed Deciduous Forest Map Class (COMP_SMDF) is mapped the length of the C&O Canal.
George Washington Memorial Parkway Range: Successional Mixed Deciduous Forest Map Class (COMP_SMDF) is mapped heavily from one end of the park to the other along the narrow stretches of land that line the parkway and the Mount Vernon Trail. It is mostly excluded from the broader expanses of Great Falls Park, Dyke Marsh, and the riverside portion of Turkey Run.
Harpers Ferry National Historical Park Range: Successional Mixed Deciduous Forest Map Class (COMP_SMDF) is mapped across the park, occurring in larger polygons in the eastern part, and as smaller patches or narrow fenceline strips in the more developed western part.
National Capital Parks-East Range: Successional Mixed Deciduous Forest Map Class (COMP_SMDF) has been documented or mapped at NACE in the central area and at Fort Foote, Fort Washington, Greenbelt, Harmony Hall, Oxon Hill Farm, Piscataway, and Shepherd Parkway.
Manassas National Battlefield Park Range: Successional Mixed Deciduous Forest Map Class (COMP_SMDF) is mapped throughout the park in large woody patches in a sort of matrix with Ruderal Virginia Pine Forest (CEGL002591) as well as between some fields.
Monocacy National Battlefield Range: Successional Mixed Deciduous Forest Map Class (COMP_SMDF) is mapped throughout the park along roads and at the edges of fields, and in a couple of larger patches.
Rock Creek Park Range: Successional Mixed Deciduous Forest Map Class (COMP_SMDF) is mapped across the park lands that ROCR administers and is especially predominant along the Rock Creek & Potomac Parkway, along the Potomac Palisades Parkway (near the Potomac waterfont), and in and around Fort Totten.
Wolf Trap National Park for the Performing Arts Range: There are three mapped polygons of Successional Mixed Deciduous Forest Map Class (COMP_SMDF) at WOTR, two near a parking lot or roadway, and one long polygon on the hills near the east side of the park. It marks the transition between more natural deciduous communities, and a successional Virginia pine forest that borders a neighborhood to its east.
NCR Parks: NPS (Antietam, C&O Canal, Catoctin Mountain, George Washington Parkway, Harpers Ferry, Jean Lafitte, Manassas, Monocacy, Natchez Trace, National Capital-East, Rock Creek, Wolf Trap)

[COMP_SUME] Successional Meadow / Grassland

CONCEPT

Summary: This type, Successional Meadow / Grassland Map Class (COMP_SUME), is a conceptual placeholder, designed only to act as a provisional type for vegetation complexes, ruderal or early-successional vegetation, and other types that cannot be reliably classified. It is created to facilitate regularized local land unit mapping of a managed area and to provide a standard label for polygons in a vegetation map. It includes successional upland herbaceous communities typically occurring on abandoned agricultural fields or in powerline rights-of-way where the invasion of woody species is curtailed by occasional mowing or other management practices. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become

forested. Successional meadows often include some invasion by woody shrubs and vines, but these comprise less than 20% of the total cover. The Successional Meadow / Grassland Map Class does not include grasslands actively maintained for agricultural or scenic/cultural purposes, nor does it include herbaceous or wooded herbaceous communities naturally occurring on rock outcrops. It is the successional stage preceding Successional Vine-Shrubland Map Class (COMP_VISH). Successional Meadow / Grassland Map Class (COMP_SUME) is mapped at the following NCR parks: Antietam National Battlefield, Catoctin Mountain Park, Chesapeake & Ohio Canal National Historic Park, George Washington Memorial Parkway, Harpers Ferry National Historical Park, Manassas National Battlefield Park, Monocacy National Battlefield, National Capital Parks-East, and Prince William Forest Park.

ENVIRONMENTAL DESCRIPTION

Antietam National Battlefield Environment: The Successional Meadow / Grassland Map Class (COMP_SUME) represents herbaceous vegetation associated with pastures, meadows and former agricultural fields where the growth of woody species is curtailed by occasional mowing or other management practices. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested.

Catoctin Mountain Park Environment: The Successional Meadow / Grassland Map Class (COMP_SUME) represents successional or maintained upland herbaceous vegetation associated with road and utility corridors, and other openings in the forest canopy where the regrowth of woody species is curtailed by occasional mowing or other management practices. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested.

Chesapeake & Ohio Canal National Historic Park Environment: The Successional Meadow / Grassland Map Class (COMP_SUME) represents successional upland herbaceous communities typically occurring on abandoned agricultural fields or in powerline rights-of-way where the growth of woody species is curtailed by occasional mowing or other management practices. This map class does not include grasslands actively maintained for agricultural or scenic/cultural purposes, nor does it include herbaceous or wooded herbaceous communities naturally occurring on rock outcrops. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested.

George Washington Memorial Parkway Environment: The Successional Meadow / Grassland Map Class (COMP_SUME) occurs on upland sites in powerline rights-of-way. These habitats are ecologically dynamic and, in many cases, are held in a state of successional flux by periodic powerline maintenance. Site moisture regime varies from dry to mesic. Soils are generally silt loams of low to moderate fertility. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested.

Harpers Ferry National Historical Park Environment: The Successional Meadow / Grassland Map Class (COMP_SUME) includes old fields and other disturbed clearings that are dominated by graminoids. Woody scrub and/or small tree saplings are also usually present in varying densities. Sites are typically unmaintained areas (not mowed) that were previously used for agriculture or cleared for other uses. The type also includes powerline rights-of-way and clearings near railroads. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested.

Manassas National Battlefield Park Environment: The Successional Meadow / Grassland Map Class (COMP_SUME) includes graminoid-dominated old fields and grasslands with woody scrub and/or small tree saplings in varying densities. Sites are typically unmaintained areas (not mowed) that were previously used for agriculture or cleared for other uses. This type also includes powerline rights-of-way and savanna-like areas with widely spaced, open-grown trees. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested.

Monocacy National Battlefield Environment: The Successional Meadow / Grassland Map Class (COMP_SUME) represents successional or maintained upland herbaceous vegetation associated with former pastures and agricultural fields, road and utility corridors, and other openings in the forest canopy where the growth of woody species is curtailed by occasional mowing or other management practices. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested.

National Capital Parks-East Environment: The Successional Meadow / Grassland Map Class (COMP_SUME) represents successional or maintained upland herbaceous vegetation associated with former pastures and agricultural fields, road and utility corridors, and other openings in the forest canopy where the growth of woody species is curtailed by occasional mowing or other management practices. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested.

Prince William Forest Park Environment: The Successional Meadow / Grassland Map Class (COMP_SUME) represents successional or maintained upland herbaceous vegetation associated with former pastures and agricultural

fields, road and utility corridors, and other openings in the forest canopy where the growth of woody species is curtailed by occasional mowing or other management practices. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested.

VEGETATION DESCRIPTION

Antietam National Battlefield Vegetation: Vegetation is dominated by a mixture of grasses, *Solidago* spp., and forbs.

Catoctin Mountain Park Vegetation: The Successional Meadow / Grassland (COMP_SUME) map class represents successional or maintained upland herbaceous vegetation comprised of native and non-native early successional herbaceous species and those that withstand period mowing or other management practices intended to keep the area open by preventing the establishment and growth of trees. **Chesapeake & Ohio Canal National Historic Park Vegetation:** The Successional Meadow / Grassland (COMP_SUME) map class represents successional upland herbaceous communities typically occurring on abandoned agricultural fields or in powerline rights-of-way where the invasion of woody species is curtailed by occasional mowing or other management practices. Successional meadows often include some invasion by woody shrubs and vines, but these comprise less than 20% of total cover. This map class does not include grasslands actively maintained for agricultural or scenic/cultural purposes, nor does it include herbaceous or wooded herbaceous communities naturally occurring on rock outcrops. This is the successional stage preceding COMP_VISH (successional vine-shrubland).

George Washington Memorial Parkway Vegetation: Herbaceous vegetation predominates and woody plants contribute less than 30% cover to the stand. However, low woody species are usually well-established, at least in patches. The herbaceous flora may include a wide variety of weedy, light-demanding natives and exotics, including (but not limited to) *Andropogon virginicus, Schedonorus pratensis (= Festuca pratensis), Tridens flavus, Solidago* spp., *Eupatorium* spp., *Lespedeza* spp., and *Desmodium* spp. Woody plants include tree saplings from the adjacent forests and thickets or tangles of *Rubus* spp., *Lonicera japonica, Rosa multiflora*, and *Smilax rotundifolia*.

Harpers Ferry National Historical Park Vegetation: The Successional Meadow / Grassland Map Class contains a mixture of aggressive, light-demanding scrub and/or small forest-tree saplings, grasses and forbs. The dominant woody scrub species include *Rhus* spp., *Robinia pseudoacacia*, and *Rubus* spp. The forest-tree saplings include common shade-intolerant species such as *Liriodendron tulipifera, Juniperus virginiana var. virginiana, Juglans nigra, Acer rubrum*, and *Prunus serotina*. Woody vines, such as *Toxicodendron radicans* and *Vitis* spp., are also quite common. The amount of woody cover varies depending on time since abandonment and current, if any, management (i.e., powerline rights-of-way). Fields tend to be dense stands of forbs and sod-forming grasses usually present under, or forming mosaics with, the woody species. Common forbs and grasses include *Apocynum cannabinum, Andropogon virginicus, Cichorium intybus, Cirsium arvense, Panicum anceps, Daucus carota, Dipsacus fullonum (= Dipsacus sylvestris), Schedonorus arundinaceus (= Festuca arundinacea), Melilotus officinalis (= Melilotus albus), Phytolacca americana, Solidago altissima, Danthonia spicata, Trifolium pratense*, and *Verbesina occidentalis*.

Manassas National Battlefield Park Vegetation: The Successional Meadow / Grassland Map Class includes a mix of aggressive, light-demanding scrub and/or small forest-tree saplings and warm-season or cool-season grasses. The dominant woody scrub species include *Rhus* spp., *Robinia pseudoacacia*, and *Rubus* spp. The forest-tree saplings include common shade-intolerant species such as *Liriodendron tulipifera, Juniperus virginiana var. virginiana, Juglans nigra, Acer rubrum*, and *Prunus serotina*. The amount of woody cover varies depending on time since abandonment and current, if any, management (i.e., powerline rights-of-way). Fields tend to be dense stands of warm-season or cool-season, sod-forming grasses usually present under, or forming mosaics with, the woody species. Common warm-season grasses include *Andropogon gerardii, Andropogon virginicus, Eragrostis spectabilis, Panicum anceps, Panicum virgatum, Schizachyrium scoparium, Sorghastrum nutans, Tridens flavus*, and *Tripsacum dactyloides*. Cool-season grasses include the native grasses *Agrostis hyemalis, Danthonia spicata*, and *Poa pratensis*, as well as the exotic grasses *Agrostis stolonifera, Anthoxanthum odoratum, Dactylis glomerata, Schedonorus arundinaceus (= Lolium arundinaceum), Schedonorus pratensis (= Lolium pratense)*, and *Phleum pratense*.

Monocacy National Battlefield Vegetation: The Successional Meadow / Grassland (COMP_SUME) map class represents successional or maintained upland herbaceous vegetation comprised of native and non-native early successional herbaceous species and those that withstand period mowing or other management practices intended to keep the area open by preventing the establishment and growth of trees.

National Capital Parks-East Vegetation: This is a generic map class consisting of any abandoned field where natural succession is progressing, weedy herbaceous species have invaded, and some woody species have begun to colonize, but cover of woody vegetation is less than 30%. One area at NACE identified as a Successional Meadow /

Grassland Map Class contains *Achillea millefolium, Apocynum cannabinum, Asclepias syriaca, Liquidambar styraciflua, Panicum anceps, Paspalum laeve, Solanum carolinense*, and *Tridens flavus*.
Prince William Forest Park Vegetation: The Successional Meadow / Grassland (COMP_SUME) map class represents successional or maintained upland herbaceous vegetation comprised of native and non-native early successional herbaceous species and those that withstand period mowing or other management practices intended to keep the area open by preventing the establishment and growth of trees.

CHARACTERISTIC SPECIES

George Washington Memorial Parkway: *Andropogon virginicus*, *Desmodium paniculatum*, *Lespedeza procumbens*, *Lonicera japonica*, *Rubus argutus*, *Schedonorus pratensis*, *Solidago altissima*
Harpers Ferry National Historical Park: *Apocynum cannabinum*, *Juniperus virginiana* var. *virginiana*, *Panicum anceps*, *Robinia pseudoacacia*
Manassas National Battlefield Park: *Andropogon virginicus*, *Juniperus virginiana* var. *virginiana*, *Liriodendron tulipifera*, *Panicum anceps*, *Robinia pseudoacacia*

OTHER NOTEWORTHY SPECIES

George Washington Memorial Parkway: Invasive/Exotic Plants: *Lonicera japonica* (High/Medium), *Schedonorus pratensis* (High/Low)
Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Daucus carota* (Low), *Dipsacus fullonum* (Medium/Low), *Melilotus officinalis* (Medium/Low), *Schedonorus arundinaceus* (High/Medium)
Manassas National Battlefield Park: Invasive/Exotic Plants: *Agrostis stolonifera* (Medium/Low), *Anthoxanthum odoratum*, *Dactylis glomerata* (Medium/Insignificant), *Phleum pratense* (Medium), *Schedonorus arundinaceus* (High/Medium), *Schedonorus pratensis* (High/Low)

CLASSIFICATION

Antietam National Battlefield Classification Comments: The Successional Meadow / Grassland (COMP_SUME) includes successional upland herbaceous communities typically occurring on abandoned agricultural fields or in powerline rights-of-way where the invasion of woody species is curtailed by occasional mowing or other management practices. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested. Successional meadows often include some invasion by woody shrubs and vines, but these comprise less than 20% of the total cover.
Catoctin Mountain Park Classification Comments: The Successional Meadow / Grassland (COMP_SUME) includes successional upland herbaceous communities typically occurring on abandoned agricultural fields or in powerline rights-of-way where the invasion of woody species is curtailed by occasional mowing or other management practices. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested. Successional meadows often include some invasion by woody shrubs and vines, but these comprise less than 20% of the total cover.
Chesapeake & Ohio Canal National Historic Park Classification Comments: The Successional Meadow / Grassland (COMP_SUME) includes successional upland herbaceous communities typically occurring on abandoned agricultural fields or in powerline rights-of-way where the invasion of woody species is curtailed by occasional mowing or other management practices. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested. Successional meadows often include some invasion by woody shrubs and vines, but these comprise less than 20% of the total cover.
George Washington Memorial Parkway Classification Comments: This map class can be identified by its powerline habitat alone.
Harpers Ferry National Historical Park Classification Comments: Successional Meadow / Grassland Map Class is distinguished from other upland vegetation in the park by its development in non-natural settings, such as recently cleared areas or maintained open areas (such as powerline rights-of-way and railroad buffers). The woody species present in Successional Meadow / Grassland Map Class can be similar to vegetation classified as natural woodlands, (i.e., *Juniperus virginiana var. virginiana*), but this map class is distinguished based on its location in disturbed and/or maintained areas.
Manassas National Battlefield Park Classification Comments: The graminoid species present in Successional Meadow / Grassland Map Class are similar to vegetation classified as Pasture / Hay. The type is distinguished by having unmaintained meadows no longer used for agriculture and by having shrub and/or small forest-tree saplings growing throughout the meadows in varying densities.
Monocacy National Battlefield Classification Comments: The Successional Meadow / Grassland Map Class (COMP_SUME) is distinguished by its occurrence in areas with past disturbance or agricultural use.

National Capital Parks-East Classification Comments: The Successional Meadow / Grassland Map Class (COMP_SUME) is scattered throughout NACE, with larger areas documented or mapped at Kenilworth, Oxon Hill Farm and Piscataway.
Prince William Forest Park Classification Comments: The Successional Meadow / Grassland (COMP_SUME) includes successional upland herbaceous communities typically occurring on abandoned agricultural fields or in powerline rights-of-way where the invasion of woody species is curtailed by occasional mowing or other management practices. It may also represent herbaceous areas in an early successional state that are not maintained and will eventually become forested. Successional meadows often include some invasion by woody shrubs and vines, but these comprise less than 20% of the total cover.

DISTRIBUTION

Antietam National Battlefield Range: The Successional Meadow / Grassland Map Class (COMP_SUME) is scattered throughout the park in large and small patches, most commonly beside agricultural fields that are more regularly maintained.
Catoctin Mountain Park Range: Successional Meadow / Grassland is documented at four locations in the park where it is limited to small openings or along road or utility rights of way.
Chesapeake & Ohio Canal National Historical Park Range: The Successional Meadow / Grassland Map Class (COMP_SUME) occurs the length of the Chesapeake & Ohio Canal, but is most commonly mapped in the Hagerstown Valley (Canal mile 69 – 112).
George Washington Memorial Parkway Range: In the Potomac Gorge section of George Washington Memorial Parkway, this map class is known only from a powerline south of the parkway in the southern part of Turkey Run Park.
Harpers Ferry National Historical Park Range: The Successional Meadow / Grassland Map Class (COMP_SUME) occurs in scattered patches throughout the park in areas with recent disturbance or industrial use (powerlines or railroads). The largest concentration of the type is in the western end of the park, surrounding more developed areas.
Manassas National Battlefield Park Range: The Successional Meadow / Grassland Map Class (COMP_SUME) occurs in scattered patches throughout the park in areas with past disturbance or agricultural use. The largest concentration of the type is in the western end of the park, southwest of Stony Ridge.
Monocacy National Battlefield Range: The Successional Meadow / Grassland Map Class (COMP_SUME) occurs in scattered linear patches between agricultural fields and Monocacy River, and elsewhere in areas with past disturbance or agricultural use.
National Capital Parks-East Range: The Successional Meadow / Grassland Map Class (COMP_SUME) is widespread and scattered throughout National Capital Parks-East, with the largest area documented or mapped at Kenilworth, Oxon Hill Farm, and Piscataway.
Prince William Forest Park Range: The Successional Meadow / Grassland Map Class (COMP_SUME) occurs in scattered patches throughout the park and along powerlines near the peripheries of the park.
NCR Parks: NPS (Antietam, C&O Canal, Catoctin Mountain, George Washington Parkway, Harpers Ferry, Manassas, Monocacy, National Capital-East, Prince William)

[COMP_VISH] Successional Vine-Shrubland

CONCEPT

Summary: This type, Successional Vine-Shrubland Map Class (COMP_VISH), is a conceptual placeholder, designed only to act as a provisional type for vegetation complexes, ruderal or early-successional vegetation, and other types that cannot be reliably classified. It is created to facilitate regularized local land unit mapping of a managed area and to provide a standard label for polygons in a vegetation map. It represents successional uplands dominated by a variable mix of native and exotic shrubs, vines, and/or young saplings, often intermixed with successional old-field forbs and grasses; any saplings present do not appear to be planted but are randomly distributed. Vines may smother remaining trees. Standing dead and dying trees are often present and vegetation in the understory can range from sparse to dense but usually includes at least a few scrambling vines and/or shrubs. COMP_VISH usually occurs in abandoned fields or clearings, utility rights-of-way, small blow-down gaps within upland forests, forest edges, field edges, and roadsides. This is the successional stage following the successional herbaceous vegetation represented by the Successional Meadow / Grassland Map Class (COMP_SUME). It may include the described associations Ruderal Kudzu Vineland (CEGL003882) and possibly Ruderal Chinese Wisteria Vineland (CEGL008568), as well as undescribed vegetation types. It is mapped at the following NCR parks:

Antietam National Battlefield (ANTI), Catoctin Mountain Park (CATO), Chesapeake & Ohio Canal National Historical Park (CHOH), George Washington Memorial Parkway (GWMP), Harpers Ferry National Historical Park (HAFE), Manassas National Battlefield Park (MANA), Monocacy National Battlefield (MONO), National Capital Parks-East (NACE), Prince William Forest Park (PRWI), and Rock Creek Park (ROCR).

ENVIRONMENTAL DESCRIPTION

Antietam National Battlefield Environment: The Successional Vine-Shrubland Map Class represents terrestrial vegetation occurring in former agricultural areas, old pastures and fallow fields.

Catoctin Mountain Park Environment: The Successional Vine-Shrubland Map Class typically occurs on abandoned agricultural fields, powerline rights-of-way, or canopy gaps resulting from windthrow and other disturbance.

Chesapeake & Ohio Canal National Historic Park Environment: The Successional Vine-Shrubland Map Class typically occurs on abandoned agricultural fields, powerline rights-of-way, or canopy gaps resulting from windthrow and other disturbance.

George Washington Memorial Parkway Environment: The Successional Vine-Shrubland Map Class occupies severely disturbed areas on old building sites, quarries, fill, and steep clearings, particularly embankments below parkway overlooks. Sites vary from gentle to steep and rocky, and many have had their original soil cover altered or removed.

Harpers Ferry National Historical Park Environment: The Successional Vine-Shrubland Map Class occupies severely disturbed areas on old building sites, quarries, and steep clearings. Sites conditions vary from gentle slopes to steep and rocky, but all sites have had their original soil cover altered or removed.

National Capital Parks-East Environment: This generic map class consisting of shrub- or shrub-and-vine-dominated successional vegetation does not have fidelity to any particular habitat or environment.

Prince William Forest Park Environment: The Successional Vine-Shrubland Map Class occupies an old clearing or homesite area along the loop road in the eastern part of the park.

Rock Creek Park Environment: The Successional Vine-Shrubland Map Class occupies severely disturbed sites, including old clearings, quarries, or fill. Sites vary, and many are along trails or at the interface between natural and developed areas.

VEGETATION DESCRIPTION

Antietam National Battlefield Vegetation: In the Successional Vine-Shrubland Map Class (COMP_VISH), vegetation is dominated by clumps or thickets of shrubs with old-field grasses and forbs in the intervening areas. Vines may be abundant in all strata.

Catoctin Mountain Park Environment: The Successional Vine-Shrubland Map Class represents successional upland vegetation dominated by shrubs and/or vines. It is the successional stage succeeding the herbaceous stage represented by Successional Meadow / Grassland Map Class (COMP_SUME).

Chesapeake & Ohio Canal National Historic Park Vegetation: The Successional Vine-Shrubland Map Class represents successional upland vegetation dominated by shrubs and/or vines. It is the successional stage succeeding the herbaceous stage represented by Successional Meadow / Grassland Map Class (COMP_SUME).

George Washington Memorial Parkway Vegetation: Vegetation is exceedingly dense and dominated by vine tangles and shrubs of highly variable composition. Vines are most characteristic and include the exotics *Ampelopsis brevipedunculata, Celastrus orbiculatus, Hedera helix, Lonicera japonica, Polygonum perfoliatum, Pueraria montana var. lobata (= Pueraria lobata)*, and *Wisteria sinensis*, as well as native species such as *Parthenocissus quinquefolia, Smilax* spp., *Toxicodendron radicans*, and *Vitis* spp. Shrubs are typically exotics and may include *Lonicera maackii, Lonicera morrowii, Ligustrum* spp., *Albizia julibrissin, Rosa multiflora*, and *Rubus phoenicolasius*. Various tree saplings, as well as scattered full-sized trees (usually covered in vines), may also be present. The herbaceous flora may be entirely absent because of dense vine cover or may be represented by any of number of weedy, native or exotic species. This dense regeneration of viney vegetation follows catastrophic site disturbances. Local composition may be quite dynamic over short time periods. Sites where most of the vines have been killed by herbicides are characterized by dense tangles of dead vines.

Harpers Ferry National Historical Park Vegetation: Vegetation is exceedingly dense and dominated by vine tangles and shrubs of highly variable composition. Vines are most characteristic and include the exotics *Ampelopsis brevipedunculata, Celastrus orbiculatus, Hedera helix, Lonicera japonica, Polygonum perfoliatum*, and *Wisteria sinensis*, as well as native species such as *Parthenocissus quinquefolia, Smilax* spp., *Toxicodendron radicans*, and *Vitis* spp. Shrubs are typically exotics and may include *Lonicera maackii, Lonicera morrowii, Ligustrum* spp., *Albizia julibrissin, Rosa multiflora*, and *Rubus phoenicolasius*. Various tree saplings, as well as scattered full-sized trees (usually covered in vines) may also be present. The herbaceous flora may be entirely absent because of dense

vine cover, or may be represented by any of numerous weedy, native or exotic species. Some polygons on Loudoun Heights are entirely dominated by *Polygonum perfoliatum*.

National Capital Parks-East Vegetation: This is a generic map class consisting of any shrub- or shrub-and-vine-dominated successional community. It may occur as a mixture of species, or as a monoculture of invasive vine species such as *Pueraria montana var. lobata* (CEGL003882) or *Wisteria sinensis* (CEGL008568). Vines in examples of this mixed successional vine-shrubland at NACE may include *Ampelopsis brevipedunculata, Clematis terniflora, Lonicera japonica*, and *Vitis vulpina*. An open subcanopy may contain *Acer negundo, Liquidambar styraciflua, Prunus serotina var. serotina*, and scattered examples of other successional trees. Some examples contain the tall herb *Phytolacca americana*. In addition, *Galium obtusum* and *Rubus* sp. may be present. In contrast to this, some examples are monospecific patches of *Pueraria montana var. lobata*.

Prince William Forest Park Vegetation: Vegetation consists of scattered full-sized trees and shrubby regeneration of *Liquidambar styraciflua* and *Acer rubrum*, much of which is covered by dense vine tangles of *Smilax rotundifolia*.

Rock Creek Park Vegetation: Vegetation is dense and dominated by vine tangles and shrubs of highly variable composition. Vines are most characteristic and include the exotics *Lonicera japonica, Celastrus orbiculatus, Ampelopsis brevipedunculata, Hedera helix, Polygonum perfoliatum, Pueraria montana var. lobata (= Pueraria lobata)*, *Vinca minor, Akebia quinata*, and *Wisteria sinensis*, as well as native species such as *Parthenocissus quinquefolia, Smilax* spp., *Toxicodendron radicans*, and *Vitis* spp. Shrubs are typically exotics and may include bush honeysuckles (*Lonicera* spp.)*, Ligustrum* spp., *Rubus phoenicolasius*, *Euonymus alatus*, *Rosa multiflora*, and *Albizia julibrissin*. Various tree saplings, as well as scattered full-sized trees (usually covered in vines), may also be present. Herbaceous flora may be entirely absent because of dense vine cover or may be represented by any of number of weedy, native or exotic species.

CHARACTERISTIC SPECIES

Antietam National Battlefield: Successional Vine Shrubland may be characterized by a variety of early successional vines, shrubs and trees, many of which may be non-native invasive species.

Catoctin Mountain Park: Successional Vine Shrubland may be characterized by a variety of early successional vines, shrubs and trees, many of which may be non-native invasive species.

George Washington Memorial Parkway: *Ampelopsis brevipedunculata*, *Celastrus orbiculatus*, *Clematis terniflora*, *Polygonum perfoliatum*, *Pueraria montana* var. *lobata*, *Wisteria sinensis*

Harpers Ferry National Historical Park: Successional Vine Shrubland may be characterized by a variety of early successional vines, shrubs and trees, many of which may be non-native invasive species.

National Capital Parks-East: Successional Vine Shrubland may be characterized by a variety of early successional vines, shrubs and trees, many of which may be non-native invasive species.

Prince William Forest Park: *Acer rubrum*, *Liquidambar styraciflua*, *Smilax rotundifolia*

Rock Creek Park: Successional Vine Shrubland may be characterized by a variety of early successional vines, shrubs and trees, many of which may be non-native invasive species.

OTHER NOTEWORTHY SPECIES

George Washington Memorial Parkway: Invasive/Exotic Plants: *Alliaria petiolata* (High/Medium), *Ampelopsis brevipedunculata* (Medium/Low), *Celastrus orbiculatus* (High/Medium), *Clematis terniflora*, *Glechoma hederacea* (Low), *Microstegium vimineum* (High/Medium), *Polygonum cespitosum* var. *longisetum*, *Polygonum perfoliatum* (Medium), *Pueraria montana* var. *lobata*, *Rosa multiflora* (Medium/Low), *Wisteria sinensis* (Medium)

Harpers Ferry National Historical Park: Invasive/Exotic Plants: *Ampelopsis brevipedunculata* (Medium/Low), *Celastrus orbiculatus* (High/Medium), *Polygonum perfoliatum* (Medium, = *Polygonum perfoliatum*), *Wisteria sinensis* (Medium)

CLASSIFICATION

Antietam National Battlefield Classification Comments: Successional Vine-Shrubland Map Class (COMP_VISH) includes vegetation in the successional stage succeeding COMP_SUME (successional meadow / grassland).

Catoctin Mountain Park Classification Comments: Successional Vine-Shrubland Map Class (COMP_VISH) includes vegetation in the successional stage succeeding COMP_SUME (successional meadow / grassland).

Chesapeake & Ohio Canal National Historical Park Classification Comments: Successional Vine-Shrubland Map Class (COMP_VISH) includes vegetation in the successional stage succeeding COMP_SUME (successional meadow / grassland). At this park it includes the described association Ruderal Kudzu Vineland (CEGL003882).

George Washington Memorial Parkway Classification Comments: Successional Vine-Shrubland Map Class (COMP_VISH) includes vegetation in the successional stage succeeding COMP_SUME (successional meadow / grassland).
Harpers Ferry National Historical Park Classification Comments: Successional Vine-Shrubland Map Class (COMP_VISH) includes vegetation in the successional stage succeeding COMP_SUME (successional meadow / grassland).
Manassas National Battlefield Park Classification Comments: Successional Vine-Shrubland Map Class (COMP_VISH) includes vegetation in the successional stage succeeding COMP_SUME (successional meadow / grassland).
Monocacy National Battlefield Classification Comments: Successional Vine-Shrubland Map Class (COMP_VISH) includes vegetation in the successional stage succeeding COMP_SUME (successional meadow / grassland).
National Capital Parks-East Classification Comments: Successional Vine-Shrubland Map Class (COMP_VISH) includes vegetation in the successional stage succeeding COMP_SUME (successional meadow / grassland).
Prince William Forest Park Classification Comments: Successional Vine-Shrubland Map Class (COMP_VISH) includes vegetation in the successional stage succeeding COMP_SUME (successional meadow / grassland).
Rock Creek Park Classification Comments: Successional Vine-Shrubland Map Class (COMP_VISH) includes vegetation in the successional stage succeeding COMP_SUME (successional meadow / grassland). It is also the successional stage that Managed Meadows would succeed to, left to themselves.

DISTRIBUTION

Antietam National Battlefield Range: Successional Vine-Shrubland Map Class is mapped in approximately 20 patches, with large patches concentrated in the south of the park.
Catoctin Mountain Park Range: Successional Vine-Shrubland Map Class is mapped in thirteen scattered and mostly small locations in the park.
Chesapeake & Ohio Canal National Historical Park Range: Successional Vine-Shrubland Map Class (COMP_VISH) is documented with six observation points and is mapped at many locations on the Chesapeake & Ohio Canal, as far downstream as Pennyfield (Canal mile 21).
George Washington Memorial Parkway Range: Successional Vine-Shrubland Map Class (COMP_VISH) occurs in widely scattered patches throughout George Washington Memorial Parkway.
Harpers Ferry National Historical Park Range: Successional Vine-Shrubland Map Class (COMP_VISH) is found in a few discrete patches near the more developed areas of the park, as well as on Loudoun Heights.
Manassas National Battlefield Park Range: Successional Vine-Shrubland Map Class (COMP_VISH) occurs in patches, most of which are concentrated in the western edge of the park.
Monocacy National Battlefield Range: Successional Vine-Shrubland Map Class (COMP_VISH) occupies several patches, some linear, along or near I-270 (Washington National Pike).
National Capital Parks-East Range: Successional Vine-Shrubland Map Class (COMP_VISH) has been documented or mapped at NACE in the central Area and at Oxon Hill Farm and Piscataway.
Prince William Forest Park Range: Successional Vine-Shrubland Map Class (COMP_VISH) is known only from one area in the Prince William Forest Park, along the loop road in the eastern part of the park.
Rock Creek Park Range: The Successional Vine-Shrubland Map Class (COMP_VISH) occupies severely disturbed sites, especially along Rock Creek Parkway (south of the National Zoo) and in areas peripheral to the park core, such as in Glover Archbold or the Fort Circle Parks.
NCR Parks: NPS (Antietam, C&O Canal, Catoctin Mountain, George Washington Parkway, Harpers Ferry, Manassas, Monocacy, National Capital-East, Prince William, Rock Creek)

[COMP_WOWE] Successional Woody Wetland

CONCEPT

Summary: The Successional Woody Wetland Map Class (COMP_WOWE) represents successional shrublands and woodlands of disturbed floodplains, seepage wetlands, and artificial impoundments (including impoundments due to beaver activity). Standing snags of dead or dying trees are often present. This type is a conceptual placeholder, designed only to act as a provisional type for vegetation complexes, ruderal or early-successional vegetation, and other types that cannot be reliably classified. It is created to facilitate regularized local land unit mapping of a managed area and to provide a standard label for polygons in a vegetation map. It includes successional, early to

moderately-aged shrublands, woodlands, and forests of floodplains or swamps with characteristics of past disturbance and succession, e.g., even-aged canopy, early successional species, signs of previous farming or other disturbances. Wooded stands may be dominated by *Acer negundo*, *Juglans nigra* or other wetland trees, or co-dominated by a mixture of early and late successional species such as *Salix nigra, Acer rubrum, Liriodendron tulipifera, Maclura pomifera*, *Gleditsia triacanthos, Acer saccharinum*. Other native floodplain trees like *Populus deltoides, Platanus occidentalis, Acer saccharinum, Ulmus americana*, and *Ulmus rubra* may be present but not in a natural mixture. Successional wet shrublands may include *Salix nigra, Populus deltoides, Cephalanthus occidentalis, Alnus serrulata, Cornus amomum* ssp. *amomum*, and/or young saplings of hydrophytic/alluvial trees; they may also include a large number of standing dead snags in the case of impounded wetlands or due to beaver activity, in which case signs of beaver activity (e.g., cut stumps) are often present. In the National Capital Region, this map class may include the associations Hazel Alder Shrub Swamp (CEGL005082), Northeastern Buttonbush Shrub Swamp (CEGL006069), small patches of Ruderal Box-elder Floodplain Forest (CEGL005033) and Ruderal Black Walnut Forest (CEGL007879), and unclassified successional shrublands and woodlands occurring in wetlands. It is mapped at the following NCR Parks: Catoctin Mountain Park (CATO), Chesapeake & Ohio Canal National Historical Park (CHOH), George Washington Memorial Parkway (GWMP), Harpers Ferry National Historical Park (HAFE), Manassas National Battlefield Park (MANA), National Capital Parks-East (NACE), and Prince William Forest Park (PRWI).

Environmental Description

Catoctin Mountain Park Environment: The Successional Woody Wetland Map Class (COMP_WOWE) occupies disturbed floodplains, seepage wetlands, and artificial impoundments.
Chesapeake & Ohio Canal National Historical Park Environment: The Successional Woody Wetland Map Class (COMP_WOWE) occupies disturbed floodplains, seepage wetlands, and artificial impoundments (including impoundments due to beaver activity).
George Washington Memorial Parkway Environment: The Successional Woody Wetland Map Class (COMP_WOWE) occupies artificial pond edges, disturbed wetlands surrounding various infrastructures (road, boardwalks, etc.), and formerly cleared small-stream floodplains currently in a state of young regeneration by water-tolerant woody species.
Harpers Ferry National Historical Park Environment: The Successional Woody Wetland Map Class (COMP_WOWE) occurs in floodplain sites along the main stem and a tributary of the Shenandoah River where beavers or other disturbance have modified the normal forest cover. These habitats are ecologically dynamic and, in many cases, are undergoing rapid successional changes following major disturbance. Hydrology varies from saturated to seasonally flooded. Soils may be sandy, silty or mucky.
Manassas National Battlefield Park Environment: The Successional Woody Wetland Map Class (COMP_WOWE) occupies disturbed floodplains, seepage wetlands, and artificial impoundments.
National Capital Parks-East Environment: The Successional Woody Wetland Map Class (COMP_WOWE) could occupy any wetland area that has been heavily disturbed.
Prince William Forest Park Environment: The Successional Woody Wetland Map Class (COMP_WOWE) occurs in floodplain sites where beavers have modified the normal forest cover, primarily along Quantico Creek and South Fork Quantico Creek. These habitats are ecologically dynamic and, in many cases, are undergoing rapid successional changes following catastrophic disturbance. Hydrology varies from saturated to seasonally flooded. Soils may be sandy, silty, or mucky.

Vegetation Description

Catoctin Mountain Park Vegetation: In the Successional Woody Wetland Map Class, woody vegetation has greater than 30% cover. Stands may be dominated by wetland trees or shrubs or co-dominated by a mixture of early and late successional species. Associated herbaceous vegetation varies by site conditions. Exotic shrubs, vines, and herbs may also be present in disturbed examples.
Chesapeake & Ohio Canal National Historical Park Vegetation: This map class includes shrublands, woodlands, and forests of variable composition. Stands may be dominated by *Acer negundo*, *Juglans nigra* or other wetland trees, or co-dominated by a mixture of early and late successional species such as *Salix nigra, Acer rubrum, Liriodendron tulipifera, Maclura pomifera*, *Gleditsia triacanthos, Acer saccharinum*. Other native floodplain trees like *Populus deltoides, Platanus occidentalis, Acer saccharinum, Ulmus americana*, and *Ulmus rubra* may be present but not in a natural mixture. Successional wet shrublands may include *Salix nigra, Populus deltoides, Cephalanthus occidentalis, Alnus serrulata, Cornus amomum* ssp. *amomum*, and/or young saplings of hydrophytic/alluvial trees; they may also include a large number of standing dead snags in the case of impounded wetlands or due to beaver activity, in which case signs of beaver activity (e.g., cut stumps) are often present.

George Washington Memorial Parkway Vegetation: In the Successional Woody Wetland Map Class, woody vegetation has >30% cover. Composition and physiognomy vary, but typically consist of shrublands or young, even-aged forests of weedy, hydrophytic trees. Trees are generally sapling or pole-sized, and stands are too young to exhibit stratification into canopy and understory layers. Characteristic species include *Salix nigra, Acer rubrum, Betula nigra, Fraxinus pennsylvanica, Ulmus americana, Alnus serrulata*, and *Cephalanthus occidentalis*. Associated herbaceous species are highly variable.
Harpers Ferry National Historical Park Vegetation: In the Successional Woody Wetland Map Class, woody vegetation contributes more than 30% cover to the stand and is highly variable, ranging from scattered full-sized trees to dense saplings/coppice to shrub and vine thickets, or combinations of these expressions. Early-successional trees, including *Betula nigra, Acer rubrum*, and *Salix nigra*, are common. Characteristic shrubs include *Alnus serrulata, Cephalanthus occidentalis, Lindera benzoin, Lyonia ligustrina var. ligustrina*, and *Viburnum dentatum*. Dense, extensive tangles of *Smilax rotundifolia* are common in some areas. Associated herbaceous vegetation varies by site conditions and can include species of relatively well-drained soils, e.g., *Thelypteris noveboracensis*, as well as more hydrophytic species such as *Carex lurida, Carex scoparia, Juncus effusus*, and *Leersia oryzoides*. Invasive exotics, especially *Arthraxon hispidus* and *Microstegium vimineum*, are common.
Manassas National Battlefield Park Vegetation: In the Successional Woody Wetland Map Class, woody vegetation has greater than 30% cover. Stands may be dominated by wetland trees or shrubs or co-dominated by a mixture of early and late successional species. Associated herbaceous vegetation varies by site conditions. Exotic shrubs, vines, and herbs may also be present in disturbed examples.
National Capital Parks-East Vegetation: The Successional Woody Wetland Map Class consists of heavily disturbed wetlands with greater than 30% woody cover, including beaver wetlands and Northeastern Buttonbush Shrub Swamp (CEGL006069), which is dominated by *Cephalanthus occidentalis*, as well as possibly other types. The shrub stratum is predominant and includes *Cephalanthus occidentalis* (which may dominate), *Acer rubrum, Cornus amomum, Fraxinus pennsylvanica, Rosa palustris, Salix nigra*, and *Vaccinium corymbosum*. Some stands may contain scattered *Acer saccharinum*. Vines may be present, including *Smilax rotundifolia, Toxicodendron radicans*, and *Clematis* sp. Herbs may include *Apios americana, Boehmeria cylindrica, Carex* sp., *Helenium autumnale, Hibiscus moscheutos (= ssp. moscheutos), Impatiens capensis, Iris* sp., *Juncus* sp., *Lobelia cardinalis, Mimulus alatus, Peltandra virginica, Polygonum arifolium, Sagittaria latifolia, Saururus cernuus*, and *Symphyotrichum lateriflorum var. horizontale*. Many exotic shrubs, vines, and herbs may also be present in disturbed examples, including *Mikania scandens* and *Murdannia keisak*.
Prince William Forest Park Vegetation: In the Successional Woody Wetland Map Class, woody vegetation contributes more than 30% cover to the stand and is highly variable, ranging from scattered full-sized trees to dense sapling/coppice trees to shrub and vine thickets, or combinations of these expressions. Early-successional trees, including *Betula nigra, Acer rubrum*, and *Salix nigra*, are common. Characteristic shrubs include *Alnus serrulata, Cephalanthus occidentalis, Lindera benzoin, Lyonia ligustrina var. ligustrina*, and *Viburnum dentatum*. Dense, extensive tangles of *Smilax rotundifolia* are common in some areas. Associated herbaceous vegetation varies by site conditions and can include species of relatively well-drained soils, e.g. *Thelypteris noveboracensis*, as well as more hydrophytic species such as *Carex lurida, Carex scoparia, Juncus effusus*, and *Leersia oryzoides*. Invasive exotics, especially *Arthraxon hispidus* and *Microstegium vimineum*, are common.

CHARACTERISTIC SPECIES

Catoctin Mountain Park: *Alnus serrulata* (hazel alder)
Chesapeake & Ohio Canal National Historical Park: *Acer negundo, Alnus serrulata*, *Cephalanthus occidentalis, Juglans nigra, Populus deltoides, Salix nigra*
George Washington Memorial Parkway: *Acer negundo, Acer rubrum*, *Alnus serrulata*, *Betula nigra*, *Cephalanthus occidentalis*, *Salix nigra*
Harpers Ferry National Historical Park: *Acer negundo, Acer rubrum*, *Alnus serrulata*, *Betula nigra*, *Juglans nigra, Salix nigra*, *Smilax rotundifolia*
Manassas National Battlefield Park: *Acer negundo, Juglans nigra*
National Capital Parks-East: *Acer negundo, Cephalanthus occidentalis*
Prince William Forest Park: *Acer rubrum*, *Alnus serrulata*, *Betula nigra*, *Salix nigra*, *Smilax rotundifolia*

OTHER NOTEWORTHY SPECIES

Harpers Ferry National Historical Park: **Invasive/Exotic Plants**: *Arthraxon hispidus* (Medium/Low), *Microstegium vimineum* (High/Medium)
Prince William Forest Park: **Invasive/Exotic Plants**: *Arthraxon hispidus* (Medium/Low), *Microstegium vimineum* (High/Medium)

CLASSIFICATION

Catoctin Mountain Park Classification Comments: At this park, the Successional Woody Wetland Map Class (COMP_WOWE) consists of a small-patch mosaic of existing successional association Hazel Alder Shrub Swamp (CEGL005082) and unclassified successional shrublands and woodlands occurring in wetlands. The Successional Woody Wetland Map Class may intergrade with the Successional Herbaceous Wetland Map Class (COMP_HEWE), which can occur in similar habitats but is distinguished by having less than 30% cover of woody plants.

Chesapeake & Ohio Canal National Historical Park Classification Comments: At this park, the Successional Woody Wetland Map Class (COMP_WOWE) may consist of a small-patch mosaic of existing successional associations Northeastern Buttonbush Shrub Swamp (CEGL006069), Ruderal Box-elder Floodplain Forest (CEGL005033), and Ruderal Black Walnut Forest (CEGL007879), as well as unclassified successional shrublands and woodlands occurring in wetlands. The Successional Woody Wetland Map Class may intergrade with the Successional Herbaceous Wetland Map Class (COMP_HEWE), which can occur in similar habitats but is distinguished by having less than 30% cover of woody plants.

George Washington Memorial Parkway Classification Comments: At this park, the Successional Woody Wetland Map Class (COMP_WOWE) may consist of a small-patch mosaic of Ruderal Box-elder Floodplain Forest (CEGL005033) and unclassified successional shrublands and woodlands occurring in wetlands. The herb layer of the Successional Woody Wetland Map Class can be quite similar to that of the Successional Herbaceous Wetland Map Class (COMP_HEWE), which has less than 30% cover by woody plants. The two types occur adjacent to each other at Dyke Marsh. Successional Woody Wetland Map Class is distinguished by its higher cover of woody shrubs and trees.

Harpers Ferry National Historical Park Classification Comments: At this park, the Successional Woody Wetland Map Class (COMP_WOWE) may consist of a small-patch mosaic of existing successional associations Ruderal Box-elder Floodplain Forest (CEGL005033) and Ruderal Black Walnut Forest (CEGL007879), as well as unclassified successional shrublands and woodlands occurring in wetlands. The Successional Woody Wetland Map Class may intergrade with the Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in similar habitats but is distinguished by having less than 30% cover of woody plants. Persistent stands of Successional Herbaceous Wetland Map Class often occupy wetter habitats than those typical of Successional Woody Wetland Map Class or represent an earlier-successional stage of recovery from disturbance.

Manassas National Battlefield Park Classification Comments: At this park, the Successional Woody Wetland Map Class (COMP_WOWE) may consist of a small-patch mosaic of existing successional associations Ruderal Box-elder Floodplain Forest (CEGL005033) and Ruderal Black Walnut Forest (CEGL007879), as well as unclassified successional shrublands and woodlands occurring in wetlands. The Successional Woody Wetland Map Class may intergrade with the Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in similar habitats but is distinguished by having less than 30% cover of woody plants.

National Capital Parks-East Classification Comments: At this park, the Successional Woody Wetland Map Class (COMP_WOWE) may consist of a small-patch mosaic of existing successional associations Northeastern Buttonbush Shrub Swamp (CEGL006069) and Ruderal Box-elder Floodplain Forest (CEGL005033), as well as unclassified successional shrublands and woodlands occurring in wetlands. The Successional Woody Wetland Map Class may intergrade with the Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in similar habitats but is distinguished by having less than 30% cover of woody plants.

Prince William Forest Park Classification Comments: At this park, the Successional Woody Wetland Map Class (COMP_WOWE) consists of a mosaic of unclassified successional shrublands and woodlands occurring in wetlands. The Successional Woody Wetland Map Class may intergrade with the Successional Herbaceous Wetland Map Class (COMP_HEWE), which occurs in similar habitats but is distinguished by having <30% cover of woody plants. Persistent stands of Successional Herbaceous Wetland Map Class often occupy wetter habitats than those typical of Successional Woody Wetland Map Class or represent an earlier-successional stage of recovery from beaver disturbance.

DISTRIBUTION

Catoctin Mountain Park Range: Successional Woody Wetland Map Class (COMP_WOWE) is mapped in two locations in the park, one along Owens Creek near Sabillasville Road and the other along Big Hunting Creek near Foxville Road.

Chesapeake & Ohio Canal National Historical Park Range: Successional Woody Wetland Map Class (COMP_WOWE) occupies disturbed floodplains, seepage wetlands, and artificial impoundments (including impoundments due to beaver activity). It occurs at various locations, most commonly in the Ridge and Valley.

George Washington Memorial Parkway Range: Successional Woody Wetland Map Class is uncommon in George Washington Memorial Parkway. It is known from the border of Clay Pond at Great Falls Park and along Pimmit Run at the NPS boundary. It also occurs in a few small patches along the parkway near Daingerfield Island and as a narrow linear stand in Dyke Marsh along a boardwalk path.
Harpers Ferry National Historical Park Range: Successional Woody Wetland Map Class occurs in a disturbed area on the southwestern side of the Shenandoah River (former Shenandoah Canal), along the north side of the Potomac River, and along a tributary to the Shenandoah River in Jackson's Right Flank (2 polygons). It is also mapped in the bed of the former Chesapeake and Ohio Canal (CHOH), adjacent to Harpers Ferry National Historical Park.
Manassas National Battlefield Park Range: Successional Woody Wetland Map Class is scattered throughout the park in small to large patches, mostly along streams, but also along roads.
National Capital Parks-East Range: Successional Woody Wetland Map Class has been documented or mapped at NACE at Oxon Hill Farm, Patuxent North, and Piscataway.
Prince William Forest Park Range: Successional Woody Wetland Map Class is scattered in small to large, often linear patches along beaver-impacted reaches of Quantico Creek and South Fork Quantico Creek.
NCR Parks: NPS (C&O Canal, Catoctin Mountain, George Washington Parkway, Harpers Ferry, Jean Lafitte, Manassas, National Capital-East, Prince William)

[MANMEAD] Managed Meadow

CONCEPT

Summary: Rock Creek Park maintains about a dozen or more small areas as meadows for wildlife diversity. Scattered throughout the park, these open areas are maintained in a grassy or shrubby state to accommodate plants and animals that favor these conditions.

CLASSIFICATION

Rock Creek Park Classification Comments: Managed Meadow is a map class for non-natural open areas maintained by the park to accommodate plants and animals that favor these conditions.

DISTRIBUTION

Rock Creek Park Range: Managed meadows occupy open areas throughout the park and the Fort Circle Parks, including beside Picnic Area 13, along the Valley Trail near the Meadowlink Trail, near the picnic area at Fort Slocum, and near the Mamie D. Lee Community Garden in the Fort Circle Parks.
NCR Parks: NPS (Rock Creek)

[NLCD11] Open Water

CONCEPT

Summary: Any stream, river, canal, pond, or lake.

[NLCD21] Developed, Open Space

CONCEPT

Summary: Developed areas dominated by vegetation in the form of lawn grasses and/or ornamental plantings, where impervious surfaces account for less than 20% of total cover. Typical examples include parks, golf courses, historic sites, wide median strips and mowed rights-of-way.

[NLCD22] Developed, Low Intensity

CONCEPT

Summary: Developed areas with a mixture of constructed materials and vegetation, where impervious surfaces comprise 20-49% of total cover. The most typical example is single-family housing units.

[NLCD23] Developed, Medium Intensity

CONCEPT

Summary: Developed areas with a mixture of constructed materials and vegetation, where impervious surfaces comprise 50-79% of total cover. The most typical example is single-family housing units.

[NLCD24] Developed, High Intensity

CONCEPT

Summary: Highly developed areas including high-density residential areas (i.e., apartment complexes), commercial/industrial areas, and paved roads, where impervious surfaces comprise 80% or more of total cover.

[NLCD31] Barren Land

CONCEPT

Summary: Unvegetated areas without buildings and without impervious surfaces.

[NLCD32] Unconsolidated Shore

CONCEPT

Summary: Unconsolidated material such as silt, sand, or gravel that is subject to inundation and redistribution due to the action of water. Characterized by substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable. Erosion and deposition by waves and currents produce a number of landforms representing this class.

[NLCD61] Orchards and Vineyards

CONCEPT

Summary: Orchards, vineyards, and other areas planted or maintained for the production of fruits, nuts, berries, or ornamentals. Also includes abandoned orchards that may be overrun with weeds and vines. Note: This code / map class was standard in the NLCD 1992 scheme but was absorbed into code NLCD82 (cultivated crops) in the 2001 scheme. For NCR, we continued to use this as a separate map class to separate orchards from herbaceous row crops.

[NLCD81] Pasture/Hay

CONCEPT

Summary: Any field managed primarily for grazing, hay production, and/or scenic values, including historic battlefields actively maintained as warm-season or cool-season grasslands. Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.

ENVIRONMENTAL DESCRIPTION

Manassas National Battlefield Park Environment: Pasture / Hay includes graminoid-dominated fields managed primarily for grazing, hay production, and/or scenic values, including historic battlefields actively maintained as warm-season or cool-season grasslands.

VEGETATION DESCRIPTION

Manassas National Battlefield Park Vegetation: Pasture / Hay vegetation is typically dominated by either warm-season or cool-season grasses, or a mixture of the two. Herbaceous cover tends to be very dense, near 100%. Common warm-season grasses include *Andropogon gerardii, Andropogon virginicus, Eragrostis spectabilis, Panicum anceps, Panicum virgatum, Schizachyrium scoparium, Sorghastrum nutans, Tridens flavus*, and *Tripsacum dactyloides*. Cool-season grasses include the native grasses *Agrostis hyemalis, Danthonia spicata*, and *Poa pratensis*, as well as the exotic grasses *Agrostis stolonifera, Anthoxanthum odoratum, Dactylis glomerata, Schedonorus arundinaceus (= Lolium arundinaceum), Schedonorus pratensis (= Lolium pratense)*, and *Phleum pratense*.

CHARACTERISTIC SPECIES

Manassas National Battlefield Park: *Andropogon gerardii*, *Andropogon virginicus*, *Panicum anceps*, *Schizachyrium scoparium*, *Sorghastrum nutans*, *Tridens flavus*

OTHER NOTEWORTHY SPECIES

Manassas National Battlefield Park: **Vulnerable Plants**: *Buchnera americana* (G5?, VA state-rare); **Invasive/Exotic Plants**: *Agrostis stolonifera* (Medium/Low), *Anthoxanthum odoratum*, *Dactylis glomerata* (Medium/Insignificant), *Phleum pratense* (Medium), *Schedonorus arundinaceus* (High/Medium), *Schedonorus pratensis* (High/Low)

CLASSIFICATION

Manassas National Battlefield Park Classification Comments: The graminoid species present in Pasture / Hay are similar to vegetation classified as Successional Meadow / Grassland Map Class (COMP_SUME). The type is distinguished by its lack of woody species and wholly herbaceous vegetation maintained by active management for grazing, hay production, or scenic values.
Classification Comments: NLCD 2001. http://www.mrlc.gov/

[NLCD82] Cultivated Crops

CONCEPT

Summary: Areas used for the production of annual crops such as corn, soybeans, vegetables, tobacco, and cotton. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled. Any field actively managed for the production of row crops. This may combine NLCD 2001 classes 82, 83 and 84.

[QUAR] Historic Quarry

CONCEPT

Summary: Historic Quarry - Prior to the early 1900's certain types of bedrock were quarried in the park. Many of these quarries are in Kennsington Tonalite, a popular early building stone known as Rock Creek Granite. These areas support a semi-natural community dominated by hardy and fast-growing non-native invasive trees, vines, shrubs, and small plants.

[RT] Roads and Urban Walkways

CONCEPT

Summary: Roads and Urban Walkways - This map class includes paved and unpaved roads and sidewalks.

[SF_AQUA] Aquatic Garden

CONCEPT

Summary: Kenilworth Aquatic Garden, a unique feature occurring only as a single polygon in NACE.

[SF_FORS] Forested Open Space

CONCEPT

Summary: Residential or recreational open space with substantial tree canopy; similar to NLCD21, but trees rather than lawns are considered the dominant vegetation. Lawn grasses may or may not be dominant below the canopy. This map class represents forested or heavily wooded recreational areas such as campgrounds and picnic sites, as well as large-lot residential areas. In these areas, classification as successional or natural forest is inappropriate, but the definition for NLCD21 does not fit either due to the heavy tree cover.

[SF_NWSG] Native Warm-season Grassland

CONCEPT

Summary: Open fields similar to NLCD81, but with native warm-season grasses rather than cool-season grasses as the dominant vegetation. These were mapped separately from NLCD81 at MANA at the request of park staff, using the park's own data layers.

[SF_REFO] Managed Reforestation Area

CONCEPT

Summary: Former agricultural fields actively being reforested or designated for reforestation in the future. Differs from Planted Deciduous Forest (COMP_PLDE) in that the intent is to restore a "natural" forest rather than to produce timber for harvest. Only a few reforestation sites were mapped at ANTI, at the request of park staff and using the park's own data layers.

[SF_TOWP] C & O Canal Towpath

CONCEPT

Summary: Right-of-way associated with the Chesapeake & Ohio Canal Towpath, including the towpath itself (whether gravel, dirt, or paved) and narrow embankments or strips of vegetation (whether herbaceous or wooded) on either side that cannot reasonably be pulled out as separate map classes

[SF_TWRE] Tidal Wetland Restoration and Experimental Area

CONCEPT

Summary: Areas of freshwater tidal mudflats where marshes are being or have been actively restored, and/or where experimental plots have been established to monitor restoration success under different conditions. This special feature is limited to a few polygons in NACE.

[SHOAL] Rocky Shoals

CONCEPT

Summary: Rocky Shoals - Rocky shoals are found in the Potomac River where bedrock is visible at low water levels.

ITESC Ecological Systems Descriptions

FOREST & WOODLAND

Tropical, temperate and boreal forests, woodlands and tree savannas characterized by broadly mesomorphic (including scleromorphic) tree growth forms (including *broad-leaved, needle-leaved, sclerophyllous, palm, bamboo trees*, and *tree ferns*), typically with at least 10% cover (but tropical tree savannas up to 40% cover, when trees <8 m tall), irregular horizontal spacing of vegetation structure, and spanning humid to seasonally dry tropical to boreal and subalpine climates and wet to dry substrate conditions. Includes native forests, as well as managed, and some plantation forests where human management is infrequent.

Temperate & Boreal Forest & Woodland

Temperate & Boreal Forest & Woodland is typically dominated by broad-leaved deciduous and needle-leaved trees, with some broad-leaved evergreens in warmer regions, and a climate that varies from warm-temperate with only rare frosts to very cold subarctic conditions. It is found across the globe in the mid-latitudes, typically between 25° and 60-70°N and S latitude, and includes boreal, cool-temperate, and warm-temperate/Mediterranean forests.

CES203.242 SOUTHERN ATLANTIC COASTAL PLAIN MESIC HARDWOOD FOREST

Primary Division: Gulf and Atlantic Coastal Plain (203)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval
National Mapping Codes: EVT 7343; BPS 8843
Concept Summary: This upland system of the Atlantic Coastal Plain ranges from Delaware south to interior Georgia in a variety of moist but non-wetland sites that are naturally sheltered from frequent fire. Such sites include lower slopes and bluffs along streams and rivers in dissected terrain, mesic flats between drier pine-dominated uplands and floodplains, and local topographic high areas within bottomland terraces or nonriverine wet flats. Soil textures are variable in both texture and pH. The vegetation consists of forests dominated by combinations of trees that include a significant component of mesophytic deciduous hardwood species, such as *Fagus grandifolia* or *Acer floridanum*. Its southern limit is generally exclusive of the natural range of *Pinus glabra* and *Magnolia grandiflora*. Upland and bottomland oaks at the mid-range of moisture tolerance are usually also present, particularly *Quercus alba*, but sometimes also *Quercus pagoda, Quercus falcata, Quercus michauxii, Quercus shumardii*, or *Quercus nigra*. *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past cutting. Analogous systems on the Gulf Coastal Plain have pine as a natural component, and this may be true for some examples of this system. Understories are usually well-developed. Shrub and herb layers may be sparse or moderately dense. Within its range, *Sabal minor* may be a prominent shrub. Species richness may be fairly high in basic sites but is fairly low otherwise.
Comments: There remains some uncertainty how this system and other mesic hardwood systems should be divided. There is a broad gradient in climate and species composition from north to south and west. The boundaries at the northern edge of its range (the Chesapeake Bay Lowlands TNC ecoregion) and at the break between the South Atlantic Coastal Plain and East Gulf Coastal Plain ecoregions are boundaries of convenience to create breaks in this broad gradient. At the southern end, the boundary has been better determined (April 2006) to exclude areas within the combined ranges of *Pinus glabra* and *Magnolia grandiflora*, making this system deciduous rather than mixed evergreen-deciduous. Differences from mesic forests of the Piedmont are sometimes fairly subtle, and species that differentiate them in one part of the range may not work in other parts. In particular, some species that are excluded from the Coastal Plain farther south are common components farther north. In MD and DC, this system can extend into the Piedmont (this area is part of TNC Ecoregion 52, but USFS 221C [2005 version]), straddling the fall zone where the Coastal Plain and Piedmont meet. Besides the variation across the range of this system, there are two sets of distinctions within it that may be worthy of consideration for defining separate systems. Acidic and basic substrates have substantial floristic differences. Variants on upland slopes, nonriverine swamp islands, and high ridges in bottomlands could be recognized as separate systems, or the latter two could be treated as part of the systems that surround them. However, the difference between ecological processes in uplands and wetlands separates those surrounded by wetland systems from the surrounding systems. This is especially true in the case of

floodplains, which have flood-carried nutrient input as well as wetness as a difference. Floristic differences may exist between these variants, but they are subtle and do not appear to be definitive.

DISTRIBUTION

Range: This system ranges from Delaware south to central Georgia in the Atlantic Coastal Plain. Its southern limit is generally exclusive of the natural range of *Pinus glabra* as mapped by Kossuth and Michael (1990) and *Magnolia grandiflora* as mapped by Outcalt (1990).
Divisions: 203:C
TNC Ecoregions: 52:C, 56:C, 57:C, 58:C, 61:C
Nations: US
Subnations: GA:SNR, NC:SNR, SC:SNR, VA:SNR
Map Zones: 55:C, 58:C, 60:C
USFS Ecomap Regions: 221D:CC, 232Ac:CCC, 232B:CC, 232C:CC, 232H:CC, 232I:CC, 232J:CC

CONCEPT

High-ranked species: Ambystoma cingulatum (G2), Anzia ornata (G1G3), Baptisia megacarpa (G2), Campephilus principalis (G1), Carex acidicola (G2G3), Carex chapmanii (G3), Carex impressinervia (G2), Eurybia mirabilis (G3), Fissidens scalaris (G2?), Forestiera godfreyi (G2), Graptemys barbouri (G2), Ilex cuthbertii (G1?), Lindera subcoriacea (G3), Plethodon savannah (G2G3), Pycnanthemum clinopodioides (G1G2), Rhododendron eastmanii (G3), Salix floridana (G2), Schisandra glabra (G3), Scutellaria ocmulgee (G2), Sideroxylon alachuense (G1), Silene ovata (G3), Silene polypetala (G2), Thalictrum macrostylum (G3G4), Thelypteris ovata var. ovata (G3G5T3T4)
Environment: This system occurs in a variety of moist non-wetland sites that are naturally sheltered from frequent fire. The distribution of these forests is determined by the interaction of local topography and soil texture. Most common are lower slope and bluff examples along streams and rivers in dissected terrain, but some examples occur on mesic flats between drier pine-dominated uplands and floodplains or on local high areas within bottomland terraces or nonriverine wet flats. Soils cover the full range of mineral soil textures, except the coarsest sands. Richer and more mesic stands occur in more strongly concave and finer-textured areas. Soils are not saturated for any significant time during the growing season and seldom, if ever, are extremely dry. Soils developed from calcareous materials or rich alluvium may be basic; others are strongly acidic. Sites are protected from most natural fires by steep topography or by surrounding extensive areas of non-flammable vegetation (Batista and Platt 1997).
Vegetation: Stands of this system include a significant component of mesophytic species such as *Fagus grandifolia* or *Acer floridanum (= Acer barbatum)*. Upland and bottomland oaks at the mid-range of moisture tolerance are usually also present, particularly *Quercus alba*, but sometimes also *Quercus falcata, Quercus michauxii, Quercus shumardii*, or *Quercus nigra*. Other hardwood components include *Liriodendron tulipifera, Liquidambar styraciflua, Carya cordiformis, Nyssa sylvatica*, and *Magnolia tripetala*. *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past removal of the hardwood canopy and subsequent invasion. Analogous systems on the Gulf Coastal Plain have pine as a natural component, and this may be true for some examples of this system. Understories are usually well-developed. Shrub and herb layers may be sparse or moderately dense, with the herb layer being forb-dominated. Some typical smaller trees and shrubs include *Cornus florida, Symplocos tinctoria, Oxydendrum arboreum, Hamamelis virginiana, Morus rubra*, and *Stewartia malacodendron*. Within its range, *Sabal minor* may be a prominent shrub. Some stands may contain *Arundinaria gigantea*. Some typical herbs include *Mitchella repens* and *Hexastylis arifolia*. Species richness may be fairly high in basic sites but is fairly low otherwise.
Dynamics: Fire is naturally infrequent to absent in this system. Sites are protected from most natural fires by steep topography or by surrounding extensive areas of non-flammable vegetation (Landfire 2007a). If fire does penetrate, it is likely to be low in intensity but may have significant ecological effects. These forests probably generally exist naturally as old-growth forests, with canopy dynamics dominated by gap-phase regeneration. However, exposure to occasional fires and severe storms may create more frequent and larger canopy disturbances than analogous systems inland. Storm-related disturbance can be followed by waves of tree recruitment, growth, and death resulting in changes in the density and structure of tree populations and in consequent fluctuations in forest species composition. Disturbances in these forests appear to be critical for both regeneration and change in older stands (Batista and Platt 1997). Periodic droughts will cause death of or stress to moisture-requiring canopy trees.

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system, occurring in mosaics with other small-patch systems, or as small isolated patches surrounded by wetlands.

Size: Generally occurs as small to large patches, of a few to dozens of acres. Mosaics may contain up to several hundred acres in close proximity.
Heterogeneity: Most slope and bluff occurrences are in mosaics or are interfingered with Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (CES203.241) in the central and southern part of this system's range (south of the James River, VA). North of the James River, it may be interfingered with Northern Atlantic Coastal Plain Hardwood Forest (CES203.475). Island occurrences are generally homogeneous patches surrounded by floodplain or nonriverine wetland systems. Within the system, most occurrences are homogeneous, with only one association present.
Adjacent Ecological System Comments: Most commonly associated with Southern Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (CES203.241) and various floodplain systems. Less commonly associated with Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304). Floodplain systems often occur below this system. In MD and DC, where this system occurs along the fall zone, it may be found below ridges and hilltops supporting Central Appalachian Dry Oak-Pine Forest (CES202.591) and adjacent to steep slopes supporting Northern Atlantic Coastal Plain Dry Oak-Hardwood Forest (CES203.475).
Other Comments: The relationship of this system to the equivalent system in the Gulf Coastal Plain needs to be clarified and resolved. It may be more appropriate to rename this system "Atlantic Coastal Plain Mesic Hardwood Forest" and confine its range to the Atlantic Coastal Plain north of the range of *Pinus glabra* and *Magnolia grandiflora*. The Gulf system (CES203.476) would then be renamed "Southern Coastal Plain Mesic Slope Forest" and its range extended in the Atlantic Coastal Plain consistent with the range of these species.

SOURCES

References: Batista and Platt 1997, Comer et al. 2003*, Edwards et al. 2013, Engeman et al. 2007, Eyre 1980, Flynn 1994, Kossuth and Michael 1990, LANDFIRE 2007a, Nelson 1986, Outcalt 1990, Quarterman and Keever 1962, Schafale 2012, Ware et al. 1993
Version: 14 Jan 2014**Stakeholders:** East, Southeast
Concept Author: R. Evans **Lead Resp:** Southeast

CES202.593 APPALACHIAN (HEMLOCK)-NORTHERN HARDWOOD FOREST

Primary Division: Central Interior and Appalachian (202)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Mesotrophic Soil; Needle-Leaved Tree; Broad-Leaved Deciduous Tree; Pinus spp. - Tsuga canadensis
National Mapping Codes: EVT 7370; BPS 8870
Concept Summary: This forested system of the eastern U.S. ranges from central New England west to Lake Erie and south to the higher elevations of Virginia and West Virginia. It is one of the matrix forest types in the northern part of the Central Interior and Appalachian Division. Northern hardwoods such as *Acer saccharum, Betula alleghaniensis*, and *Fagus grandifolia* 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*), *Liriodendron tulipifera, Prunus serotina, Acer rubrum*, and *Betula lenta*. It is of more limited extent and more ecologically constrained in the southern part of its range in northern parts of Virginia and West Virginia.
Comments: Northward this system is replaced by Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563) and Laurentian-Acadian Northern Hardwood Forest (CES201.564), but the systems overlap on the Allegheny Plateau and in central New England. USFS ecological province lines provide a general delimiter, with areas in Provinces 211 and M211 mostly falling into the Laurentian-Acadian systems, and areas in Provinces 221 and M221 falling into this Appalachian system. The range of *Liriodendron tulipifera* is a good approximator for the northern limit of this system's range.

DISTRIBUTION

Range: This system is found from southern New Hampshire south to Virginia and West Virginia, and possibly in adjacent Kentucky.
Divisions: 202:C
TNC Ecoregions: 48:C, 49:C, 52:C, 59:C, 60:C, 61:C
Nations: US

Subnations: CT:SNR, KY?:SNA, MA:SNR, MD:SNR, NH:SNR, NJ:SNR, NY:SNR, OH?:SNA, PA:SNR, VA:SNR, WV:SNR
Map Zones: 53:C, 60:C, 61:C, 62:C, 63:C, 64:C, 65:C, 66:C
USFS Ecomap Regions: 211E:CC, 211Fc:CCC, 211Fd:CCC, 211G:CC, 221Aa:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Am:CCC, 221B:CC, 221D:CC, 221E:CC, 221F:CC, 222I:CC, M221A:CC, M221B:CC, M221C:CP

CONCEPT

High-ranked species: Aneides aeneus (G3G4), Bryocrumia vivicolor (G1G2), Buckleya distichophylla (G3), Canis rufus (G1Q), Carex brysonii (G1), Cephaloziella spinicaulis (G3G4), Cheilolejeunea evansii (G1G2), Clematis addisonii (G1?), Desmognathus wrighti (G3), Diplophyllum obtusatum (G2?), Donrichardsia pringlei (G2G3), Drepanolejeunea appalachiana (G2?), Fissidens appalachensis (G2G3), Frullania appalachiana (G2?), Hexastylis contracta (G3), Homaliadelphus sharpii (G3?), Hymenophyllum tayloriae (G2), Lejeunea blomquistii (G1G2), Lophocolea appalachiana (G1G2Q), Microtus chrotorrhinus carolinensis (G5T3), Nardia lescurii (G3?), Neotoma magister (G3G4), Plagiochila austinii (G3), Plagiochila caduciloba (G3), Plagiochila sullivantii var. spinigera (G2T1), Plagiochila sullivantii var. sullivantii (G2T2), Plagiochila virginica var. caroliniana (G3T2), Plethodon aureolus (G2G3), Plethodon hubrichti (G2G3), Plethodon punctatus (G3), Plethodon welleri (G3), Riccardia jugata (G2), Schlotheimia lancifolia (G2), Shortia galacifolia var. brevistyla (G3T2), Shortia galacifolia var. galacifolia (G3T2T3), Sorex palustris punctulatus (G5T3), Stygobromus sp. 17 (G2), Trillium persistens (G1), Tsuga caroliniana (G2G3), Virginia valeriae pulchra (G5T3T4)
Environment: This system occurs predominantly on mesic sites over a broad range of topographic conditions, such as protected low and midslopes and valley bottoms, at elevations from 305 to 1360 m. Soils are usually acidic and retain some moisture except during severe droughts. They are moderately well-drained to well-drained loamy or silty soils and are rocky and usually deep in depressions among boulders. Forests in this system are also associated with high-elevation periglacial boulderfields. In the Central Appalachian center of its range, its ecological amplitude is somewhat broader, and it becomes the matrix forest in some areas of Pennsylvania, Maryland, West Virginia. At Shenandoah National Park, this system spans a broad range of environmental settings from steep west-facing slopes to south-facing gentle slopes.
Vegetation: The canopy is characterized and often usually dominated by northern hardwoods (e.g., *Fagus grandifolia* and *Acer saccharum*), often with *Tsuga canadensis*, but may also contain large amounts of *Pinus strobus* and *Quercus* spp. *Tsuga canadensis* can dominate the canopy on cool/moist sites at higher elevations and in shaded coves, valley bottoms and riparian areas. Bottomlands and toeslopes may also contain *Fraxinus americana*, as well as *Platanus occidentalis* (Whitney 1990). Other common associates may include *Acer rubrum, Prunus serotina, Betula lenta, Tilia americana, Pinus strobus, Liriodendron tulipifera, Quercus* spp., and *Magnolia acuminata*. The subcanopy and shrub layers are usually well-developed and may include *Viburnum lantanoides (= Viburnum alnifolium), Viburnum acerifolium, Hamamelis virginiana*, and *Cornus alternifolia*. A dense, low to high shrub layer of *Rhododendron maximum* and sometimes *Kalmia latifolia* is sometimes present. Common herbaceous species include *Maianthemum canadense, Onoclea sensibilis, Huperzia lucidula (= Lycopodium lucidulum), Dryopteris carthusiana (= Dryopteris spinulosa), Oxalis montana*, and *Mitchella repens* (Lutz 1930, Braun 1950).
Dynamics: In general, this system is dominated by long-lived, mesophytic species that form multi-layered uneven-aged forests. Canopy dynamics are dominated by single and multiple disturbances encouraging gap phase regeneration (Abrams and Orwig 1996). Larger disturbances include windthrow, insect attack and icestorms. Although stand-replacing wind events are rare, small to medium blowdown events are more common and occur at greater frequency on the plateau and exposed sideslopes (Ruffner and Abrams 2003).This system is currently being devastated in large parts of its range by the hemlock woolly adelgid (*Adelges tsugae*). This sucking insect is continuing to cause close to 100% mortality in some areas as it spreads from the north into the southern United States. The insect will most likely cause canopy hemlocks to be replaced by other canopy trees. Historically, this system was probably only subject to occasional fires. Fires that did occur may have been catastrophic and may have led to even-aged stands of pine and hemlock. Fire suppression appears to have increased the extent of this system at the expense of oak-pine systems.

Fire Regime Description (from Landfire 2007a): Historically, this system was probably only subject to occasional fires. Fires that did occur may have been catastrophic and may have led to even-aged stands of pine and hemlock. Due to the predominance of cool, moist site conditions, surface and replacement fires are extremely rare, occurring at 700- to 1000-year intervals. Most protected sites are essentially fire-free. The principal cause of fuel formation leading to fire in northern hardwood ecosystems is broad-scale, storm-driven windthrow of catastrophic proportions (Hough 1936, Runkle 1982). The importance of red maple, sweet birch, northern red oak, and especially

black cherry in contemporary Central Appalachian examples of this community group reflects secondary succession following catastrophic logging and fire disturbances in the early part of the twentieth century. Sugar maple and beech, both abundant in understory layers and locally codominant in the overstory, appear positioned to assume dominance as current secondary stands mature. However, beech bark disease and excessive deer browsing are serious threats to the future viability of the largest stands on Allegheny Mountain (VDNH 2007).

SPATIAL CHARACTERISTICS

Spatial Summary: Matrix in the northern portion of its range to large patch on the southern end of its range in Virginia and West Virginia.
Size: Some examples may be more than 1000 acres, but smaller in the southern part of the range.
Heterogeneity: In the central Appalachians and northward, occurrences may include areas of deciduous cover as well as mixed hemlock-hardwood cover, and smaller areas of pure hemlock.
Adjacent Ecological System Comments: The concept of this system was revised in April 2007 to remove areas south and west of Virginia and West Virginia from its range; hemlock and mixed coves in that southern range are now within Southern and Central Appalachian Cove Forest (CES202.373), and small areas of non-cove hemlock are to be considered patches within the surrounding forest matrix system. The Region 8 National Forests and other Federal lands, as well as ecoregions and mapzones related to this area were also removed.
Other Comments: The concept of this system was revised in April 2007 to remove areas south and west of Virginia and West Virginia from its range; hemlock and mixed coves in that southern range are now within Southern and Central Appalachian Cove Forest (CES202.373), and small areas of non-cove hemlock are to be considered patches within the surrounding forest matrix system. The Region 8 National Forests and other Federal lands, as well as ecoregions and mapzones related to this area were also removed.

The range of this system south and west of Pennsylvania, West Virginia, and western Virginia is problematic. Kentucky (B. Yahn pers. comm. 2008) believes that it is present in that state, but investigation of this is incomplete. At a minimum, it is in EPA 69a, 69c, and 70b in West Virginia, western Virginia, and adjacent Kentucky (mapzone 53) (S. Gawler pers. comm. 2008).

SOURCES

References: Abrams and Orwig 1996, Braun 1950, Braun 2001, Comer et al. 2003*, Connolly et al. 2007, Delcourt and Delcourt 1988, Edinger et al. 2014a, Ellison et al. 2005, Evans et al. 2009, Eyre 1980, Fike 1999, Gawler and Cutko 2010, Hough 1936, Hough 1963, Ison 2000, LANDFIRE 2007a, Litvaitis 2003, Lorimer and Frelich 1994, Lutz 1930, NYNHP 2013b, ONHD unpubl. data, Orwig and Foster 1998, Orwig et al. 2012, PNHP 2002, Paradis et al. 2007, Ruffner and Abrams 2003, Runkle 1981, Runkle 1982, Runkle 1985, Schafale 2012, Sperduto and Nichols 2004, Spies 2004, Swain and Kearsley 2011, VDNH 2007, Whitney 1990a, Whitney 1990b
Version: 14 Jan 2014**Stakeholders:** East, Midwest, Southeast
Concept Author: S.C. Gawler, R. White, R. Evans, M. Pyne **Lead Resp:** East

CES202.373 SOUTHERN AND CENTRAL APPALACHIAN COVE FOREST

Primary Division: Central Interior and Appalachian (202)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Broad-Leaved Tree
National Mapping Codes: EVT 7318; BPS 8818
Concept Summary: This system consists of mesophytic hardwood or hemlock-hardwood forests of sheltered topographic positions in the Southern Blue Ridge and central Appalachian Mountains. Examples are generally found on concave slopes that promote moist conditions. The system includes acidic and "rich" coves that may be distinguished by individual plant communities based on perceived differences in soil fertility and species richness (rich examples have higher diversity and density in the herbaceous layer). Both acidic and rich coves may occur in the same site, with the acidic coves potentially creeping out of the draw-up to at least midslope on well-protected north-facing slopes. Characteristic species in the canopy include *Aesculus flava, Acer saccharum, Fraxinus americana, Tilia americana, Carya cordiformis, Liriodendron tulipifera, Halesia tetraptera, Tsuga canadensis, Fagus grandifolia, Magnolia acuminata*, and *Magnolia fraseri*.
Comments: This system is best distinguished from others in its range by the combination of sheltered topography, low elevation, and mesophytic flora with high species richness. Canopies can sometimes become depauperate after repeated logging. It does not include rich, mesophytic "cove" forests further west in the Cumberland Plateau and

Interior Low Plateau, even though some of these approach or exceed Appalachian examples in their species composition and occur on similar sites. They are interpreted as variability within South-Central Interior Mesophytic Forest (CES202.887). In West Virginia and north, the Allegheny front is adopted as the divide between these two similar systems: examples to the west go to South-Central Interior Mesophytic Forest (CES202.887), and examples to the east go to this system.

DISTRIBUTION

Range: This system occurs in the southern and central Appalachian Mountains, ranging into the Cumberland Mountains of Kentucky and Tennessee. This range is more-or-less consistent with the "Oak-Chestnut" forest region of Braun (1950) and Greller (1988), versus the "Mixed Mesophytic" and "Western Mesophytic" forest regions to the west. In West Virginia and north, the Allegheny front is the boundary between this and South-Central Interior Mesophytic Forest (CES202.887).
Divisions: 202:C
TNC Ecoregions: 50:C, 51:C, 52:C, 59:C, 61:P
Nations: US
Subnations: GA:SNR, KY:SNR, MD:SNR, NC:SNR, SC:SNR, TN:SNR, VA:SNR, WV:SNR
Map Zones: 53:C, 57:C, 61:C, 62:C
USFS Ecomap Regions: M221A:CC, M221B:CC, M221Cb:CCC, M221Cc:CCC, M221Cd:CCC, M221D:CC

CONCEPT

High-ranked species: Aconitum reclinatum (G3G4), Actaea racemosa (G3G4), Actaea rubifolia (G3), Aneides aeneus (G3G4), Arabis patens (G3), Bryoerythrophyllum ferruginascens (G3G4), Calystegia catesbeiana (G3), Canis rufus (G1Q), Cardamine clematitis (G3), Cardamine flagellifera (G3), Carex manhartii (G3G4), Carex radfordii (G3), Carex roanensis (G2G3), Clematis addisonii (G1?), Collinsonia verticillata (G3G4), Desmognathus aeneus (G3G4), Desmognathus imitator (G3G4), Desmognathus santeetlah (G3G4Q), Desmognathus wrighti (G3), Diervilla rivularis (G3), Donrichardsia pringlei (G2G3), Drepanolejeunea appalachiana (G2?), Entodon sullivantii (G3G4), Euphorbia purpurea (G3), Hydrastis canadensis (G3G4), Hygrohypnum closteri (G3), Juglans cinerea (G3), Lejeunea blomquistii (G1G2), Lophocolea appalachiana (G1G2Q), Megaceros aenigmaticus (G3), Melanoplus acrophilus acrophilus (G2G3T2T3), Melanoplus cherokee (G1G3), Melanoplus divergens (G2G3), Melanoplus serrulatus (G1G3), Metzgeria uncigera (G3), Microtus chrotorrhinus carolinensis (G5T3), Nesticus sheari (G2?), Panax quinquefolius (G3G4), Pieris virginiensis (G2G3), Plagiochila austinii (G3), Plagiochila caduciloba (G3), Plagiochila retrorsa (G2G4), Plagiochila virginica var. virginica (G3T3), Plagiomnium carolinianum (G3), Plethodon aureolus (G2G3), Plethodon hubrichti (G2G3), Plethodon punctatus (G3), Plethodon welleri (G3), Polymnia laevigata (G3), Riccardia jugata (G2), Scutellaria pseudoserrata (G3), Scutellaria saxatilis (G3G4), Silene ovata (G3), Sorex palustris punctulatus (G5T3), Speyeria diana (G2G3), Thaspium pinnatifidum (G2G3), Trechus luculentus luculentus (GHTH), Trillium discolor (G3), Trillium lancifolium (G3), Trillium simile (G3), Virginia valeriae pulchra (G5T3T4)
Environment: This mixed mesophytic forest system occurs on moist, topographically protected areas such as coves, V-shaped valley bottoms and ravines, and north- and east-facing toeslopes in a dissected landscape. It generally occurs below 1525 m (5000 feet) elevation. The dissected topography creates strong gradients in microclimate and soil moisture and fertility at the local (watershed) scale (Hutchins et al. 1976, Iverson et al. 1997, Morris and Boerner 1998). This forest type developed primarily on mesic, sheltered landscape positions (e.g., lower concave slopes, coves, ravines) but also occurred on some dry-mesic slopes, where presumably fire was infrequent (Wade et al. 2000). This system has two primary components, an acidic cove of lower soil fertility that ranges from the lowest slope positions up the slope on north-facing protected slopes, and a rich, high-fertility cove forest that tends to occur only at the lowest slope positions. Both are sheltered from wind and may be shaded by concave topography, which promotes moist conditions. Local slopes are usually concave. Bedrock may be of numerous types. Acidic rocks, such as felsic igneous and metamorphic rocks, support rich cove forests in a more limited range of sites than do basic rocks, such as mafic metamorphic rocks or marble. Soils may be rocky or fine-textured, and may be residual, alluvial, or colluvial. In the southern Appalachians, the hemlock "phase" of this ("acidic cove forest") often occurs between "richer" examples of Southern and Central Appalachian Cove Forest (CES202.373) in the lowest areas and Southern Appalachian Oak Forest (CES202.886) on the midslopes.
Vegetation: This system is among the most diverse in the United States, containing more than 30 canopy tree species. Vegetation consists of forests dominated by various combinations of mesophytic species, usually with many different species of primarily deciduous trees present. *Acer saccharum, Liriodendron tulipifera, Tilia americana, Tilia americana var. heterophylla, Fraxinus americana, Aesculus flava, Fagus grandifolia, Betula lenta, Magnolia acuminata, Magnolia fraseri, Quercus rubra, Halesia tetraptera, Prunus serotina*, and *Tsuga canadensis* are the

most frequent dominant canopy species (Braun 1950, Muller 1982). Witness tree data (from early land surveys) and studies of old-growth forests suggest that mixed-oak forests were generally more abundant on the landscape than mixed-mesophytic forests prior to European settlement (Beatley 1959, McCarthy et al. 1987, Abrams et al. 1995, Dyer 2001, McCarthy et al. 2001, Rentch et al. 2003). Canopies are generally very diverse, with all species potentially occurring in one 20x50-meter plot in rich cove areas. A well-developed herb layer, often very dense and usually high in species richness, is present in all but the acid coves. Well-developed and fairly diverse subcanopy and shrub layers are often also present in all but the acid coves. Ulrey (1999) listed *Caulophyllum thalictroides, Actaea racemosa (= Cimicifuga racemosa), Laportea canadensis, Osmorhiza claytonii, Sanguinaria canadensis, Viola canadensis, Acer saccharum, Aesculus flava, Carya cordiformis*, and *Tilia americana var. heterophylla* as characteristic species.

Dynamics: This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration on a fine scale. Occasional extreme wind or ice events may disturb larger patches. In the absence of frequent or catastrophic disturbance, environmental gradients formed by the dissected topography determine forest composition (Hutchins et al. 1976, Muller 1982, Iverson et al. 1997, Dyer 2001). Most of the component species are among the less fire-tolerant in the region. The mixed-mesophytic forest type is fire regime class III, surface fires with return intervals 30-100+ years (Wade et al. 2000). Mixed-severity fires may occur approximately every 500 years opening the canopy with increased mortality. Straight-line winds or microbursts may cause blowdowns on a scale of one to 100 acres. Stand-replacement fires happen very infrequently. Current composition and structure of this system is influenced by the absence of fire, deer herbivory, and non-native invasive species (plants, animals, insects and disease). The absence of fire is causing an expansion of some of the characteristic mesic taxa out of coves, potentially replacing previous oak-dominated vegetation on drier and more exposed sites than those typically associated with "mesic" vegetation.

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system commonly occurring in a landscape mosaic with several other systems. On slopes it forms a mosaic with fire-prone Central Appalachian Dry Oak-Pine Forest (CES202.591), where these forests are restricted to the most protected coves.

Size: Most individual patches are tens to sometimes a few hundred acres. Because it frequently occurs in mosaics with other systems, separation distance for occurrences has a strong effect on the size of occurrences. Complexes of thousands of acres of this system are possible.

Heterogeneity: Patches usually occur in a mosaic with other systems, sometimes as complexes of patches, often as branching linear bodies following valleys. Small-patch systems are occasionally embedded. Within the system, most occurrences are homogeneous, with only a single association, occasionally two, present.

Adjacent Ecological System Comments: This system is usually bordered by Southern Appalachian Oak Forest (CES202.886) in the Southern Blue Ridge. The border with adjacent systems is gradational. It may also contain small embedded patches of Southern Appalachian Montane Cliff and Talus (CES202.330) or other small-patch systems. In the southern Appalachians, the "richer" phase of Southern and Central Appalachian Cove Forest (CES202.373) occurs downslope from the hemlock "phase" ("acidic cove forests") and tends to be more mesic and more species-rich than the hemlock-dominated areas. Southern Appalachian Oak Forest (CES202.886) occurs upslope from this system and tends to be drier and even less diverse than the hemlock areas, which may grade into Southern Appalachian Low-Elevation Pine Forest (CES202.332) in especially dry occurrences. On slopes it forms a mosaic with fire-prone Central Appalachian Dry Oak-Pine Forest (CES202.591), where these forests are restricted to the most protected coves.

SOURCES

References: Abrams et al. 1995, Beatley 1959, Braun 1950, Brown and Smith 2000, Comer et al. 2003*, Delcourt et al. 1998, DuMond 1970, Dyer 2001, Edwards et al. 2013, Evans et al. 2009, Eyre 1980, Frost 1998, Gettman 1974, Guyette et al. 2003, Hutchins et al. 1976, Iverson et al. 1997, Küchler 1964, LANDFIRE 2007a, McCarthy et al. 1987, McCarthy et al. 2001, McNab and Avers 1994, Morris and Boerner 1998, Muller 1982, Nelson 1986, Patterson 1994, Rentch et al. 2003, Schafale 2012, Schafale and Weakley 1990, Schmidt et al. 2002, Simon 2011, Simon 2015, Tobe et al. 1992, Ulrey 1999, Wade et al. 2000

Version: 28 Apr 2016**Stakeholders:** East, Southeast

Concept Author: M. Schafale, M. Pyne, R. White, R. Evans **Lead Resp:** Southeast

CES202.598 APPALACHIAN SHALE BARRENS

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Sideslope; Talus (Substrate); Unglaciated; Unconsolidated
National Mapping Codes: EVT 7340; BPS 8840
Concept Summary: This system encompasses the distinctive shale barrens of the Central and Southern Appalachians at low to mid elevations. The exposure and lack of soil create extreme conditions for plant growth. Vegetation is mostly classified as woodland, overall, but may include large open areas of sparse vegetation. Dominant trees are primarily *Quercus montana* and *Pinus virginiana*, although on higher-pH substrates the common trees include *Juniperus virginiana* and *Fraxinus americana*. Shale barren 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.
Comments: Examples of related barrens in the "Knobs" region of Kentucky are included in Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692), not here. The southern range limit is not completely clear. "Central Appalachian Shale Barrens" (sensu VDNH) are the "core" concept. The bluestone shale barrens of West Virginia are placed in this system even though many of the endemics are not present there; the same is true at the northern periphery of this system in Pennsylvania.

DISTRIBUTION

Range: This system is found from southern Pennsylvania south to Virginia and extreme eastern Tennessee. Application of the concept south of Virginia is uncertain. It is not attributed to Kentucky.
Divisions: 202:C
TNC Ecoregions: 50:P, 51:P, 59:C
Nations: US
Subnations: MD:SNR, NC?:SNA, PA:SNR, TN:SNR, VA:SNR, WV:SNR
Map Zones: 57:C, 61:C
USFS Ecomap Regions: M221Ac:CCC, M221Be:CCC

CONCEPT

High-ranked species: Allium oxyphilum (G2), Arabis serotina (G2), Canis rufus (G1Q), Carex juniperorum (G3), Clematis coactilis (G3), Clematis viticaulis (G1), Malaxis bayardii (G1G2), Melanoplus divergens (G2G3), Oenothera argillicola (G3G4), Phlox buckleyi (G2), Pyrgus wyandot (G1G2Q), Taenidia montana (G3), Thaspium pinnatifidum (G2G3), Trifolium virginicum (G3), Virginia valeriae pulchra (G5T3T4)
Environment: This system is found at low to mid elevations in the Central and Southern Appalachians. Most shale barrens occur between 305 and 610 m (1000-2000 feet) elevation and have a generally southern exposure. Slopes are steep and often undercut by a stream at the base. Soils are thin, with a layer weathered rock fragments covering the surface. The exposure and lack of soil create extreme conditions for plant growth. The chemistry and pH vary somewhat from site to site, and this variability may be reflected in the vegetation. The substrate includes areas of solid rock as well as unstable areas of shale scree, usually steeply sloped.
Vegetation: Although stunted trees of several species such as *Quercus montana (= Quercus prinus), Pinus virginiana*, and *Carya glabra* are common, Central Appalachian Shale Barrens are strongly characterized by their open physiognomy and by a suite of uncommon and rare plants found almost exclusively in these habitats (Fleming et al. 2004). Endemic or near-endemic shale barren species include *Arabis serotina, Clematis albicoma, Clematis viticaulis* (also endemic to Virginia), *Eriogonum allenii, Oenothera argillicola, Packera antennariifolia*, and *Trifolium virginicum*. Other more-or-less widespread and characteristic herbaceous species of Virginia shale barrens include *Carex pensylvanica, Schizachyrium scoparium, Danthonia spicata, Deschampsia flexuosa var. flexuosa, Phlox subulata, Paronychia montana, Selaginella rupestris, Antennaria virginica, Potentilla canadensis, Helianthus laevigatus, Brickellia eupatorioides var. eupatorioides, Blephilia ciliata, Erysimum capitatum var. capitatum* (Bath and Alleghany counties).

SOURCES

References: Comer et al. 2003*, Eyre 1980, Fleming et al. 2004, Keener 1970, Platt 1951, Schafale 2012, TDNH unpubl. data 2018
Version: 05 May 2008**Stakeholders:** East, Southeast
Concept Author: S.C. Gawler **Lead Resp:** East

CES202.591 CENTRAL APPALACHIAN DRY OAK-PINE FOREST

Primary Division: Central Interior and Appalachian (202)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Acidic Soil; Pinus (strobus, rigida, echinata, virginiana) - Quercus prinus
National Mapping Codes: EVT 7369; BPS 8869
Concept Summary: These oak and oak-pine forests cover large areas in the low- to mid-elevation Central Appalachians and middle Piedmont. The topography and landscape position range from rolling hills to steep slopes, with occasional occurrences on more level, ancient alluvial fans. In the highly dissected fall zone of Maryland and the District of Columbia, where the Piedmont and Coastal Plain meet, it is also found on dry knolls capped with Pleistocene- and Tertiary-aged fluvial cobble and gravel terrace deposits. Soils are typically coarse and infertile; they may be deep (on glacial deposits in the northern and terrace deposits in the southern parts of the system's range), or more commonly shallow, on rocky slopes of acidic rock (shale, sandstone, other acidic igneous or metamorphic rock). The well-drained soils and exposure create dry conditions. The forest is mostly closed-canopy but can include patches of more open woodlands. It is dominated by a variable mixture of dry-site oak and pine species, most typically *Quercus montana, Pinus virginiana*, and *Pinus strobus*, but sometimes *Quercus alba* and/or *Quercus coccinea*. The system may include areas of oak forest, pine forest (usually small), and mixed oak-pine forest. Heath shrubs such as *Vaccinium pallidum, Gaylussacia baccata*, and *Kalmia latifolia* are common in the understory and often form a dense layer. Embedded submesic ravines and concave landforms support slightly more diverse forests characterized by mixtures of oaks, several hickories, *Cornus florida*, and sometimes *Liriodendron tulipifera*. Small hillslope pockets with impeded drainage may support small isolated wetlands with *Acer rubrum* and *Nyssa sylvatica* characteristic. Disturbance agents include fire, windthrow, and ice damage. Increased site disturbance generally leads to secondary forest vegetation with a greater proportion of *Pinus virginiana* and weedy hardwoods such as *Acer rubrum*.
Comments: This system occurs in drier settings than the other matrix oak forest system of the division, Northeastern Interior Dry-Mesic Oak Forest (CES202.592), except in New York and New England, which are mostly out of the range of CES202.592. In that system, *Quercus rubra, Quercus alba, Quercus velutina*, and/or *Quercus coccinea* and *Carya* spp. are the typical dominants rather than *Quercus montana*. It includes the system formerly segregated as Southern Piedmont Dry Oak-Heath Forest (CES202.023). Its analog from central Virginia south is Southern Piedmont Dry Oak-(Pine) Forest and Woodland (CES202.339), which has somewhat more southern floristics, for example, the typical presence of *Pinus taeda*.

DISTRIBUTION

Range: This system is found from central New England through Pennsylvania and south to the Roanoke River in southern Virginia. It is primarily Appalachian but overlaps slightly into the upper Piedmont and fall zone in Virginia, Maryland and the District of Columbia.
Divisions: 202:C
TNC Ecoregions: 52:C, 58:C, 59:C, 60:C, 61:C
Nations: US
Subnations: CT:SNR, DC:SNR, MA:SNR, MD:SNR, ME:SNR, NH:SNR, NJ:SNR, NY:SNR, OH:SNR, PA:SNR, RI:SNR, VA:SNR, VT:SNR, WV:SNR
Map Zones: 57:P, 60:C, 61:C, 63:C, 64:C, 65:C, 66:C
USFS Ecomap Regions: 211E:CC, 211F:CC, 211G:CC, 211I:CC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Am:CCC, 221An:CCP, 221B:CC, 221D:CC, 232A:CC, M221A:CC, M221Ba:CCC, M221Bb:CCC, M221Bd:CCC, M221Bf:CCC, M221Da:CCC

CONCEPT

High-ranked species: Callophrys irus (G2G3)
Environment: These oak and oak-pine forests cover large areas in the low- to mid-elevation central Appalachians and middle Piedmont. The topography and landscape position range from rolling hills to steep slopes, with occasional occurrences on more level, ancient alluvial fans. The soils are coarse and infertile; they may be deep (on glacial deposits in the northern part of the system's range), or more commonly shallow, on rocky slopes of acidic rock (shale, sandstone, other acidic igneous or metamorphic rock). The well-drained soils and exposure create dry conditions. In the highly dissected fall zone of Maryland and the District of Columbia, where the Piedmont and

Coastal Plain meet, it is also found on dry knolls capped with Pleistocene- and Tertiary-aged fluvial cobble and gravel terrace deposits.
Vegetation: Stands of this forest system are mostly closed-canopied but can include more open woodlands. They are dominated by a variable mixture of dry-site oak and pine species, including *Quercus montana (= Quercus prinus), Pinus virginiana*, and *Pinus strobus*. The system may include areas of pine forest and mixed oak-pine forest. Heath shrubs such as *Vaccinium pallidum, Gaylussacia baccata*, and *Kalmia latifolia* are common in the understory. Within these forests, hillslope pockets with impeded drainage may support small isolated wetlands with *Acer rubrum* and *Nyssa sylvatica* characteristic.
Dynamics: Disturbance agents include fire, windthrow, and ice damage.

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch (at outer range) to matrix (in center of range) system that may cover extensive hillslopes and low ridges.
Other Comments: In the Blue Ridge (EPA Level III Ecoregion 66), this extends south to the Roanoke River in central Virginia, where it is replaced by Southern Appalachian Oak Forest (CES202.886). In the northern Piedmont (EPA Level III Ecoregion 64), this extends south to Richmond, Virginia, where southward (i.e., in EPA Level III ecoregion 45) it is replaced by Southern Piedmont Dry Oak-(Pine) Forest and Woodland (CES202.339). This corresponds closely to the line between USFS Sections 231I and 221D, with CES202.591 occurring in 221D and CES202.339 in 231I (SCG 7-07).

SOURCES

References: Comer et al. 2003*, Edinger et al. 2014a, Eyre 1980, Gawler and Cutko 2010, LANDFIRE 2007a, ONHD unpubl. data, Sperduto and Nichols 2004
Version: 23 Jan 2012**Stakeholders:** East, Midwest, Southeast
Concept Author: S.C. Gawler **Lead Resp:** East

CES202.600 CENTRAL APPALACHIAN PINE-OAK ROCKY WOODLAND

Primary Division: Central Interior and Appalachian (202)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Woody-Herbaceous; Ridge/Summit/Upper Slope; Acidic Soil; Pinus (strobus, rigida, echinata, virginiana) - Quercus prinus
National Mapping Codes: EVT 7377; BPS 6377
Concept Summary: This system encompasses open or patchily wooded hilltops and outcrops or rocky slopes in the Central Appalachians, High Allegheny Plateau, and Lower New England / Northern Piedmont. It occurs mostly at lower elevations, but occasionally up to 1220 m (4000 feet) in West Virginia. The substrate rock is generally granitic or of other acidic lithology, although near the northern limit of its range in New England, examples can also occur on intermediate, base-rich, or mafic bedrock including traprock. The vegetation is patchy, with woodland as well as open portions. *Pinus rigida* (and within its range *Pinus virginiana*) is diagnostic and often mixed with xerophytic *Quercus* spp. and sprouts of *Castanea dentata*. In New England, some examples lack pine and feature *Juniperus virginiana* or *Ostrya virginiana* as important codominants with oak. Some areas have a fairly well-developed heath shrub layer, others a graminoid layer, the latter particularly common under oaks or other deciduous trees. Conditions are dry and for the most part nutrient-poor, and at many, if not most, sites, a history of fire is evident. In the Central Appalachians ecoregion, this system is rarely found on sandy soils rather than rock.
Comments: The northern extent of this system in central New England may overlap with Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571), which has *Picea* spp. prominent. The southern extent overlaps with Southern Appalachian Montane Pine Forest and Woodland (CES202.331), which is characterized by *Pinus pungens*. The present type may have some *Pinus pungens* (from southern Pennsylvania south) but generally has other pines as well. This type is differentiated from the similar Central Appalachian Dry Oak-Pine Forest (CES202.591) by its mosaic nature of wooded and open patches, as opposed to being merely a "thin forest." New England dry-rich forest/woodlands (e.g., those on traprock ridges) are also housed here, expanding the concept beyond pitch pine diagnostics. Pike Knob, West Virginia, with its disjunct red pine woodlands, is put into this system.

DISTRIBUTION

Range: This system occurs from central New England south to Virginia and West Virginia, with peripheral occurrences in southeastern Ohio and easternmost Kentucky.
Divisions: 202:C
TNC Ecoregions: 49:C, 50:C, 52:C, 59:C, 60:C, 61:C, 64:C
Nations: US
Subnations: CT:SNR, KY:SNR, MA:SNR, MD?:SNA, ME:SNR, NH:SNR, NJ:SNR, NY:SNR, OH:SNR, PA:SNR, VA:SNR, VT:SNR, WV:SNR
Map Zones: 53:C, 57:P, 60:C, 61:C, 62:C, 63:C, 64:C, 65:C, 66:C
USFS Ecomap Regions: 211E:CC, 211F:CC, 221A:CC, 221B:CC, M211Bb:CCC, M211Bd:CCC, M211C:CC, M221A:CC, M221B:CP

CONCEPT

High-ranked species: Arabis serotina (G2), Canis rufus (G1Q), Carex polymorpha (G3), Castanea dentata (G3), Catocala herodias gerhardi (G3T3), Gaylussacia brachycera (G3), Malaxis bayardii (G1G2), Packera millefolium (G3), Pyrgus wyandot (G1G2Q), Taenidia montana (G3), Virginia valeriae pulchra (G5T3T4)
Environment: This system occurs mostly at lower elevations, but occasionally up to 1220 m (4000 feet) in West Virginia. The substrate rock is generally granitic or of other acidic lithology, although near the northern limit of its range in New England, examples can also occur on intermediate, base-rich, or mafic bedrock including traprock.

This system contains species-poor, fire-influenced, mixed woodlands of xeric, exposed montane habitats. They are typically located on convex, south to west facets of steep spur ridges, narrow rocky crests, and cliff tops. Pine - oak / heath woodlands are widespread throughout both the Ridge and Valley and Blue Ridge provinces in western Virginia. They occur at elevations from below 305 m (1000 feet) to more than 1220m (4000 feet) on various substrates, but most commonly on acidic, sedimentary and metasedimentary substrates, e.g., sandstone, quartzite, and shale. A few stands occur on Piedmont monadnocks and foothills. Soils are very infertile, shallow, and droughty (VDNH 2007).

The type is restricted to poor, dry sites which have been disturbed in the recent past by heavy cutting, fire, or both. It is found on thin, rocky soils in the mountainous areas. Soils are strongly acidic and devoid of nutrients. Precipitation is low in the shale barrens of eastern West Virginia and adjacent states (Eyre 1980).
Vegetation: Short-statured *Pinus pungens* and *Pinus rigida* are usually the dominants forming an open overstory, often with codominant *Quercus montana*. Less important tree associates include *Quercus coccinea, Pinus virginiana*, and *Sassafras albidum*. Except in the Piedmont, *Quercus ilicifolia* is characteristically abundant in the shrub layer, along with various ericaceous species. Colonial shrubs usually preempt available microhabitats for most herbaceous species, but *Pteridium aquilinum var. latiusculum* and *Xerophyllum asphodeloides* are often competitive enough to achieve significant cover (VDNH 2007). The globally rare *Carex polymorpha* is locally associated with these woodlands (VDNH 2007).
Dynamics: Periodic fire is an important ecological process that provides opportunities for regeneration of both pines and less competitive herbaceous species, while setting back successional encroachment of potential overstory oaks (especially chestnut oak). On cliffs and other very rocky sites, the vegetation is self-perpetuating due to extreme edaphic conditions. (VDNH 2007). Fire is the most common disturbance type, but frost pockets and late-spring frosts have been also documented. If disturbances occur very frequently (every 2-3 years), *Quercus ilicifolia* may be replaced by low shrubs, grasses, ferns, and other herbs. If disturbances are infrequent, canopy trees can outgrow the shade-intolerant *Quercus ilicifolia*. Suppression of white pine and increase in Virginia pine were accomplished through low-intensity fires in shortleaf pine - oak forests in Georgia (Hubbard et al. 2004).

SPATIAL CHARACTERISTICS

Size: Patch sizes can range from a few acres to 300+ acres, but typically range from 1-50 acres. It is usually a small-patch occurrence.

SOURCES

References: Comer et al. 2003*, Edinger et al. 2014a, Eyre 1980, Gawler and Cutko 2010, Hubbard et al. 2004, LANDFIRE 2007a, Metzler and Barrett 2006, ONHD unpubl. data, Sperduto 2005, Sperduto and Nichols 2004, VDNH 2007
Version: 23 Jan 2012**Stakeholders:** East, Midwest, Southeast
Concept Author: S.C. Gawler **Lead Resp:** East

CES202.592 NORTHEASTERN INTERIOR DRY-MESIC OAK FOREST

Primary Division: Central Interior and Appalachian (202)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland
Diagnostic Classifiers: Lowland; Forest and Woodland (Treed); Acidic Soil; Quercus - Carya
National Mapping Codes: EVT 7303; BPS 8803
Concept Summary: These oak-dominated forests are one of the matrix forest systems in the northeastern and north-central U.S. Occurring in dry-mesic settings, they are typically closed-canopy forests, though there may be areas of patchy-canopy woodlands. They cover large expanses at low to mid elevations, where the topography is flat to gently rolling, occasionally steep. Soils are mostly acidic and relatively infertile but not strongly xeric. Local areas of calcareous bedrock, or colluvial pockets, may support forests typical of richer soils. Oak species characteristic of dry-mesic conditions (e.g., *Quercus rubra, Quercus alba, Quercus velutina*, and *Quercus coccinea*) and *Carya* spp. (particularly *Carya tomentosa, Carya glabra, Carya ovalis, Carya ovata*, and *Carya pallida*) are dominant in mature stands. *Quercus montana* may be present but is generally less important than the other oak species. *Castanea dentata* was a prominent tree before chestnut blight eradicated it as a canopy constituent. *Acer rubrum, Betula lenta*, and *Betula alleghaniensis* may be common associates; *Acer saccharum* is occasional. With a long history of human habitation, many of the forests are early- to mid-successional, where *Pinus strobus, Pinus virginiana*, or *Liriodendron tulipifera* may be dominant or codominant. Within these forests, hillslope pockets with impeded drainage may support small isolated wetlands, including non-forested seeps or forested wetlands with *Acer rubrum, Quercus bicolor*, or *Nyssa sylvatica* characteristic.
Comments: The oak-dominated forest matrix in this region spans a range of elevational and moisture regimes, reflected in different ecological systems. Those in drier settings, within the general range of this system, are placed in either Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359) or Central Appalachian Dry Oak-Pine Forest (CES202.591).

DISTRIBUTION

Range: This system is found from southern New York west through Ohio and Pennsylvania and south to Virginia. It does not extend to the southernmost part of Virginia, except in the Ridge and Valley.
Divisions: 202:C
TNC Ecoregions: 49:C, 52:C, 59:C, 60:C, 61:C
Nations: US
Subnations: MA:SNR, MD:SNR, NJ:SNR, NY:SNR, OH:SNR, PA:SNR, VA:SNR, WV:SNR
Map Zones: 53:C, 57:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecomap Regions: 211F:CC, 211G:CC, 221Ae:CCC, 221Am:CCC, 221B:CC, 221D:CC, 221F:CC, M221A:CC, M221B:CC, M221Da:CCC

CONCEPT

High-ranked species: Callophrys irus (G2G3), Canis rufus (G1Q), Carex communis var. amplisquama (G5T3), Carex polymorpha (G3), Castanea dentata (G3), Coreopsis delphiniifolia (G3?), Fothergilla major (G3), Gaylussacia brachycera (G3), Melanoplus serrulatus (G1G3), Taenidia montana (G3), Thermopsis fraxinifolia (G3?), Thermopsis mollis (G3G4), Virginia valeriae pulchra (G5T3T4)
Environment: These oak-dominated forests are one of the matrix forest systems in the northeastern and north-central U.S. Occurring in dry-mesic settings, they are typically closed-canopy forests, though there may be areas of patchy-canopy woodlands. They cover large expanses at low to mid elevations, where the topography is flat to gently rolling, occasionally steep. The typical landscape position is midslope to toeslope, transitioning to more xeric systems on the upper slopes and ridges. Soils are acidic and relatively infertile but not strongly xeric.
Vegetation: Mature stands are dominated by oak species characteristic of dry-mesic conditions (e.g., *Quercus rubra, Quercus alba, Quercus velutina*, and *Quercus coccinea*), along with various *Carya* spp. (particularly *Carya tomentosa (= Carya alba), Carya glabra, Carya ovalis, Carya ovata*, and *Carya pallida*). In addition, *Quercus montana (= Quercus prinus)* may be present but is generally less important than the other oak species. *Castanea dentata* was a prominent tree before chestnut blight eradicated it as a canopy constituent. *Acer rubrum* and *Betula lenta* are frequently common associates. Local areas of calcareous bedrock may support forests typical of richer soils (e.g., with *Acer saccharum* and/or *Quercus muehlenbergii*). Common shrubs include *Viburnum acerifolium, Hamamelis virginiana, Corylus* spp., and *Smilax* spp., as well as heaths such as *Kalmia latifolia, Vaccinium* spp., and *Gaylussacia* spp. Herbs, forbs, and ferns are usually sparse to moderate in density.

Dynamics: This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration. Most oaks are long-lived, with typical age of mortality ranging from 200 to 400 years. *Quercus coccinea* and *Quercus velutina* are shorter-lived with typical ages being approximately 50 to 100 years, while *Quercus alba* can live as long as 600 years. Extreme wind or ice storms occasionally create larger canopy openings.

This forest system is characterized by low-severity surface fires that cause variable structure and composition based on fire frequency and intensity. The great majority of historical fires were generated by Native Americans.

Open woodlands developed within a moderate burning regime, (fire-return intervals of 5 to 15 years), and canopy closure occurred with greater fire-return intervals. Shade-tolerant, fire-sensitive trees such as *Acer saccharum* regenerated beneath oak-hickory canopies when fire was excluded over several decades. With continued fire exclusion, *Acer saccharum* and other late-successional species gradually replaced overstory oaks and hickories as forest gaps closed (Sutherland et al. 2003), generating a mosaic of vegetation types formed with varying fire history (Cutter and Guyette 1994). A recent study on fire history of a *Quercus rubra* stand in West Virginia revealed that fire intervals ranged from 7 to 32 years from 1846 to 2002, in contrast to intervals of 7 to 15 years prior to the fire control era. These results were consistent with previous research in the oak forests of Ohio, Maryland, and Missouri (Schuler and McClain 2003).

SPATIAL CHARACTERISTICS

Spatial Summary: These were historically among the most important matrix forests of the Northeast. They cover extensive areas where conditions are not extreme. Upslope they may grade into more xeric oak ridge systems or rocky oak-pine forests/woodlands. Mesic cove forest systems may be embedded within this matrix in protected draws. Small pocket wetlands, not discriminated as separate systems, may also occur within these forests.
Adjacent Ecological System Comments: Dry-mesic oak forests often occur on hilltops and sideslopes. Though often contiguous, patches of this system are often interdigitated with other systems, especially Southern and Central Appalachian Cove Forest (CES202.373) and Central Appalachian Dry Oak-Pine Forest (CES202.591). At the highest elevations, this system may grade into Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593). Small patches of other communities, such as rock outcrops and mountain wetlands, are sometimes embedded within this system.

SOURCES

References: Braun 1950, Comer et al. 2003*, Cutter and Guyette 1994, Edinger et al. 2014a, Eyre 1980, Greller 1988, LANDFIRE 2007a, ONHD unpubl. data, Schuler and McClain 2003, Sutherland et al. 2003, USFS 1995, Vanderhorst and Streets 2006
Version: 20 Aug 2015**Stakeholders:** East, Midwest, Southeast
Concept Author: S.C. Gawler **Lead Resp:** East

CES203.069 NORTHERN ATLANTIC COASTAL PLAIN CALCAREOUS RAVINE

Primary Division: Gulf and Atlantic Coastal Plain (203)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland
Diagnostic Classifiers: Ravine; Slope; Seepage-Fed Sloping; Calcareous
National Mapping Codes: EVT 9190; BPS 8190
Concept Summary: This system occurs on dry to mesic slopes and saturated bottoms of dissected ravine systems in the northern Atlantic Coastal Plain where erosion has exposed Tertiary-aged shell deposits, limesands, or aboriginal shell middens. These calcium-bearing sediments produce soils that range from slightly acidic to circumneutral and moderately to very strongly calcareous. The fertile soils support a rich diversity of plant species that distinguishes this system from the more widespread dry-mesic, acidic (poor) ravines. This system includes mostly deciduous upland forests and woodlands on slopes and low interfluves and forested seepage wetlands found in saturated stream valley bottoms. Species composition varies with the environmental setting , but all habitats are characterized by species indicative of high base status soils. The communities of this system often contain species that are disjunct from their primary ranges in the mountains or Piedmont, such as Erigeron pulchellus, *Actaea pachypoda, Caltha palustris, Pedicularis lanceolata, Solidago flexicaulis, Quercus muehlenbergii, Verbesina virginica var. virginica, Hexalectris spicata, Corallorhiza wisteriana, Campanulastrum americanum, Celastrus scandens, Muhlenbergia sobolifera, Muhlenbergia tenuiflora, Sanicula marilandica*, and *Thalictrum revolutum*.

DISTRIBUTION

Range: This system is known from the northern Atlantic Coastal Plain of Virginia and Maryland, possibly ranging north into Delaware and New Jersey.
Divisions: 203:C
TNC Ecoregions: 57:C, 58:C
Nations: US
Subnations: DE?:SNA, MD:SNR, NJ?:SNA, VA:SNR
Map Zones: 60:C

CONCEPT

High-ranked species: Actaea racemosa (G3G4)
Environment: This system occurs on dry to mesic slopes and saturated bottoms of dissected ravine systems in the northern Atlantic Coastal Plain where erosion has exposed Tertiary-aged shell deposits, limesands or aboriginal shell middens that have been exposed by downcutting streams or on river fronting bluffs along the northern Atlantic Coastal Plain of Virginia, Maryland, Delaware and New Jersey. It includes mesic and dry uplands and groundwater-saturated wetlands associated with these fertile, base-rich soils. Occurrences are typically linear or small patch and uncommon.
Vegetation: Forests of mesic slopes and low interfluves are characterized by *Fagus grandifolia, Liriodendron tulipifera, Quercus alba, Carya cordiformis*, and *Quercus rubra* in the overstory. Other canopy dominants and associates may include *Quercus muehlenbergii, Fraxinus americana, Tilia americana*, and *Acer floridanum (= Acer barbatum)*. The understory is often dense and may include *Asimina triloba, Lindera benzoin, Viburnum prunifolium, Ulmus rubra, Ilex opaca, Magnolia tripetala*, and *Cercis canadensis var. canadensis*. The ground cover is lush though sometimes patchy and may include *Podophyllum peltatum, Arisaema triphyllum, Sanguinaria canadensis, Circaea lutetiana ssp. canadensis, Maianthemum racemosum ssp. racemosum, Cardamine concatenata*, and *Polystichum acrostichoides*. More locally abundant herbs include *Cystopteris protrusa, Deparia acrostichoides, Diplazium pycnocarpon, Actaea racemosa (= Cimicifuga racemosa), Phegopteris hexagonoptera, Nemophila aphylla*, and *Actaea pachypoda*.

Drier, more southerly facing convex slopes are characterized by a more open canopy of *Quercus muehlenbergii*; common associates may include *Acer floridanum, Carya cordiformis, Fagus grandifolia, Fraxinus americana, Quercus alba, Quercus rubra*, and *Quercus montana (= Quercus prinus)*. The understory may include *Juniperus virginiana var. virginiana, Cercis canadensis var. canadensis, Dirca palustris, Ilex opaca var. opaca, Sideroxylon lycioides*, and *Viburnum rufidulum*. The herb layer is usually patchy but contains a diversity of species, including *Aquilegia canadensis, Erigeron pulchellus var. pulchellus, Bromus pubescens, Dichanthelium boscii, Verbesina virginica var. virginica, Campanulastrum americanum, Smallanthus uvedalius, Silphium trifoliatum var. trifoliatum, Desmodium pauciflorum, Hexalectris spicata*, and *Piptochaetium avenaceum*.

Forested seepage wetlands are often found along stream bottoms and at the base of slopes. Braided streams and hummock-and-hollow microtopography are characteristic of the environmental setting. The tree canopy is characterized by *Fraxinus pennsylvanica, Acer rubrum, Liquidambar styraciflua, Nyssa biflora*, and others. The shrub layer is composed of *Lindera benzoin, Morella cerifera (= Myrica cerifera)*, and *Cornus foemina*. Vines are abundant, especially *Decumaria barbara*. The herbaceous layer is characterized by *Caltha palustris, Carex bromoides, Packera aurea (= Senecio aureus), Scirpus lineatus, Thelypteris palustris, Pedicularis lanceolata, Carex tetanica, Liparis loeselii*, and *Carex granularis* on drier hummocks, and *Saururus cernuus, Bidens laevis, Pilea fontana, Glyceria striata*, and *Impatiens capensis* in wetter hollows and seepage rivulets.
Dynamics: Natural erosion of steep bluffs exposed by downcutting streams.

SPATIAL CHARACTERISTICS

Spatial Summary: Small, linear patch.

SOURCES

References: Comer et al. 2003*, Eyre 1980, Fleming 2002b, McAvoy and Harrison 2012, Patterson 2008c, Ware and Ware 1992
Version: 14 Jan 2014**Stakeholders:** East, Southeast
Concept Author: NCR Review Team **Lead Resp:** East

CES203.475 NORTHERN ATLANTIC COASTAL PLAIN DRY OAK-HARDWOOD FOREST

Primary Division: Gulf and Atlantic Coastal Plain (203)
Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval; Broad-Leaved Deciduous Tree
National Mapping Codes: EVT 7324; BPS 8824
Concept Summary: This ecological system comprises dry hardwood forests largely dominated by oaks, ranging from sandy glacial and outwash deposits of Cape Cod, Massachusetts, and Long Island, New York, south to the Coastal Plain portions of Maryland and Virginia south to about the James River. *Quercus alba, Quercus montana (= Quercus prinus), Quercus coccinea*, and *Quercus rubra* are typical, and *Ilex opaca* is sometimes present. *Pinus* species may be codominant in some areas, for example the mixture of oaks with *Pinus virginiana* or *Pinus echinata* on very xeric, relict inland dunes. In the northern half of the range, conditions can grade to dry-mesic, reflected in the local abundance of *Fagus grandifolia*. These forests occur on acidic, sandy to gravelly soils with a thick duff layer, often with an ericaceous shrub layer. From New Jersey south to Virginia, this system also includes oak-beech/heath forests on steep slopes.
Comments: This system grades into other hardwood types of the northeastern U.S. as one moves inland and northward. North of Cape Cod, similar forests are treated as part of Central Appalachian Dry Oak-Pine Forest (CES202.591). In Delaware and New York these coastal forests are apparently distinct (fauna, flora and substrate are distinct) from more inland forests. The southern part of this type's range overlaps with Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242); where they overlap, they are separated based on moisture regime, with the drier forests (often with an ericaceous shrub layer) going to this type.

DISTRIBUTION

Range: This system ranges from sandy glacial and outwash deposits of Massachusetts and Long Island, New York, south to the Coastal Plain portions of Maryland and Virginia, south to about the James River, with historic occurrences (and possibly some extant remnants) in eastern Pennsylvania.
Divisions: 202:C, 203:C
TNC Ecoregions: 52:P, 58:C, 61:C, 62:C
Nations: US
Subnations: CT:SNR, DC:SNR, DE:SNR, MA:SNR, MD:SNR, NJ:SNR, NY:SNR, PA:SNR, VA:SNR
Map Zones: 60:C, 65:C, 66:C
USFS Ecomap Regions: 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221An:CCC, 221Db:CPP, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Ha:CCC, 232Hb:CCC, 232Hc:CCC, 232Hd:CCC, 232Ib:CCC

CONCEPT

Other Comments: Includes the system formerly segregated as Atlantic Coastal Plain Northern Mixed Oak-Heath Forest (CES203.188).

SOURCES

References: Comer et al. 2003*, Edinger et al. 2014a, Eyre 1980, NatureServe Explorer 2009a
Version: 05 Feb 2009**Stakeholders:** East, Southeast
Concept Author: R. Evans **Lead Resp:** East

CES203.269 NORTHERN ATLANTIC COASTAL PLAIN PITCH PINE BARRENS

Primary Division: Gulf and Atlantic Coastal Plain (203)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Xeric; F-Patch/High Intensity; Needle-Leaved Tree
National Mapping Codes: EVT 7355; BPS 8855
Concept Summary: This system comprises a group of dry pitch pine woodlands and forests of deep sandy soils ranging from Cape Cod (Massachusetts) south through Long Island (New York) and the famous Pine Barrens of the New Jersey Coastal Plain, with occasional occurrences north to southernmost Maine and south to the Anacostia watershed (Maryland). The vegetation is characterized by a tree canopy of *Pinus rigida* with a tall-shrub layer dominated by *Quercus ilicifolia* and a low-shrub layer characterized by *Vaccinium pallidum* and/or *Vaccinium angustifolium*. The system is heavily influenced by fire, the composition and structure of its components varying with fire frequency. In general, tree oaks are more prevalent in those stands having a longer fire-return interval; fire frequencies of 8-10 years foster the growth of "pine plains," i.e., dwarf pine stands 1 m in height. Pine barrens with a history of more-or-less biennial burns for lowbush blueberry production may have very few trees and be

characterized as sandplain grasslands. Dwarf-shrubs such as *Arctostaphylos uva-ursi, Vaccinium angustifolium, Vaccinium pallidum*, and *Hudsonia ericoides* typify the field layer of pine plains and sandplain grasslands. *Schizachyrium scoparium* is the most common grass (in close proximity to the coast, it may be represented by its close relative *Schizachyrium littorale*).

Scrub oak stands may occur without pine cover, particularly in low-lying areas that do not intersect the water table, where cold-air drainage inhibits pine growth. North of the glacial boundary, heathlands characterized by *Arctostaphylos uva-ursi, Corema conradii*, and *Morella pensylvanica*, and grasslands characterized by *Schizachyrium littorale, Schizachyrium scoparium*, and *Danthonia spicata* occur as small (or occasionally large) patches. The Pine Barrens of New Jersey are very similar in structure and composition to those north of the glacial boundary but are characterized by additional species, such as *Quercus marilandica, Quercus stellata, Pyxidanthera barbulata, Leiophyllum buxifolium*, and others. Where the water table is close to the surface, pitch pine lowland vegetation (described as a separate system) occurs.

Comments: This system includes the New Jersey Pine Barrens, the uniqueness of which has long been recognized, and the system is well-studied and summarized in a number of recent treatments (Forman 1979, Buckhholz and Good 1982, Gibson et al. 1999).

DISTRIBUTION

Range: This system is found in the Atlantic Coastal Plain from Delaware Bay northward through the New Jersey Coastal Plain and Long Island (New York) to Cape Cod, Massachusetts, with peripheral occurrences in Pennsylvania (historic), New Hampshire (historic), and southern Maine (Kennebunk Plains and Wells Barren).
Divisions: 203:C
TNC Ecoregions: 58:C, 62:C
Nations: US
Subnations: DE:SNR, MA:SNR, MD:SNR, ME:SNR, NH:SNR, NJ:SNR, NY:SNR, PA:SNR, RI:SNR
Map Zones: 60:C, 65:C
USFS Ecomap Regions: 221Ab:CCC, 221Ac:CCP, 221An:CCC, 232A:CC, 232Hc:CCC

CONCEPT

High-ranked species: Catocala herodias gerhardi (G3T3), Phoberia ingenua (G3G4)
Environment: This system typically occurs on deep well-drained sand deposits. In the coastal regions of the glaciated Northeast, it occurs on outwash plains and morainal deposits. In New Jersey, it occurs on Cohansey sand, which is sometimes overlain with hilltop gravel deposits.
Vegetation: The uniqueness of the New Jersey Pine Barrens flora has long been recognized (Stone 1911, Harshberger 1916). More recent treatments by Forman (1979) and Buckhholz and Good (1982) have compiled much of the available information. *Pinus rigida* is the dominant and characteristic species of this system. It may be found in well-developed tree form or as a short-statured, shrubby ecotype. *Pinus rigida* may occur as the sole dominant or occur with a variety of oak species, especially *Quercus marilandica, Quercus stellata*, and *Quercus ilicifolia*. In some examples *Pinus echinata* may co-occur.
Dynamics: Different fire frequencies and intensities interrupt succession, accounting for variations in forest composition. Periodic severe wildfires with 40- to 100-year intervals have produced oak-pine mixtures over extensive areas of uplands, while more frequent severe fires have created mixtures of pitch pine and shrub oaks. The most frequent and severe fires have created the pine plains (Landfire 2007a).

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: Coastal Plain ponds and Atlantic white-cedar swamps may be embedded in these pine barrens.

SOURCES

References: Backman 1984, Buckhholz and Good 1982, Comer et al. 2003*, Edinger et al. 2014a, Eyre 1980, Finton 1998, Forman 1979, Gawler and Cutko 2010, Gibson et al. 1999, Givnish 1981, Harshberger 1916, Jordan et al. 2003, LANDFIRE 2007a, Motzkin and Foster 2002, Stone 1911, Swain and Kearsley 2011, Wacker 1979, Walker and Solecki 1999, Windisch 1990, Windisch 1994, Windisch 1999
Version: 14 Jan 2014**Stakeholders:** East, Southeast
Concept Author: L. Sneddon and K. Straskosch Walz **Lead Resp:** East

CES202.268 PIEDMONT HARDPAN WOODLAND AND FOREST

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Clay Soil Texture; Broad-Leaved Tree
National Mapping Codes: EVT 7342; BPS 8842
Concept Summary: This system of the southern Piedmont occurs in places where a particularly dense clay hardpan has developed over a range of typically mafic rocks, sometimes with more limited areas of shallow glade-like vegetation. In the deeper soil portions of this system, the density of the clay, in combination with its shrink-swell properties, limits water and root penetration into the soil and creates xeric conditions for plants despite the presence of deep soil. Possibly the most typical expression of this system in North and South Carolina is an open forest or woodland of *Quercus stellata*, with *Quercus marilandica* as a characteristic associate. The open canopy leads to a better developed herb layer than in most Piedmont forests, one that is usually grassy. In Virginia, typical canopy trees include *Quercus alba, Carya glabra*, and *Fraxinus americana*. Some of these sites may have once supported open prairies or prairie savannas when they burned more frequently. Fire was probably once the most important natural dynamic process, but the universal elimination of fire in the Piedmont makes this difficult to observe on most of the modern landscape.
Comments: This system is distinguished from others in the Piedmont by occurrence on distinctive substrates. These include hardpan soils in the Triassic basins, as well as on soils derived from gabbro and on acidic metasediments in the Carolina Slate Belt. Despite the contrast in vegetation, this system will sometimes grade quite gradually into Piedmont Upland Depression Swamp (CES202.336), with which it often co-occurs. One of the best sites in South Carolina is the Little Mountain Creek area near Edgefield, SC (Simon and Hayden 2014).

DISTRIBUTION

Range: As currently known, this system is found in the Piedmont of Maryland, Virginia, North Carolina, South Carolina and Georgia. Its status in Alabama is not known. Its occurrence may be more frequent in the Triassic basins, but it is not restricted to them.
Divisions: 202:C
TNC Ecoregions: 52:C, 61:C
Nations: US
Subnations: GA:SNR, MD:SNR, NC:SNR, SC:SNR, VA:SNR
Map Zones: 54:C, 59:C, 60:C, 61:C
USFS Ecomap Regions: 221B:CC, 221D:CC, 221J:CC, 231A:CC, 231D:CC, 231I:CC, M221A:CC, M221B:CC

CONCEPT

High-ranked species: Amorpha schwerinii (G3G4), Berberis canadensis (G3G4), Collinsonia tuberosa (G3G4), Collinsonia verticillata (G3G4), Coreopsis delphiniifolia (G3?), Echinacea laevigata (G2G3), Helianthus schweinitzii (G3), Lotus unifoliolatus var. helleri (G5T3), Parthenium auriculatum (G3G4), Rhus michauxii (G2G3), Ribes echinellum (G1), Ruellia purshiana (G3), Symphyotrichum georgianum (G3), Trillium discolor (G3), Trillium lancifolium (G3), Trillium reliquum (G3)
Environment: This system occurs in places in the southern Piedmont where a particularly dense clay hardpan, typically composed of Montmorillonite, has developed. The substrate is typically mafic igneous or metamorphic rock (gabbro, basalt, diabase, or amphibolite) but occasionally is slate. The density of the clay, or its shrink-swell properties, limits penetration of water into the soil and limits penetration of roots, creating xeric conditions for plants despite the presence of deep soil. These areas generally occur on unusually flat uplands but may occur on tops of narrower ridges. Only a minority of these substrates form the distinctive soil conditions of this system. Local topography that promotes runoff is important to forming this system. Areas with these soil conditions but with concave topography perch water and support Piedmont depressional wetlands. Soils in most examples are basic or circumneutral, but those formed from slate are somewhat acidic. In Virginia and adjacent Maryland, this system occupies one of the largest Triassic basins in eastern North America. It includes a mix of sedimentary rocks, especially siltstone, mixed with igneous intrusions. The igneous rocks weather to form more mafic soils, while the sedimentary rocks are more acidic. The local landscape may best be thought of as a lowland, in comparison with the surrounding and prevailing topography.
Vegetation: Vegetation consists of xerophytic species, most typically consisting of open forests or woodlands of *Quercus stellata*, with *Quercus marilandica* as a characteristic associate in North and South Carolina. In Virginia and adjacent Maryland, *Quercus alba, Fraxinus americana*, and *Carya glabra* are common canopy components. The open canopy leads to a better developed herb layer than in most Piedmont forests, one that is usually grassy. Some of these sites may have once supported open prairies or prairie savannas when they burned more frequently. A

significant flora of shade-intolerant herbs with prairie affinities is present in open areas on these soils. Typical understory species include *Juniperus virginiana, Cercis canadensis, Diospyros virginiana, Vaccinium arboreum, Ulmus alata*, and *Chionanthus virginicus*. Shrubs may be sparse or dense, with *Viburnum rafinesqueanum, Viburnum prunifolium, Vaccinium stamineum*, and *Vaccinium pallidum* being typical. The most common herbs are *Danthonia spicata* and *Schizachyrium scoparium*. Other herbs include *Clematis ochroleuca, Sericocarpus linifolius (= Aster solidagineus), Hieracium venosum, Hieracium gronovii, Hypericum hypericoides, Symphyotrichum dumosum (= Aster dumosus), Lespedeza* spp., *Oenothera fruticosa, Liatris pilosa (= Liatris graminifolia)*, and *Solidago* spp. (Schafale and Weakley 1990). In contrast to upland forests of adjacent portions of the Virginia Piedmont, there seems to be a greater abundance of hickory in examples of this ecological system (Farrell and Ware 1991, Ware 1992).

Dynamics: Fire was probably once the most important natural dynamic process, but the universal elimination of fire in the Piedmont makes this difficult to determine. Both the drier character of the sites and the distinctive soil conditions interact with one another to retard woody succession. These factors would presumably have interacted with the fire regime to promote more open vegetation on these sites. This would presumably lead to a greater probability that these open woodland conditions would prevail for a longer period than they would on more typical soils. Fire would have kept canopies open and would have promoted a more diverse, grass-dominated herb layer. Bison may have once been a significant grazing influence on this system. These sites are now of limited extent and it is harder to determine how these past disturbance factors operated in the larger landscape.

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system.

Size: Occurs in large patches, ranging up to dozens of acres.

Heterogeneity: This system often occurs in mosaics with Piedmont Upland Depression Swamp (CES202.336) or Southern Piedmont Dry Oak-(Pine) Forest (CES202.339). Within the system, patches are usually homogeneous, with only one or occasionally two associations.

Adjacent Ecological System Comments: Piedmont Upland Depression Swamp (CES202.336) occurs on similar soils with topography that limits runoff of rainwater. Most are surrounded by basic soil associations of Southern Piedmont Dry Oak-(Pine) Forest and Woodland (CES202.339) on less extreme soils.

Other Comments: M. Schafale (pers. comm. 2006): I know that Virginia has some around Kerr Lake, but I don't know how far north it goes. "They do occur in other geologic regions than the Triassic Basin, and on other substrates too. We have some on gabbro near Charlotte and some on acidic metasediments in the Carolina Slate Belt. Most are on mafic rocks, with the clayey sedimentary rocks being the other major setting. Big diabase sills in Triassic basins are one of the largest kinds of mafic rock in the Piedmont, but the gabbro plutons in the Charlotte belt rival them. It's a more recently learned and less common thing to have them on acidic shales. Then there's the Leaksville loam site, which is on a somewhat basic Triassic clay. See EPA ecoregions 64a (Triassic Lowlands) and 64b (Traprock and Conglomerate Uplands - also called "Diabase and Conglomerate Uplands") (EPA 2004). This system bears some relationship to these map units. Gary Fleming 5-06: "CEGL008475 occurs throughout the Virginia Piedmont and parts of the inner Coastal Plain. CEGL006216 is endemic to the Northern Virginia Triassic Basin (Fairfax, Loudoun, Fauquier, Prince William, and Culpeper counties), its small extension into Montgomery County, Maryland, and to local, shallow-soiled areas in the Blue Ridge foothills of northern Virginia and Maryland."

SOURCES

References: Comer et al. 2003*, EPA 2004, Edwards et al. 2013, Engeman et al. 2007, Eyre 1980, Farrell and Ware 1991, Nelson 1986, Nordman 2013, Peet et al. 2013, Schafale 2012, Schafale and Weakley 1990, Simon and Hayden 2014, Southeastern Ecology Working Group n.d., Ware 1992, Wharton 1978

Version: 01 Oct 2015**Stakeholders:** East, Southeast

Concept Author: M. Schafale, R. Evans, G. Fleming, M. Pyne **Lead Resp:** Southeast

CES202.339 SOUTHERN PIEDMONT DRY OAK-(PINE) FOREST AND WOODLAND

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Needle-Leaved Tree; Broad-Leaved Tree

National Mapping Codes: EVT 7368; BPS 8868

Concept Summary: This system encompasses the prevailing upland forests of the southern Piedmont from Alabama north to central and southern Virginia. High-quality and historic examples are typically dominated by combinations of upland oaks, sometimes with pines 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 system is currently composed of successional forests that have arisen after repeated cutting, clearing, and cultivation of original oak-hickory and oak-hickory-pine forests. Stands of these forests are dominated by combinations of upland oaks, particularly *Quercus alba, Quercus rubra, Quercus velutina, Quercus stellata, Quercus coccinea*, and *Quercus falcata*, along with *Carya glabra, Carya tomentosa*, and other *Carya* spp. Other common tree species include *Pinus taeda, Pinus echinata, Pinus virginiana, Acer rubrum, Liquidambar styraciflua*, and *Liriodendron tulipifera*. There is considerable variation in this widespread matrix system. In particular, there are "dry-mesic" as well as "dry" components, as well as stands with codominance by *Pinus echinata*, and distinctive stands dominated by *Quercus montana* with other dry-site species on the summits of hills called monadnocks. There are particular associations that represent this variation.
Comments: Although these forests have often been called "oak-hickory" (Braun 1950) or "oak-pine-hickory" (Küchler 1964, Greller 1989, Skeen et al. 1993), Monk et al. (1990) concluded there was insufficient abundance of hickory to justify including this genus in the name of such forests. There are fairly dramatic differences in the amount of pine present across the modern day Piedmont landscape, with it being especially prevalent in South Carolina, Georgia, and Alabama (USGS 1992). To some extent, the prevalence of pine in these southern portions of the region may represent natural or presettlement conditions (Nelson 1957, Cowell 1998). It is possible that the more heavily mixed or pine-dominated forests of the southern Piedmont should be recognized as a different ecological system, but distinguishing natural examples is difficult given a long history of land-use impacts and resulting vegetational changes in the region (Brender 1974, Cowell 1998). In addition, Skeen et al. (1993) assert that "the oak-hickory-pine designation may be reflective of past land use and disturbance history and that the steady-state typal forest of the southeastern Piedmont is in reality oak-hickory-yellow poplar."

There are fairly clear variations within this system between dry and dry-mesic forests and also between those on acidic or basic soils. These might warrant separate ecological systems, but the similar canopy composition and similar dynamics tie them together, and those distinctions may best be made at the association level. Some of this variation (e.g., dry-mesic, dry, pine-dominated, monadnocks) has been recognized at the association level, and at finer spatial scales may be reliably mapped, as in Simon and Hayden (2014).

Large areas once dominated by oak-hickory forests now have successional pine forest. This may be regarded as a distinct phase of this system for mapping purposes.

DISTRIBUTION

Range: This system ranges throughout the Piedmont from Alabama to Virginia. In Virginia, it is primarily central and southern, but extends into a narrow portion of northern Virginia in the Piedmont ecoregion.
Divisions: 202:C
TNC Ecoregions: 52:C
Nations: US
Subnations: AL:SNR, GA:SNR, NC:SNR, SC:SNR, VA:SNR
Map Zones: 54:C, 59:C, 60:C, 61:C
USFS Ecomap Regions: 231A:CC, 231Dd:CCC, 231I:CC

CONCEPT

High-ranked species: Amorpha schwerinii (G3G4), Eurybia mirabilis (G3), Helianthus schweinitzii (G3), Monotropsis odorata (G3), Nardia lescurii (G3?), Rhododendron eastmanii (G3), Rhus michauxii (G2G3), Scutellaria ocmulgee (G2), Silene polypetala (G2), Symphyotrichum georgianum (G3), Thermopsis mollis (G3G4), Trillium pusillum var. pusillum (G3T2)
Environment: This system occurs on upland ridges and upper to midslopes, occupying most of the uplands. Moisture conditions, determined by topography, are dry to dry-mesic. This system may occur on soils derived from any kind of rock type, with rock chemistry being an important determinant of variation. Soils include almost the full range of upland soils, with only the shallowest rocky soils and those with extreme clay hardpans excluded.

The Piedmont has mostly gently rolling topography ranging from 90 to 365 m (300-1200 feet) elevation. Several erosion-resistant metamorphic and igneous rock types have been left as monadnocks that stand 60 to 305 m (200-1000 feet) above the surrounding landscape. Average annual precipitation is 110-122 cm (44-48 inches). The presettlement vegetation as described by early explorers and the first settlers was a mosaic of forest and open woodland, with interspersed savannas or prairies (Lederer 1672, Logan 1859). The prairie component was located

on the flat to convex and gently rolling uplands of the larger fire compartments. The largest of these in the southern part of the range was up to five miles wide without a tree or only a few blackjack oaks (Logan 1859).

This ecological system encompasses the prevailing upland forests of the southern Piedmont. High-quality and historic examples are typically dominated by combinations of upland oaks, sometimes with pines 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 upland vegetation type covering most of the landscape.

The Piedmont Monadnock Forest (Schafale and Weakley 1990) is included within this broad type. Stands are dominated by *Quercus montana*, and occur mainly on resistant ridges (monadnocks) over felsic rocks of the Piedmont, including quartzite, rhyolite, and pyrophyllite. Soils are well-drained, acidic and nutrient-poor. Lightning strikes and high winds are common in these exposed locations (Schafale and Weakley 1990).

Vegetation: Vegetation consists of forests dominated by combinations of upland oaks, particularly *Quercus alba, Quercus rubra, Quercus velutina, Quercus stellata, Quercus coccinea*, and *Quercus falcata*, along with *Carya glabra, Carya tomentosa (= Carya alba)*, and other *Carya* spp. Other common tree species include *Pinus taeda, Pinus echinata, Pinus virginiana, Acer rubrum, Liquidambar styraciflua*, and *Liriodendron tulipifera*. A well-developed understory and shrub layer is generally present, with species varying with soil chemistry. The herb layer is sparse to at most moderate in density. Before natural fires were suppressed, the forests presumably had less understory and shrub component and probably a grassy herb layer. There is considerable variation in this widespread matrix system. In particular, there are "dry-mesic" as well as "dry" components, as well as stands with codominance by *Pinus echinata*, and distinctive stands dominated by *Quercus montana (= Quercus prinus)* with other dry-site species on the summits of hills called monadnocks. There are particular associations that represent this variation. There is some uncertainly about the composition and physiognomy of this system under presettlement conditions, in particular with some debate about the relative importance of *Quercus* spp., *Carya* spp., and *Liriodendron tulipifera*, as well as the role of *Pinus echinata* and its increasing abundance to the south.

Dynamics: In successional forests recovering from clearcutting or cultivation, *Pinus taeda, Pinus echinata*, and/or *Pinus virginiana* typically dominate for a number of decades, with *Quercus* spp., *Carya* spp., and other hardwoods gradually invading the understory.

Fire was probably an important natural disturbance in this system, affecting vegetation structure and composition of the lower strata. It may have been important in favoring oaks and pines over other trees. Fires were likely almost always low-intensity surface fires. Native American burning was also important in the Piedmont (Cowell 1998). These forests appear to occur naturally as predominantly old-growth, with canopy dynamics dominated by gap-phase regeneration. Small to medium-sized canopy gaps created by wind are the primary natural disturbance at present, and probably were in the past as well. Fire likely created some small to medium-sized gaps in the past also, and likely caused all canopy gaps to persist longer. The dominant tree species are capable of living for several centuries.

Fire and grazing are possibly the most important natural processes affecting the floristic composition and vegetation structure of this system (Landfire 2007a). The presence of frequent (2-5 years) surface fire is important in order to support the reproduction of *Pinus echinata* and the development of diverse herbaceous understories. *Pinus echinata* is a shade-intolerant species and does not compete and regenerate well when fire is absent. Where fire occurs at an appropriate frequency, the stand may develop a relatively pure canopy of *Pinus echinata*, typified by a very open woodland structure with scattered overstory trees and an herbaceous-dominated understory (Landfire 2007a).

The frequency of fire is variable across the landscape to create a mosaic of vegetation. However, most agree that the fire-return interval was relatively short. Fire may have been as frequent as every two to three years. Brewer (2001) compared the current tree species composition to bearing tree records in the upper coastal plain of northern Mississippi and found that *Pinus echinata* and more fire-tolerant species such as *Quercus velutina* and *Quercus stellata* were prevalent on the landscape, indicating a greater fire frequency. Without a short fire-return interval, community succession tends to favor upland mixed pine-xeric hardwood forests or hardwood-dominated forests. Landers (1989) inferred a fire-return interval of 10 times per century for pure stands of *Pinus echinata*.

Lightning fires occurred primarily during the spring dry season (April and May) with a second peak of Native American burning during the fall (October and November). Occasionally, during extensive droughts, mixed-severity or stand-replacement fires did occur, especially on drier pine-dominated sites. Local thunderstorms and outbreaks of southern pine beetle (*Dendroctonus frontalis*) created gaps on a small but continual basis. More extensive regional disturbances included tropical storms during the growing season, ice storms during winter, and tornadoes throughout the year (Landfire 2007a).

SPATIAL CHARACTERISTICS

Spatial Summary: Naturally a matrix system, dominating most of the upland landscape in the Piedmont. Remnants are mostly large patch, but some large expanses remain.

Size: Once occurred as the matrix system, with contiguous patches covering many thousands of acres. Mature patches are now mostly reduced to large-patch remnants, some of hundreds of acres. A few areas have substantially forested landscapes in which oak-hickory forests in some condition cover thousands of acres in nearly contiguous patches.

Heterogeneity: Most occurrences are interfingered with Southern Piedmont Mesic Forest (CES202.342) and floodplain systems, following the dissected landscape. Various rock outcrops, Piedmont Hardpan Woodland and Forest (CES202.268), Piedmont Upland Depression Swamp (CES202.336), and other small-patch systems may be embedded. Within the system, most occurrences are moderately heterogeneous, consisting of mosaics of two or three associations. Areas with variable geology may have more different associations. Many stands are variable mixtures of pine (*Pinus echinata, Pinus taeda*) and hardwoods (e.g., *Quercus* spp., *Carya* spp., *Liquidambar, Liriodendron, Nyssa*, etc.).

Adjacent Ecological System Comments: Most commonly associated with Southern Piedmont Mesic Forest (CES202.342). Various rock outcrops, Piedmont Hardpan Woodland and Forest (CES202.268), Piedmont Upland Depression Swamp (CES202.336), and other small-patch systems may be embedded.

Other Comments: The name oak-hickory forest is the traditional name applied to communities of this system. Oaks are virtually always dominant, with hickories usually ranging from scarce to a significant minority of the canopy and understory. Hickories are occasionally even absent. After oaks, hickories are almost always the genus of trees with the most different species present, and usually the only genus besides oaks that have more than one species present in the canopy.

Most of 231D would be in the range of Alleghany-Cumberland Dry Oak Forest and Woodland (CES202.359) rather than Southern Piedmont Dry Oak-(Pine) Forest and Woodland (CES202.339), but 231Dd is an ambiguous area that EPA affiliates with the Piedmont (mainly 45d), so CES202.339 is being affiliated with it.

SOURCES

References: Braun 1950, Brender 1974, Brewer 2001, Comer et al. 2003*, Cowell 1998, Eyre 1980, Gibbon 1966, Godfrey 1982b, Greller 1989, Küchler 1964, LANDFIRE 2007a, Landers 1989, Lederer 1672, Logan 1859, McDonald et al. 2002, Mistretta 1984, Monk et al. 1990, Nelson 1957, Nelson 1986, Nowak 2002, Oosting 1942, Peet et al. 2013, Schafale 2012, Schafale and Weakley 1990, Simon and Hayden 2014, Simon pers. comm., Skeen et al. 1993, Taecker 2007, Taverna et al. 2005, Trimble 1974, Trimble 2008, USGS 1992, USGS 2015b, VDNH unpubl. data

Version: 02 Oct 2015 **Stakeholders:** East, Southeast

Concept Author: M. Schafale, R. Evans, M. Pyne **Lead Resp:** Southeast

CES202.608 CENTRAL APPALACHIAN RIVER FLOODPLAIN

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Toeslope/Valley Bottom; Riverine / Alluvial; Broad-Leaved Deciduous Tree; Intermittent Flooding; Short (<5 yrs) Flooding Interval

National Mapping Codes: EVT 9059; BPS 8059

Concept Summary: This system encompasses floodplains of medium to large rivers in Atlantic drainages from southern New England to Virginia. This system can include a complex of wetland and upland vegetation on deep alluvial deposits and scoured vegetation on depositional bars and on bedrock where rivers cut through resistant geology. This complex includes floodplain forests in which *Acer saccharinum, Populus deltoides*, and *Platanus occidentalis* are characteristic, as well as herbaceous sloughs, shrub wetlands, riverside prairies and woodlands. Microtopography and soil texture determine how long the various habitats are inundated. Depositional and erosional features may both be present depending on the particular floodplain.

Comments: This system is distinguished from related floodplain systems; northward, Laurentian-Acadian Floodplain Forest (CES201.587) is characterized by the lack or unimportance of *Platanus occidentalis* and *Betula nigra*, for example; and westward, North-Central Interior Floodplain (CES202.694) drains to the midwestern rivers rather than northeastern rivers. Determining the distinctions from South-Central Interior Large Floodplain (CES202.705), which overlaps the southern and western portions of this system, needs work.

DISTRIBUTION

Range: Southern New England west to Lake Erie and south to Virginia. The James River in Virginia marks the southern extent of this system.
Divisions: 201:C, 202:C
TNC Ecoregions: 49:C, 52:C, 59:C, 60:C, 61:C
Nations: US
Subnations: CT:SNR, MA:SNR, MD:SNR, NH:SNR, NJ?:SNA, NY:SNR, OH:SNR, PA:SNR, VA:SNR, VT:SNR, WV:SNR
Map Zones: 53:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C, 65:C
USFS Ecomap Regions: 211F:CC, 211G:CC, 211I:CC, 211J:CC, 221A:CC, 221B:CC, 221D:CC, 232Ac:CCP, M221A:CC, M221B:CC

CONCEPT

High-ranked species: Arabis georgiana (G1), Canis rufus (G1Q), Catocala marmorata (G3G4), Cetradonia linearis (G3), Cicindela ancocisconensis (G3), Diervilla rivularis (G3), Eurycea junaluska (G2G3), Fissidens appalachensis (G2G3), Glyptemys insculpta (G3), Hygrohypnum closteri (G3), Lejeunea blomquistii (G1G2), Lysimachia fraseri (G3), Plethodon aureolus (G2G3), Sagittaria secundifolia (G1), Sorex palustris punctulatus (G5T3), Spiraea virginiana (G2)
Environment: This system forms on broad, relatively flat floodplains along medium-sized to large rivers. Rivershores often exhibit development of one or more terraces formed in relation to hydroperiod and height from river channel. Backswamps may occur in poorly drained depressions behind the main river channel, where substrate is deep muck. Soils range from sandy and silty on point bars to deep muck in backswamps.
Vegetation: This complex includes floodplain forests in which *Acer saccharinum, Platanus occidentalis*, and *Populus deltoides* are characteristic, as well as herbaceous sloughs, shrub wetlands, riverside prairies and woodlands. Other trees may include *Acer rubrum, Acer negundo, Betula nigra, Carpinus caroliniana, Fraxinus pennsylvanica, Liriodendron tulipifera, Platanus occidentalis, Populus deltoides*, and *Ulmus americana*. Herbs and shrubs may include *Ageratina altissima, Boehmeria cylindrica, Carex trichocarpa, Carex torta, Cyperus squarrosus, Elymus virginicus, Eragrostis hypnoides, Hypericum prolificum, Ionactis linariifolius, Laportea canadensis, Eubotrys racemosa (= Leucothoe racemosa), Lindera benzoin, Lindernia dubia, Ludwigia palustris, Matteuccia struthiopteris, Onoclea sensibilis, Peltandra virginica, Physocarpus opulifolius, Schizachyrium scoparium*, and *Solidago simplex var. racemosa*.
Dynamics: Spring and summer flooding brings large amounts of sediment carried from tributaries, as well as other debris that is deposited on the floodplain as flood waters recede. Floodplain canopy trees often topple as a result of prolonged saturation of sediments; vegetation structure is highly variable and dynamic as a result. Dynamic disturbance regime and high fertility make this system highly susceptible to invasions of non-native plants.

SOURCES

References: Comer et al. 2003*, Edinger et al. 2014a, Eyre 1980, Faber-Langendoen et al. 2011, Kearsley 1999c, PNHP 2002, Rhoads and Block 1999, Sperduto and Nichols 2004, Swain and Kearsley 2011, Zimmerman 2011m, Zimmerman et al. 2012
Version: 02 Jan 2015**Stakeholders:** East, Midwest, Southeast
Concept Author: S.C. Gawler **Lead Resp:** East

CES202.609 CENTRAL APPALACHIAN STREAM AND RIPARIAN

Primary Division: Central Interior and Appalachian (202)
Land Cover Class: Mixed Upland and Wetland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland
Diagnostic Classifiers: Lowland; Riverine / Alluvial; Very Short Disturbance Interval; Flood Scouring; Intermittent Flooding
National Mapping Codes: EVT 9060; BPS 8060
Concept Summary: This riparian system ranges from southern New England to Virginia and West Virginia and occurs over a wide range of elevations. It develops on floodplains and shores along river channels that lack a broad flat floodplain due to steeper sideslopes, higher gradient, or both. It may include communities influenced by flooding, erosion, or groundwater seepage. The vegetation is often a mosaic of forest, woodland, shrubland, and herbaceous communities. Common trees include *Betula nigra* and *Platanus occidentalis*. Open, flood-scoured

rivershore prairies feature *Panicum virgatum* and *Andropogon gerardii*, and *Carex torta* is typical of wetter areas near the channel.
Comments: This is a high-gradient system, unlike the low-gradient system described in Central Appalachian River Floodplain (CES202.608). To the south in the Appalachians and interior, this system is replaced by South-Central Interior Small Stream and Riparian (CES202.706).

DISTRIBUTION

Range: This system ranges from southern New England west to Lake Erie and south to Virginia and West Virginia. The James River in Virginia marks its southern extent.
Divisions: 202:C
TNC Ecoregions: 49:C, 52:C, 59:C, 60:C, 61:C
Nations: US
Subnations: CT:SNR, DE:SNR, MA:SNR, MD:SNR, NH:SNR, NJ?:SNA, NY:SNR, OH:SNR, PA:SNR, VA:SNR, VT:SNR, WV:SNR
Map Zones: 53:C, 60:C, 61:C, 62:C, 63:P, 64:P, 65:C

CONCEPT

High-ranked species: Bryoerythrophyllum ferruginascens (G3G4), Canis rufus (G1Q), Catocala marmorata (G3G4), Cetradonia linearis (G3), Cicindela ancocisconensis (G3), Desmognathus aeneus (G3G4), Desmognathus wrighti (G3), Fissidens appalachensis (G2G3), Glyptemys insculpta (G3), Hexastylis naniflora (G3), Hexastylis rhombiformis (G3), Hexastylis shuttleworthii var. harperi (G4T3), Isotria medeoloides (G2G3), Jamesianthus alabamensis (G3), Lejeunea blomquistii (G1G2), Lysimachia fraseri (G3), Megaceros aenigmaticus (G3), Melanoplus serrulatus (G1G3), Plethodon hubrichti (G2G3), Plethodon punctatus (G3), Sagittaria secundifolia (G1), Spiraea virginiana (G2), Waldsteinia lobata (G3)
Environment: This alluvial system forms on the shores of rivers and streams influenced by flood scour and deposition. It includes vegetation on various substrates ranging from silty sediments low on the channel to rock outcrops, gorge walls, and cobbles.
Vegetation: The vegetation is often a mosaic of forest, woodland, shrubland, and herbaceous communities. Common trees include *Betula nigra, Platanus occidentalis*, and *Acer negundo*. Open, flood-scoured rivershore prairies feature *Panicum virgatum* and *Andropogon gerardii*, and *Carex torta* is typical of wetter areas near the channel.
Dynamics: High-gradient waterflow causes scouring of rivershores, removing soils and depositing them in slower-moving portions of the river. High amounts of debris cause flood-battering of trees and shrubs, and removal of woody vegetation during extreme flooding events. Seepage from uplands may emerge from shores, and the often specialized flora of these environments is maintained by repeated removal, or prevention of establishment, of woody vegetation. Flood-battering of trees prevents succession; scouring by water, and sometimes ice, exposes substrate.

SOURCES

References: Comer et al. 2003*, Edinger et al. 2014a, Eyre 1980, Faber-Langendoen et al. 2011, PNHP 2002, Sperduto and Nichols 2004, Zimmerman 2011j, Zimmerman 2011m, Zimmerman and Podniesinski 2008, Zimmerman et al. 2012
Version: 14 Jan 2014**Stakeholders:** East, Midwest, Southeast
Concept Author: S.C. Gawler **Lead Resp:** East

CES203.520 NORTHERN ATLANTIC COASTAL PLAIN BASIN SWAMP AND WET HARDWOOD FOREST

Primary Division: Gulf and Atlantic Coastal Plain (203)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
Diagnostic Classifiers: Forest and Woodland (Treed); Seepage-Fed Sloping; North Atlantic Coastal Plain
National Mapping Codes: EVT 9188; BPS 8188
Concept Summary: This system comprises nonriverine hardwood swamps of seasonally flooded habitats, including relatively shallow groundwater-influenced depressions and Coastal Plain terraces. It ranges from the southern glaciated Atlantic Plain of Long Island, New York, south along the northern Coastal Plain to Virginia. Although supporting some seepage indicators, it is also affected by overland flow. The substrate is mineral soil overlain by a variable organic but non-peaty layer. Characteristic tree species include *Acer rubrum, Liquidambar*

styraciflua, Nyssa sylvatica, Quercus michauxii, Quercus pagoda, Quercus palustris, and *Quercus phellos*. *Pinus taeda* is not uncommon south of Delaware Bay.
Comments: Vegetation along streams is accommodated in Northern Atlantic Coastal Plain Riparian and Floodplain (CES203.070).

DISTRIBUTION

Range: It ranges from Long Island, New York, south to Virginia.
Divisions: 203:C
TNC Ecoregions: 58:C, 62:C
Nations: US
Subnations: DE:SNR, MD:SNR, NH:SNR, NJ:SNR, NY:SNR, PA:SNR, VA:SNR
Map Zones: 60:C, 65:C
USFS Ecomap Regions: 221An:CCC, 232A:CC, 232H:CC, 232L:CC

CONCEPT

High-ranked species: Carex schweinitzii (G3G4), Helonias bullata (G3), Hydrochus spangleri (G1), Juncus caesariensis (G2G3), Narthecium americanum (G2), Scirpus longii (G3), Trillium pusillum var. virginianum (G3T2)
Environment: This system occurs in low-lying areas, such as stream headwaters or depressions, or along water courses.
Vegetation: Characteristic tree species include *Acer rubrum, Liquidambar styraciflua, Nyssa sylvatica, Quercus phellos*, and *Fraxinus pennsylvanica*. *Pinus taeda* is not uncommon south of Delaware Bay.
Dynamics: This system occurs on extensive, flat terraces and very wide, ancient floodplains that are no longer subject to alluvial processes. Its hydrology is seasonally to nearly permanently saturated, with occasional ponding or groundwater sheetflows, and is maintained by a high water table rather than riverine or estuarine flooding.

SOURCES

References: Comer et al. 2003*, Edinger et al. 2014a, Eyre 1980, Faber-Langendoen et al. 2011, Metzler and Barrett 2006, NYNHP 2013c, Rhoads and Block 2011d, Sperduto and Nichols 2004, Stevens 1992, Zimmerman et al. 2012
Version: 14 Jan 2014**Stakeholders:** East, Southeast
Concept Author: R. Evans **Lead Resp:** East

CES203.374 NORTHERN ATLANTIC COASTAL PLAIN PITCH PINE LOWLAND

Primary Division: Gulf and Atlantic Coastal Plain (203)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
National Mapping Codes: EVT 7456; BPS 6456
Concept Summary: This system comprises wetland pine barrens vegetation and coastal plain peatlands from the New Jersey Pine Barrens south into the Delmarva Peninsula and upper Chesapeake Bay. Although this system can be extensive, components often co-occur as a mosaic with upland pine barrens vegetation as well. The vegetation is characterized by associations having variable hydroperiods, occurring on a range of substrates from saturated deep peats to seasonally saturated mineral soils. Physiognomy of the component associations is similarly widely variable, ranging from wet grasslands dominated by *Calamovilfa brevipilis*, to boggy shrublands characterized by *Gaylussacia dumosa, Chamaedaphne calyculata, Eubotrys racemosa*, and others, to seasonally saturated pine forests characterized by mesic species such as *Clethra alnifolia*. Fire frequency, as well as hydrology, has a profound influence on the vegetation. Where fire frequency is high, woody vegetation is impeded, favoring the development of large wet grasslands.
Comments: Ponded wetlands with standing water (which may drop over the course of the season) and mineral soils are treated as Northern Atlantic Coastal Plain Pond (CES203.518).

DISTRIBUTION

Range: This system is best developed in the New Jersey Pine Barrens, but occurrences are present south to the Inner Coastal Plain of Maryland.
Divisions: 203:C
TNC Ecoregions: 58:C, 62:C
Nations: US

Subnations: DE?:SNA, MD:SNR, NJ:SNR
Map Zones: 60:C
USFS Ecomap Regions: 232A:CC, 232Hb:CCC, 232Hc:CCC, 232Hd:CCC

CONCEPT

High-ranked species: Cirsium virginianum (G3), Coreopsis rosea (G3), Eupatorium resinosum (G3), Gentiana autumnalis (G3), Juncus caesariensis (G2G3), Muhlenbergia torreyana (G3), Narthecium americanum (G2), Platanthera integra (G3G4), Rhexia aristosa (G3G4), Rhynchospora knieskernii (G2), Rhynchospora pallida (G3), Rubus hypolasius (G1?Q), Scirpus longii (G3)
Environment: This system occurs within the larger matrix of pitch pine - scrub oak barrens of the New Jersey Pinelands. Hydrology is primarily groundwater-controlled; vegetation composition is a reflection of depth to water table.
Vegetation: The vegetation is characterized by associations having variable hydroperiods, occurring on a range of substrates from saturated deep peats to seasonally saturated mineral soils. Physiognomy of the component associations is similarly widely variable, ranging from wet grasslands dominated by *Calamovilfa brevipilis*, to boggy shrublands characterized by *Gaylussacia dumosa, Chamaedaphne calyculata, Eubotrys racemosa (= Leucothoe racemosa)*, and others, to seasonally saturated pine forests characterized by mesic species such as *Clethra alnifolia*.
Dynamics: This system and the composition and structure of its mosaic of patch types are influenced by depth to water table (Ehrenfeld 1986). Pitch pines are also structured by fires, but fire regime differs from uplands in that in the wet environment, fire frequency is lower, but the high shrub density often leads to crown fires. In high-intensity fires, pitch pines are killed, and even the organic layer may be consumed during periods of drought. Successional pathways following fire depend on depth of remaining organic layer and proximity of seed source (Little 1979c).

SOURCES

References: Comer et al. 2003*, Ehrenfeld 1986, Eyre 1980, Faber-Langendoen et al. 2011, Little 1979c, Zampella et al. 1992
Version: 14 Jan 2014**Stakeholders:** East, Southeast
Concept Author: R. Evans and L. Sneddon **Lead Resp:** East

CES203.070 NORTHERN ATLANTIC COASTAL PLAIN RIPARIAN AND FLOODPLAIN

Primary Division: Gulf and Atlantic Coastal Plain (203)
Land Cover Class: Mixed Upland and Wetland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland
Diagnostic Classifiers: Riverine / Alluvial
National Mapping Codes: EVT 9195; BPS 8195
Concept Summary: This ecological system is found throughout the northern Atlantic Coastal Plain, ranging from Virginia to New Jersey. Examples occur along low-gradient streams and rivers. Floodplain development varies from little to moderate according to stream size. This system is influenced by overbank flooding, groundwater seepage and occasional beaver impoundments. The vegetation is a mosaic of forests, woodlands, shrublands, and herbaceous communities. Canopy composition and cover can vary within and among examples of this system, but typical tree species may include *Quercus palustris, Quercus phellos, Chamaecyparis thyoides, Acer rubrum, Fraxinus pennsylvanica, Nyssa sylvatica, Betula nigra, Liquidambar styraciflua*, and *Platanus occidentalis*. Shrubs and herbaceous layers can vary in richness and cover. Some characteristic shrubs may include *Alnus maritima, Carpinus caroliniana, Lindera benzoin*, and *Viburnum nudum*. Seepage forests dominated by *Acer rubrum* and *Magnolia virginiana* can often be found within this system, especially at the headwaters and terraces of streams.
Comments: New Jersey's Pine Barrens riverside savannas, not covered in other ecological systems, fit this concept and are explicitly included, pending further review.

DISTRIBUTION

Range: This system occurs on the mid-Atlantic Coastal Plain from Virginia to New Jersey.
Divisions: 203:C
TNC Ecoregions: 57:C, 58:C, 62:C
Nations: US
Subnations: DE:SNR, MD:SNR, NJ:SNR, VA:SNR
Map Zones: 60:C

USFS Ecomap Regions: 232A:CC, 232H:CC

CONCEPT

High-ranked species: Alnus maritima (G3)
Environment: This system occurs on Coastal Plain flood terraces of streams and rivers and is also influenced by groundwater seepage. In New Jersey, this system occurs in the Pine Barrens matrix.
Dynamics: This system is hydrologically influenced primarily by groundwater seepage but is also subjected to periodic overbank flooding. The system is maintained by a natural disturbance regime of flooding and periodic fires of varied intensity. High-intensity fires may consume peat and limit re-establishment of Atlantic white-cedar.

SPATIAL CHARACTERISTICS

Spatial Summary: Small, linear patch.
Size: Can be quite long but never very wide.
Heterogeneity: Within a given occurrence, there may be floodplain forest and seepage forest, as well as shrub-herb openings and small patches of unvegetated beaches or bluffs.
Adjacent Ecological System Comments: This list is incomplete; other systems are adjacent in different parts of the range.

SOURCES

References: Comer et al. 2003*, Eyre 1980, Faber-Langendoen et al. 2011, Laderman 1989, Smith 2012, Strakosch-Walz 2004, Wacker 1979, Walz et al. 2006c
Version: 14 Jan 2014**Stakeholders:** East, Southeast
Concept Author: NCR Review Team **Lead Resp:** East

CES203.282 NORTHERN ATLANTIC COASTAL PLAIN TIDAL SWAMP

Primary Division: Gulf and Atlantic Coastal Plain (203)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
Diagnostic Classifiers: Forest and Woodland (Treed); Tidal / Estuarine
National Mapping Codes: EVT 9198; BPS 8198
Concept Summary: This system encompasses freshwater to oligohaline tidally-flooded deciduous forests and shrublands in lower river floodplains and edges of estuaries of the North Atlantic Coastal Plain. This system is restricted to narrow zones along upper tidal reaches of Inner Coastal Plain rivers and tributaries which have sufficient volumes of freshwater and short flooding to support tree canopies. These areas are influenced by lunar tides up to 1 m (3 feet), but diluting freshwater flows from upstream, keeping salinity levels below 0.5 ppt. Deciduous hardwood species predominate, especially *Nyssa biflora* and/or *Fraxinus profunda* or *Fraxinus pennsylvanica*. In Maryland and Virginia, *Taxodium distichum* may be locally dominant.
Comments: The range of this system is generally conceived as Chesapeake Bay and northward (e.g., in the Coastal Plain from the James River, Virginia, northward to New Jersey and Massachusetts). Examples of tidal swamp forests south of this region are treated under Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240); the boundaries may overlap somewhere in Virginia.

DISTRIBUTION

Range: This system ranges from the James River, Virginia, northward to the New Jersey Coastal Plain. Possible occurrence of this system in Pennsylvania requires additional study. Examples are probably most common in the Chesapeake Bay region.
Divisions: 203:C
TNC Ecoregions: 58:C, 62:C
Nations: US
Subnations: DE:SNR, MA:SNR, MD:SNR, NJ:SNR, NY:SNR, PA?:SNA, VA:SNR
Map Zones: 60:C, 65:C
USFS Ecomap Regions: 232Ad:CCC, 232Ha:CCC, 232Hb:CCC, 232Ib:CCC

CONCEPT

High-ranked species: Ludwigia brevipes (G2)
Environment: This association occurs along fresh reaches of tidal rivers, usually receiving diurnal or irregular tidal flooding. There is distinct hummock-and-hollow microtopography with hollows flooded during higher tides.

Soil is generally organic-rich and contains a frequently deep organic horizon over silty alluvial deposits. Pronounced hummock-and-hollow microtopography is characteristic. Hollows are inundated by diurnal tides; hummocks may be only irregularly flooded, and the tops of hummocks are only rarely (less than annually) submerged (Rheinhardt and Hershner 1992).
Vegetation: Deciduous hardwood species predominate, especially *Nyssa biflora* and/or *Fraxinus profunda* or *Fraxinus pennsylvanica*. In Maryland and Virginia, *Taxodium distichum* may be locally dominant.
Dynamics: Development and persistence of this association appears to be limited downstream by halinity and upstream by the availability of sufficient sediment. Hence, tidal hardwood swamps are associated primarily with the upper (higher halinity) end of the freshwater portion of the halinity gradient and typically occur on higher landscape positions adjacent to tidal freshwater marshes (Rheinhardt and Hershner 1992). These swamps are maintained by regular biomass input deposited by regular tidal flow.

SOURCES

References: Comer et al. 2003*, Edinger et al. 2014a, Eyre 1980, Faber-Langendoen et al. 2011, NYNHP 2013d, Rheinhardt and Hershner 1992
Version: 14 Jan 2014**Stakeholders:** East, Southeast
Concept Author: R. Evans and P. Coulling **Lead Resp:** East

CES202.336 PIEDMONT UPLAND DEPRESSION SWAMP

Primary Division: Central Interior and Appalachian (202)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
Diagnostic Classifiers: Depressional
National Mapping Codes: EVT 9210; BPS 8210
Concept Summary: This system represents isolated wetlands primarily of the Piedmont in small, shallow basins in upland settings where water pools due to limited soil drainage. Most known examples occur over mafic bedrock. The typical hydrology is seasonally flooded. Most examples consist of forests of wetland oaks, but a few are treeless or open-canopied ponds. Vegetation in open ponds is typically zoned with an outer ring of trees, a more interior ring of shrubs, herbs and vines, and a central area with or without standing water year round depending on precipitation. This system also includes the wet hardwood forests ("Iredell Flatwoods" or "Gabbro Glades") which occur on gently sloping terrain or shallowly depressed upland flats over gabbro-derived clays in the Piedmont of Georgia and South Carolina. A few examples of this system occur in the adjacent Southern Blue Ridge; these are extremely rare and small-patch examples.
Comments: This system is distinct from all other Piedmont systems in its ponded wetland hydrology in upland settings. The vegetation is generally also distinct from all other Piedmont systems. Though apparently quite different, Piedmont Hardpan Woodland and Forest (CES202.268) is closely related by the importance of an impermeable clay hardpan, and some intermediate gradations occur. A few examples of this system (CES202.336) appear to be closely related to Coastal Plain depressional wetlands, sharing some flora, but most are more distinct. The system has significant variation in vegetation and environment. The forested swamps and open pools represent well-marked subtypes. There is a more subtle distinction between the basic and acidic soil swamps. There is substantial variation among the pools, related to substrate, basin morphology, and geographic location. This system includes the depression swamps of the Triassic Basins of Virginia and Maryland. A few disjunct examples may occur in the Southern Blue Ridge because of similarity in topographic setting and general structure. They do, however, occur on different substrates (quartzite and sandstone) than any examples in the Piedmont. Their vegetation is different from other examples but not in having more montane flora. Their vegetation is no more different than most other pools are from each other.

DISTRIBUTION

Range: This system ranges throughout the Piedmont, from Virginia to Alabama. A few examples attributable to this system are found in the adjacent Southern Blue Ridge.
Divisions: 202:C
TNC Ecoregions: 51:C, 52:C, 59:?
Nations: US
Subnations: AL:SNR, GA:SNR, MD:SNR, NC:SNR, SC:SNR, VA:SNR
Map Zones: 54:C, 57:C, 59:C, 60:C, 61:C

USFS Ecomap Regions: 221D:CC, 231A:CC, 231I:CC

CONCEPT

High-ranked species: Boltonia montana (G1G2), Carex decomposita (G3G4), Isoetes virginica (G1), Quercus oglethorpensis (G3), Trillium pusillum var. virginianum (G3T2)

Environment: This system occurs in small, shallow basins or gentle swales on flat to rolling upland sites, and occasionally in depressions on narrow, steeper ridgetops. Soils have a dense clay hardpan or occasionally bedrock which limits internal drainage. Rainwater accumulates in the basins and persists through the wet season, occasionally persisting all year. Only a few kinds of rock are known to form these depressions. Most examples occur on soils derived from mafic rocks such as gabbro or diabase, but a few occur over slates or mafic to felsic tuffs where a dense clay hardpan has formed, and a few occur over unfractured bedrock. Some sites in Georgia have soils with shrink-swell tendencies which allow for both wetness and extreme dryness and inhibit the survival of trees, promoting an open woodland structure (Edwards et al. 2013). Examples in North Carolina may lack trees in the deepest water parts of basins. A few occur over bedrock of other kinds. Rock chemistry affects soil chemistry and influences variation in vegetation, but hydroperiod is a more important influence.

Vegetation: Vegetation consists either of swamps dominated by wetland oaks, or of more open-canopy pools with sparse trees and with substantial shrub or herbaceous vegetation. Swamps are most often dominated by *Quercus phellos*, with a substantial minority dominated by *Quercus lyrata* and a few having *Quercus bicolor, Quercus michauxii*, or other species. Examples that have been logged or cleared may be dominated by *Acer rubrum* or *Liquidambar styraciflua*. Lower strata are generally sparse in the swamps, often just a few shrubs such as *Vaccinium* spp., patches of *Smilax*, and a few wetland herbs. Open ponds may have the same canopy species on the edges, but a few have *Nyssa sylvatica* or other wetland species. The lower strata are better developed in the open pools, with *Cephalanthus occidentalis, Eubotrys racemosa (= Leucothoe racemosa), Vaccinium* spp., or other wetland species occurring as thickets along the edge or scattered in the interior. Large *Smilax* tangles sometimes occur. Herbs are usually still sparse or patchy but may include dense beds of various graminoids or ferns, as well as scattered clumps. *Sphagnum* is sometimes extensive in parts of the pools. These isolated seasonal wetlands are often important breeding sites for amphibians.

Dynamics: The dynamics of water levels are the most important factor in these systems, differentiating them from the surrounding uplands and differentiating the various communities within the system. These wetlands typically have very small watersheds, and input of water comes largely from rainfall. Variation in rainfall patterns will drive variation in duration of flooding, though most upland depression swamps have an outlet that limits water depth. Fire may be naturally rare in some examples of these systems, such as in North Carolina. Though they could naturally be exposed to fires occurring in the surrounding uplands, standing water and lack of continuous fuel would limit fires to the edges, expect perhaps very rarely in early fall. Other examples in South Carolina and Georgia are naturally prone to drying out and to fire and have an open woodland structure with a grassy understory, typical of wet flatwoods which naturally burned (Edwards et al. 2013). Presumably important as a dynamic process is the migration of amphibians, which concentrate in these systems for breeding. Ecosystem dynamics may be strongly affected by the suitability of surrounding uplands for amphibian adult habitat.

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, occurring as isolated bodies surrounded by upland systems. Open pools are usually less than one acre, while swamps may be up to several acres in size.

Size: Occurs as small patches. Pools are usually less than one acre and may be substantially smaller. Swamps range up to several acres, a few to ten or more acres. Most examples occur as isolated patches, but a few occur as small groups. Extensive mafic rock areas may support a number of swamps, but most are probably not close enough together to be treated as single occurrences. Most remaining examples are of natural size.

Heterogeneity: Most occurrences are single patches. Within the system, most examples will have only a single association. The open pools often have variation in vegetation physiognomy on a very fine scale, which is best treated within a single association.

Adjacent Ecological System Comments: Most examples are surrounded by Southern Piedmont Dry Oak-(Pine) Forest and Woodland (CES202.339) or Piedmont Hardpan Woodland and Forest (CES202.268).

SOURCES

References: Comer et al. 2003*, Edwards et al. 2013, Eyre 1980, Nelson 1986, Peet et al. 2013, Schafale 2012, Schafale and Weakley 1990, Wharton 1978

Version: 14 Jan 2014**Stakeholders:** East, Southeast

Concept Author: M. Schafale **Lead Resp:** Southeast

SHRUB & HERB VEGETATION

Grasslands, shrublands, open tree savannas, marshes, bogs and fens dominated by broadly mesomorphic (including scleromorphic) shrub and herb growth forms (including *broad-leaved, needle-leaved*, and *sclerophyllous shrubs*, and *forb* and *graminoid herbs*) with an irregular horizontal canopy structure, mesomorphic trees typically <10% cover (but tropical tree savannas typically <40%), tropical to boreal and subalpine climates, and wet to dry substrate conditions.

Temperate & Boreal Grassland & Shrubland

Temperate & Boreal Grassland & Shrubland is dominated by mesomorphic grasses and shrubs, with or without scattered trees (and trees typically <10% cover), ranging from temperate coastal to inland lowland and montane grasslands and shrublands, with a strongly seasonal climate and at least some frost to extended cold seasons.

CES202.348 SOUTHERN AND CENTRAL APPALACHIAN MAFIC GLADE AND BARRENS

Primary Division: Central Interior and Appalachian (202)
Land Cover Class: Steppe/Savanna
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Shallow Soil
National Mapping Codes: EVT 9233; BPS 8233
Concept Summary: This Southern and Central Appalachian system consists of vegetation associated with shallow soils over predominantly mafic bedrock, usually with significant areas of rock outcrop. Bedrock includes a variety of igneous and metamorphic rock types such as greenstone and amphibolite. These areas support a patchy mosaic of open woodland and grassy herbaceous vegetation sometimes with a predominant woody short-shrub community present.
Comments: These glades and barrens are intermediate between other rock outcrop and forest systems, with less dense vegetation than the closed forests supported by the region's climate but with more vegetation than bare rock cover. They may grade very gradually into both kinds of systems. Systems of similar physiognomy and setting but on acidic substrates are generally included in Central Appalachian Pine-Oak Rocky Woodland (CES202.600).

DISTRIBUTION

Range: This system occurs in scattered clusters in the Southern Blue Ridge and adjacent portions of the upper Piedmont and Central Appalachians.
Divisions: 202:C
TNC Ecoregions: 51:C, 52:C, 59:C
Nations: US
Subnations: GA?:SNA, MD:SNR, NC:SNR, PA?:SNA, SC?:SNA, TN:SNR, VA:SNR
Map Zones: 54:C, 57:C, 59:C, 61:C
USFS Ecomap Regions: 221D:CC, M221D:CC

CONCEPT

High-ranked species: Arabis patens (G3), Berberis canadensis (G3G4), Canis rufus (G1Q), Coreopsis delphiniifolia (G3?), Echinacea laevigata (G2G3), Erynnis martialis (G3), Melanoplus divergens (G2G3), Packera millefolium (G3), Parthenium auriculatum (G3G4), Penstemon smallii (G3), Rudbeckia triloba var. pinnatiloba (G5T3), Sabatia capitata (G2), Virginia valeriae pulchra (G5T3T4)
Environment: This system occurs on upper to mid slopes, usually on gentle to moderate slopes but occasionally steeper. The ground is mostly shallow soil over bedrock, usually with significant areas of rock outcrop. The rock usually has few fractures but may have a pitted or irregular surface. This rock structure supports more extensive and deeper soil development than in Southern Appalachian Granitic Dome (CES202.297) but has few of the crevices and deeper rooting sites available in Southern Appalachian Rocky Summit (CES202.327). Micro-scale soil depth and presence of seepage are important factors in determining the vegetation patterns. Shallow soil, unable to support a closed tree canopy, separates this system from forest systems. Bedrock includes a variety of igneous and metamorphic rock types. Some examples are on mafic substrates such as amphibolite, some are on felsic rock such as granitic gneiss but have flora that suggests a basic influence, and a few occur on felsic rocks and are clearly acidic. Rock or soil chemistry appears to be the most important factor affecting different associations on sites that have the physical structure to belong to this system. Elevation may also be an important factor causing variation.

Vegetation: Vegetation is a fine mosaic of different physiognomies, with open woodland and grassy herbaceous vegetation or short shrubs predominating. Some instances may have closed canopies of small trees or large shrubs, but no examples have large canopy trees with a closed canopy. Bare rock outcrops are usually present in a minority of the area. The canopy species are species tolerant of dry, shallow soils, most commonly *Quercus montana (= Quercus prinus), Pinus* spp., and *Juniperus virginiana var. virginiana*. Basic examples may also have *Carya glabra, Fraxinus americana*, and other species abundant. Shrubs may be dense, with species determined by soil chemistry. The herb layer is usually fairly dense and dominated by grasses, both in treeless areas and beneath open canopy. An abundant forb component is also usually present, especially in the more basic examples. The forbs include species characteristic of other rock outcrops and grassland species, with a smaller number of forest species present. Other species that may be present include the woody plants *Carya tomentosa (= Carya alba), Diervilla lonicera, Gaylussacia baccata, Kalmia latifolia, Aronia melanocarpa (= Photinia melanocarpa), Physocarpus opulifolius*, and *Quercus stellata*; and herbaceous plants *Aletris farinosa, Allium cernuum, Allium cuthbertii, Carex pensylvanica, Croton michauxii var. ellipticus (= Croton willdenowii), Cheilanthes tomentosa, Deschampsia flexuosa, Helianthus divaricatus, Hylotelephium telephioides, Muhlenbergia sobolifera, Packera paupercula, Phacelia dubia, Pycnanthemum tenuifolium, Saxifraga michauxii, Schizachyrium scoparium, Selaginella rupestris, Sibbaldiopsis tridentata, Solidago simplex var. randii, Solidago ulmifolia, Sorghastrum nutans*, and *Thalictrum revolutum*.

Dynamics: The dynamics of this system are complex and poorly understood. These sites, with their shallow soil, would likely be affected by fire, drought, and windstorms. Severe droughts kill tree saplings growing in cracks and potholes, helping to retain the open character of the glades (Quarterman et al. 1993). Fire may be an important influence on the vegetation structure and may function to keep the vegetation more open in the long run. The patchy distribution of vegetation in examples of this system may limit fire intensity. These glades do not appear to be undergoing the kind of cyclic succession that has been described for granitic domes, but some balance of soil accumulation and destruction may be occurring on a longer term or coarser scale. There may be a zonation or patchiness to glade/barren vegetation, with different zones that may be identified by their characteristic plant species (Quarterman et al. 1993). These zones are apparently relatively stable, with woody plant encroachment evident only in relation to the invasion of shrubs and trees into potholes or crevices where soil accumulates more rapidly. It is possible that the slightly irregular curved surface of some examples represents a late stage in the weathering of old exfoliation surfaces that once supported granitic domes, but most known examples are not spatially associated with existing granitic domes.

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering a few acres.
Size: Most examples naturally cover a few acres, with a few examples up to 10 or more acres.
Heterogeneity: Some larger examples may have several patches in close proximity, which would be treated as a single occurrence. Most complexes are separated by Southern Appalachian Oak Forest (CES202.886). A few areas are known with loose clusters of occurrences at greater distances, but many other examples are isolated. Within the system, most examples probably have only one or two associations.
Adjacent Ecological System Comments: This system is surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern Appalachian Oak Forest (CES202.886). It is rarely associated with Southern Appalachian Granitic Dome (CES202.297) or Southern Appalachian Rocky Summit (CES202.327).

SOURCES

References: Comer et al. 2003*, DeSelm and Murdock 1993, Duffey et al. 1974, Edwards et al. 2013, Estes et al. 1979, McKinney and Lockwood 1999, Murdock pers. comm., Nelson 1986, Noss 2013, Quarterman et al. 1993, Schafale 2012, Schafale and Weakley 1990, Simon 2011, Simon 2015, South Carolina Endangered Species Program 2010, TNC 1996c, Taft 1997a, Taft 2009, Taft et al. 1995, Wiens and Dyer 1975
Version: 29 Apr 2016**Stakeholders:** East, Southeast
Concept Author: M. Schafale, R. Evans, M. Pyne, S.C. Gawler **Lead Resp:** Southeast

CES202.602 CENTRAL APPALACHIAN ALKALINE GLADE AND WOODLAND

Primary Division: Central Interior and Appalachian (202)
Land Cover Class: Steppe/Savanna
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Ridge/Summit/Upper Slope; Unglaciated; Alkaline Soil; Shallow Soil
National Mapping Codes: EVT 7400; BPS 6400
Concept Summary: This system occurs at low to moderate elevations from the Central Appalachians (with a few northward incursions into southernmost New York and New England possible) south to the Ridge and Valley and Piedmont. It consists of woodlands and open glades on thin soils over limestone, dolostone or similar calcareous rock. *Juniperus virginiana* is a common tree, often increasing in the absence of fire, and *Quercus muehlenbergii* is indicative of the limestone substrate. *Rhus aromatica, Cercis canadensis*, and *Ostrya virginiana* may occur. Prairie grasses are the dominant herbs (*Andropogon gerardii, Schizachyrium scoparium, Bouteloua* spp.). Forb richness is often high; characteristic forbs include *Asclepias verticillata, Brickellia eupatorioides, Erigeron pulchellus, Monarda fistulosa, Packera obovata, Salvia lyrata*, and *Symphyotrichum oblongifolium*. Fire is sometimes an important natural disturbance factor, but open physiognomies may also be maintained by drought.

DISTRIBUTION

Range: This system is known from Pennsylvania and northwestern New Jersey south through the Ridge and Valley to western Virginia, possibly extending to southeasternmost New York and the marble valleys of northwestern Connecticut.
Divisions: 202:C
TNC Ecoregions: 49:P, 51:C, 59:C, 61:C
Nations: US
Subnations: CT?:SNA, MD:SNR, NJ:SNR, NY?:SNA, OH:SNR, PA:SNR, VA:SNR, WV:SNR
Map Zones: 57:C, 60:C, 61:C, 64:C, 65:P
USFS Ecomap Regions: 221B:CC, 221D:CC, M221A:CC, M221B:CC

CONCEPT

High-ranked species: Canis rufus (G1Q), Castilleja kraliana (G2), Clematis coactilis (G3), Delphinium exaltatum (G3), Echinacea laevigata (G2G3), Melanoplus divergens (G2G3), Monarda fistulosa var. brevis (G5T1T2), Rhynchospora thornei (G3), Taenidia montana (G3), Thaspium pinnatifidum (G2G3), Virginia valeriae pulchra (G5T3T4)
Environment: This system occupies mid-elevation rocky ridges, gentle to steep south- and southwest-facing slopes, and outcrops with thin soils and calcareous bedrock. Large amounts of exposed mineral soils and/or gravel are characteristic. Soils are high in pH and rich in calcium and magnesium. Although these areas are subject to prolonged droughts, local areas of ephemeral vernal seepage occur in microtopographic concavities, and they may have distinctive vegetation (e.g., colonies of Dodecatheon meadia). A series of glades in western Virginia is somewhat distinctive because of the dolostone, which contains a high magnesium content. These glades are located on low dolomite knobs and foothills of Elbrook dolomite that occupy middle to upper slopes and crests of south- or southwest-facing spur ridges at relatively low elevations. In the Allegheny Mountains and along the Allegheny Front of Pennsylvania, the surface geology is primarily sandstone and shale, but the Mauch Chunk formation includes several narrow bands of limestone that outcrop frequently on steep slopes (Berg et al. 1980).
Vegetation: In some cases, the woodlands grade into closed-canopy forests. *Juniperus virginiana* is a common tree, filling in in the absence of fire, and *Quercus muehlenbergii* is indicative of the limestone substrate. *Rhus aromatica, Cercis canadensis*, and *Ostrya virginiana* may occur. Prairie grasses are the dominant herbs (*Andropogon gerardii, Schizachyrium scoparium, Bouteloua* spp.); forb richness is often high. Characteristic forbs include *Asclepias verticillata, Monarda fistulosa, Salvia lyrata, Symphyotrichum oblongifolium*, and *Brickellia eupatorioides* (Braun 1950).
Dynamics: Drought stress appears to drive patch dynamics. Fire is likely to have a somewhat lesser impact due to thin soils and sparse vegetation, although fire scars on woody vegetation of barrens in Virginia suggest that fire may also play a role in maintaining the open character of this system (Ludwig 1999), and fire is also thought to contribute to arresting succession by woody species in Pennsylvania (Laughlin 2004, McPherson 2013). Where this system occurs on steep slopes, debris avalanches may cause periodic disturbance, but this process needs further study (Bartgis 1993); anthropogenic disturbance is thought to have played a role in establishment of some occurrences in Pennsylvania; quarrying has been noted to create habitat for the establishment of species characteristic of limestone prairies, but overall this activity poses a threat through outright destruction or habitat degradation (Laughlin 2004, McPherson 2013).

SOURCES

References: Bartgis 1993, Berg et al. 1980, Braun 1950, Comer et al. 2003*, Dreese 2010, Edinger et al. 2014a, Eyre 1980, Fike 1999, Laughlin 2004, Ludwig 1999, McPherson 2013
Version: 14 Jan 2014**Stakeholders:** East, Midwest, Southeast
Concept Author: S.C. Gawler, G. Fleming, and R. Evans **Lead Resp:** East

Shrub & Herb Wetland

Shrub & Herb Wetland includes open bogs, fens, fresh and saltwater marshes, wet meadows and wet shrublands. The vegetation occurs from tropical to polar regions.

CES203.516 NORTHERN ATLANTIC COASTAL PLAIN FRESH AND OLIGOHALINE TIDAL MARSH

Primary Division: Gulf and Atlantic Coastal Plain (203)
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
Diagnostic Classifiers: Tidal / Estuarine; Graminoid
National Mapping Codes: EVT 9191; BPS 8191
Concept Summary: This system includes freshwater tidal vegetation occurring on the upper reaches of large rivers influenced by tidal flooding, but beyond the reach of the salt or brackish waters. The system is well-developed on the Chesapeake and Delaware Bay drainages, including the rivers of southern New Jersey, then extends northeast and includes inland portions of the Hudson, Connecticut, Merrimack, Kennebec, and Penobscot rivers and their tributaries. The vegetation includes tall marshes dominated by tall grasses such as *Zizania aquatica*, marshes of lower stature dominated by forbs such as *Amaranthus cannabinus, Hibiscus moscheutos* and others, and vegetation characterized by short-statured and rosette-forming forbs such as *Eriocaulon parkeri* and *Isoetes riparia*. Associations are distributed by proximity to tidal waters and thus duration and force of flooding. Sediments of more protected and isolated vegetation is composed of finer-grained materials that are poorly drained, or of well-consolidated peat deposits. Vegetation exposed to greater flooding force and scouring action is supported by mineral substrates such as sand and gravel.

DISTRIBUTION

Range: This system is best developed on the Chesapeake and Delaware Bay drainages, including the rivers of southern New Jersey, but extends northeast and includes inland portions of the Hudson, Connecticut, Merrimack, Kennebec, and Penobscot rivers and their tributaries.
Divisions: 203:C
TNC Ecoregions: 58:C, 62:C, 63:C
Nations: US
Subnations: CT:SNR, DE:SNR, MA:SNR, MD:SNR, ME:SNR, NJ:SNR, NY:SNR, PA:SNR, VA:SNR
Map Zones: 60:C, 65:C, 66:C
USFS Ecomap Regions: 211Db:CCC, 211Dc:CCC, 221A:CC, 221B:CC, 232Ad:CCC, 232B:CC, 232Ha:CCC, 232Hb:CCC, 232Ib:CCC

CONCEPT

High-ranked species: Eriocaulon parkeri (G3), Problema bulenta (G3)
Environment: This system forms on the upper reaches of large rivers regularly inundated by tidal flooding but beyond the effects of saline waters.
Dynamics: This system is characterized by a mosaic of patches controlled by a combination of substrate particle size, amount of organic matter deposition, and the degree of stress (persistent natural processes) versus disturbance (episodic and disruptive processes) (Barrett 1994). Tidal amplitude in the Delaware Estuary supporting this system is approximately 2m.

SOURCES

References: Barrett 1994, Comer et al. 2003*, Edinger et al. 2014a, Faber-Langendoen et al. 2011, Gawler and Cutko 2010, NYNHP 2013d, Rhoads and Block 2011c, Zimmerman et al. 2012
Version: 14 Jan 2014**Stakeholders:** East, Southeast
Concept Author: R. Evans and L. Sneddon **Lead Resp:** East

OPEN ROCK VEGETATION

Tropical, temperate, and boreal habitats are characterized or dominated by plant growth forms, such as *lichen, bryophyte, alga*, or *fern*, that have structural adaptations for living on stable rock surfaces or on unstable rocky substrates, such as cliffs, talus, scree, pavement, cobble, lava or boulderfields, and with associated mesomorphic grass, shrub and tree growth forms.

Temperate & Boreal Open Rock Vegetation

Rocky habitats (such as cliffs, talus, scree, pavement, cobbles, recent lava flows, or large rock outcrops) characterized by temperate, including Mediterranean, and boreal lithomorphic and lithophilic growth forms, including saxicolous *lichens, bryophytes, algae*, and/or *ferns* and other pteridophytes. Tree growth forms typically have <10% cover, are very sparse; woody growth forms, when present, include cold-deciduous broad-leaved and needle-leaved trees and shrubs. Vegetation found on temperate and boreal rocky habitats (such as cliffs, talus, recent lava flows, or rock outcrops) at low to moderate elevations at mid-latitudes from 23°to 70°N or S latitude around the globe that are characterized by nonvascular plant growth forms that have structural adaptations for living on these habitats.

CES202.601 NORTH-CENTRAL APPALACHIAN ACIDIC CLIFF AND TALUS

Primary Division: Central Interior and Appalachian (202)
Land Cover Class: Barren
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Cliff (Substrate); Talus (Substrate); Temperate; Acidic Soil
National Mapping Codes: EVT 9173; BPS 8173
Concept Summary: This system comprises sparsely vegetated to partially wooded cliffs and talus slopes in the Central Appalachians and adjacent ecoregions, occurring on rocks of acidic lithology and lacking any indicators of enriched conditions. This cliff system occurs at low to mid elevations from central New England south to Virginia, and up to 1500 m in West Virginia. It consists of vertical or near-vertical cliffs and the talus slopes below, formed on hills of granitic, sandstone, or otherwise acidic bedrock. In some cases, especially in periglacial areas, this system may take the form of upper-slope boulderfields without adjacent cliffs, where talus forms from freeze/thaw action cracking the bedrock. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present. Vegetation in seepage areas tends to be more well-developed and floristically different from the surrounding dry cliffs. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places. *Juniperus virginiana* is a characteristic tree species, *Toxicodendron radicans* a characteristic woody vine, and *Polypodium virginianum* a characteristic fern. Within its range, *Pinus virginiana* is often present.
Comments: More complete data are needed to clarify the diagnostic differences between this system and similar systems to the north, south, and west: Laurentian-Acadian Acidic Cliff and Talus (CES201.569), Cumberland Acidic Cliff and Rockhouse (CES202.309), and Central Interior Acidic Cliff and Talus (CES202.689).

DISTRIBUTION

Range: This system is found from central New England and New York south to Virginia.
Divisions: 202:C
TNC Ecoregions: 49:C, 52:?, 59:C, 60:C, 61:C
Nations: US
Subnations: CT:SNR, MA:SNR, MD:SNR, NH:SNR, NJ:SNR, NY:SNR, OH:SNR, PA:SNR, VA:SNR, WV:SNR
Map Zones: 60:C, 61:C, 62:C, 63:P, 64:P, 65:C
USFS Ecomap Regions: 221E:CC, M221A:CC, M221B:CC, M221D:CC

CONCEPT

High-ranked species: Acrobolbus ciliatus (G3?), Aneides aeneus (G3G4), Bryocrumia vivicolor (G1G2), Bryum riparium (G2G4), Canis rufus (G1Q), Carex biltmoreana (G3), Carex misera (G3), Cetradonia linearis (G3), Donrichardsia pringlei (G2G3), Heuchera alba (G2Q), Hymenophyllum tayloriae (G2), Hypericum buckleii (G3), Krigia montana (G3), Leptohymenium sharpii (G1), Liatris helleri (G2Q), Liatris microcephala (G3G4), Lophocolea appalachiana (G1G2Q), Mannia californica (G3?), Metzgeria setigera (G1), Microtus chrotorrhinus carolinensis

(G5T3), Nardia lescurii (G3?), Neotoma magister (G3G4), Plagiochila austinii (G3), Plagiochila caduciloba (G3), Plagiochila echinata (G2), Plagiochila sullivantii var. spinigera (G2T1), Plagiochila sullivantii var. sullivantii (G2T2), Plagiochila virginica var. caroliniana (G3T2), Plagiomnium carolinianum (G3), Porella japonica ssp. appalachiana (G5?T1), Radula sullivantii (G3), Rhododendron vaseyi (G3), Saxifraga careyana (G3), Saxifraga caroliniana (G3), Scutellaria arguta (G1?Q), Sedum nevii (G3), Thelypteris pilosa var. alabamensis (G4T1), Tsuga caroliniana (G2G3)

Environment: This cliff system consists of vertical or near-vertical cliffs at low to mid elevations and the talus slopes below, formed on hills of granitic, sandstone, or otherwise acidic bedrock. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present.

Vegetation: Vegetation in seepage areas tends to be more well-developed and floristically different from the surrounding dry cliffs. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places. *Juniperus virginiana* is a characteristic tree species, *Toxicodendron radicans* a characteristic woody vine, and *Polypodium virginianum* a characteristic fern. Additional species that may be present include woody plants *Betula alleghaniensis, Betula lenta, Hydrangea arborescens, Quercus montana (= Quercus prinus)*, and *Quercus rubra*; the vine *Parthenocissus quinquefolia*; herbaceous plants *Asplenium montanum, Corydalis sempervirens, Polypodium virginianum*, and *Sedum ternatum*; and the lichens *Chrysothrix chlorina, Dimelaena oreina, Lasallia papulosa, Lasallia pensylvanica, Melanelia culbersonii, Melanelia stygia, Stereocaulon glaucescens, Umbilicaria mammulata*, and *Umbilicaria muhlenbergii*.

Dynamics: Periodic rockslides maintain the open character of this system. Fire is generally not an important factor, since steep slopes and rockslides prevent extensive vegetation development, limiting litter accumulation.

SOURCES

References: Comer et al. 2003*, Edinger et al. 2014a, Eyre 1980, ONHD unpubl. data, Sperduto and Nichols 2004
Version: 02 Jan 2015**Stakeholders:** East, Midwest, Southeast
Concept Author: S.C. Gawler **Lead Resp:** East

CES202.603 NORTH-CENTRAL APPALACHIAN CIRCUMNEUTRAL CLIFF AND TALUS

Primary Division: Central Interior and Appalachian (202)
Land Cover Class: Barren
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Cliff (Substrate); Talus (Substrate); Temperate; Alkaline Soil
National Mapping Codes: EVT 9175; BPS 8175
Concept Summary: This cliff system occurs at low to mid elevations from central New England south to Virginia and West Virginia. It consists of vertical or near-vertical cliffs and steep talus slopes where weathering and/or bedrock lithology produce circumneutral to calcareous pH and enriched nutrient availability. Substrates include limestone, dolomite and other rocks. The vegetation varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. *Fraxinus americana, Tilia americana*, and *Staphylea trifolia* are woody indicators of the enriched setting. *Thuja occidentalis* may occasionally be present but is more characteristic of the related Laurentian-Acadian system to the north. The herb layer is typically not extensive but includes at least some species that are indicators of enriched conditions, e.g., *Impatiens pallida, Pellaea atropurpurea, Asplenium platyneuron*, or *Woodsia obtusa*.

DISTRIBUTION

Range: This system ranges from central New England and New York south to Virginia and West Virginia. The extent of the Virginia range remains to be documented, but it appears to be absent from the Southern Blue Ridge and Southern Ridge and Valley portions of the state.
Divisions: 202:C
TNC Ecoregions: 52:C, 59:P, 60:?, 61:C
Nations: US
Subnations: CT:SNR, MA:SNR, MD:SNR, NH:SNR, NJ:SNR, NY:SNR, OH:SNR, PA:SNR, VA:SNR, VT:SNR, WV:SNR
Map Zones: 53:C, 59:P, 61:C, 62:?, 63:P, 64:C, 65:C, 66:P
USFS Ecomap Regions: 221Ae:CCP, 221Af:CCP, 221Ag:CCP, 221B:CC, 221D:CC, 221E:CC, M221A:CC, M221B:CC

CONCEPT

High-ranked species: Aneides aeneus (G3G4), Arabis patens (G3), Clematis addisonii (G1?), Donrichardsia pringlei (G2G3), Heuchera americana var. hispida (G5T3?), Homaliadelphus sharpii (G3?), Leptohymenium sharpii (G1), Neotoma magister (G3G4), Paxistima canbyi (G2?), Penstemon smallii (G3), Radula voluta (G3), Sedum nevii (G3), Silene virginica var. robusta (G5T2T3), Syntrichia ammonsiana (G1G3), Taxiphyllum alternans (G3?)
Environment: This cliff system occurs at low to mid elevations on vertical or near-vertical cliffs and steep talus slopes where weathering and/or bedrock lithology produce circumneutral to calcareous pH and enriched nutrient availability. Substrates include limestone, dolomite and other rocks.
Vegetation: *Fraxinus americana, Tilia americana*, and *Staphylea trifolia* are woody indicators of the enriched setting. *Thuja occidentalis* may occasionally be present but is more characteristic of the related Laurentian-Acadian system to the north. The herb layer is typically not extensive but includes at least some species that are indicators of enriched conditions, e.g., *Impatiens pallida, Pellaea atropurpurea, Asplenium platyneuron*, or *Woodsia obtusa*.
Other Comments: Land snails are known to exhibit highest diversity and abundance on calcareous substrates (J. Vanderhorst pers. comm. 2008).

SOURCES

References: Comer et al. 2003*, Edinger et al. 2014a, Eyre 1980, Vanderhorst pers. comm.
Version: 02 Jan 2015**Stakeholders:** East, Midwest, Southeast
Concept Author: S.C. Gawler **Lead Resp:** East

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